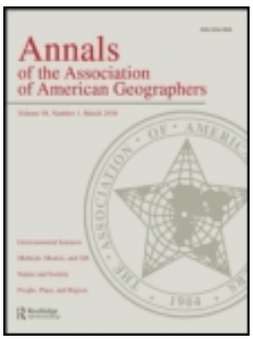

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A Multiscalar Analysis of Neighborhood Composition in Los Angeles, 2000–2010: A Location-Based Approach to Segregation and Diversity

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There continues to be cross-disciplinary interest in the patterns, extent, and changing contexts of segregation and spatial inequality more generally. The changes are clearly context dependent but at the same time there are broad generalizations that arise from the processes of residential sorting and selection. A major question in U.S. segregation research is how the growth of Asian and Hispanic populations is influencing patterns of segregation and diversity at the neighborhood level. In this article we use a variant of a nearest neighbor approach to map, graph, and evaluate patterns of race and ethnicity at varying scales. We show that using a multiscalar approach to segregation can provide a detailed and more complete picture of segregation. The research confirms work from other studies that segregation is decreasing between some groups and increasing between others, and the patterns, and processes can be described as dynamic diversity. In a series of maps of ethnic clusters and population homogeneity we show how metropolitan areas, represented in this case by Los Angeles, now display patterns of complex living arrangements with multiple groups inhabiting both local neighborhoods and wider community spheres. *Key Words: ethnicity, neighborhoods, residential patterns, scale, segregation.*

对于隔离及更普遍的空间不均之形态、范围与改变中的脉络，一直有着持续的跨领域研究兴趣。这些改变明显取决于脉络，但同时却有来自居住分类和选择过程的广泛普遍化。美国隔离研究中的主要问题是，亚裔与拉丁裔人口的成长，如何在邻里层级影响着隔离和多样化的形态。我们于本文中，运用不同的最邻近方法，製图、标绘并评估不同尺度中，种族及族裔的形态。我们显示，将多层级方法运用于隔离，可提供详细、且更为完整的隔离图像。本研究証实其他研究有关隔离在部分群体之间正在降低、但在其他群体之间正逐渐增加的论点，而该形态与过程，可被描绘成动态多样化。我们在族裔群聚和人口同质性的一系列地图中，展现出大都会地区——在本案例中呈现的是洛杉矶——今日如何呈现复杂的居住安排形态，其中多重的社群同时居住于在地邻里和更大范围的社群领域之中。*关键词：族裔，邻里，居住形态，尺度，隔离。*

Continúa notable el interés transdisciplinario sobre los patrones, alcance y cambiantes contextos de la segregación y, de manera más general, sobre la desigualdad espacial. Es claro que los cambios dependen del contexto, pero al mismo tiempo se generan amplias generalizaciones a partir de los procesos de ordenamiento y selección residencial. Un interrogante medular de la investigación sobre segregación en los EE.UU. se refiere a cómo está influyendo el crecimiento de las poblaciones asiáticas e hispanas sobre los patrones de segregación y diversidad a nivel de vecindario. En este artículo usamos una variante del método del vecino más cercano para cartografiar, graficar y evaluar los patrones de raza y etnicidad a diversas escalas. Mostramos que el uso de un enfoque multiescalar en segregación puede proporcionar un cuadro más detallado y completo de este fenómeno. La investigación confirma el trabajo de otros estudios en el sentido de que la segregación está disminuyendo entre algunos grupos, mientras aumenta entre otros, y confirma los patrones; y los procesos pueden describirse como una diversidad dinámica. Mostramos en una serie de mapas de agrupamientos étnicos y de homogeneidad de la población el modo como las áreas metropolitanas, ilustradas en este caso por Los Ángeles, despliegan ahora patrones de arreglos de vida complejos con múltiples grupos asentados tanto en vecindarios locales como dentro de esferas comunitarias más amplias. *Palabras clave: etnicidad, barrios, patrones residenciales, escala, segregación.*

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Recent studies of ethnic segregation in the United States have increasingly focused on how processes of segregation are influenced by changing population diversity in the major metropolitan areas. An overriding question in this research has been how the growth of Asian and Hispanic populations has influenced patterns of segregation and diversity at the neighborhood level. Diversity in turn has also influenced the way segregation patterns are being analyzed. Some traditional measures like the dissimilarity index are better suited for the analysis of a two-group situation and, therefore, multigroup measures based on the entropy approach have increased in research salience (Reardon and Firebaugh 2002; Reardon et al. 2009). Another advance has been to replace single-valued indexes with analyses based on a classification of neighborhoods into groups that represent different degrees of racial mixing (Johnston, Poulsen, and Forrest 2007; Holloway, Wright, and Ellis 2012). Finally, there has been a realization that segregation is a scalar phenomenon and that segregation trends can go in different directions depending on what scale is used for measurement (Reardon et al. 2009).

The neighborhood classification approach has turned out to be a useful tool both for providing a more nuanced picture of residential segregation patterns than analyses based on single number indexes and, perhaps even more important, for analyzing processes of neighborhood change. An important advantage of the neighborhood classification approach is that it allows neighborhood change to be analyzed using a transition matrix that shows to what extent a neighborhood remains in the same category between different census dates. This transition matrix has allowed the research community to address questions about whether or not and to what extent mixed neighborhoods represent stable addition to the urban mosaic or whether they are just temporary phenomena—snapshots of neighborhoods that are in transition from being dominated by one group to being dominated by another.

As currently implemented, the neighborhood classification approach has, however, relied on fixed geographical subdivisions such as the census tract. This is noteworthy because another important trend in recent segregation studies is that segregation should be seen as a multiscalar phenomenon. One early attempt by Wong (1997) compared block group, census tract, and town-based measures of segregation. Wong later proposed other methods for incorporating scale; for example, kernel-based density estimates (O'Sullivan and Wong 2007). Reardon et al. (2008) and Lee et al. (2008) also suggested the use of segregation profiles for measuring the influence of scale on segregation. These profiles are based on the construction of circular, egocentric neighborhoods with increasing radius for which the population composition is computed. Spielman and Logan (2013) showed that segregation profiles can be used to make multiscalar classifications of egocentric neighborhoods, and a similar approach was proposed by Fowler (2015). Using a circular egocentric neighborhood with different radii is not, however, the only way to address the scale issue. Thus, Östh and colleagues (Östh, Clark, and Malmberg 2014; Östh, Malmberg, and Andersson 2014) proposed that population size, instead of radius, can be used for measuring neighborhood scale. One advantage with this approach is that measures of population composition will be easier to compare across egocentric neighborhoods if they refer to populations of similar size.

In this article we aim to bridge this gap between the neighborhood classification approach and the multiscalar approach literature to facilitate a closer analysis of how aggregate demographic changes are played out at the local scale in neighborhoods and communities. We propose that neighborhood classifications should not focus on census tracts but on more detailed locations, preferably individuals but at least residential blocks or some similar very small-scale unit, and, second, that the classification should be based on an evaluation of the specific neighborhood context of these detailed locations. Our classification is based on multiscalar measures of population composition that have been computed for individualized neighborhoods with equal population size, and we use this classification to address three central questions in the segregation literature: First, do neighborhood classifications based on multiscalar measures of segregation give different results from traditional census tract–based approaches? Second, do multiscalar neighborhood classifications provide new insights into how aggregate demographic change influences the process of neighborhood change? Third, is a multiscalar classification of neighborhoods a valid tool for analyzing changing levels of diversity in metropolitan areas?

A multiscalar approach that focuses on the classification of individual locations has several advantages. It can be expected to circumvent some of the well-known problems that are associated with attempts to measure spatial variation in geographical context using fixed geographical subdivisions (Openshaw 1984). Second, a classification based on individual

locations provides a better link between studies of segregation patterns and studies of neighborhood effects. In neighborhood effects studies, there is a strong focus on how the residential context affects individual-level outcomes and it has recently been demonstrated that context measures based on individualized scalable neighborhoods perform better than traditional measures based on fixed geographical subdivisions (E. K. Andersson and Malmberg 2014). The extent to which individuals encounter members from different racial, ethnic, or socioeconomic groups in everyday life is influenced by more than the patterns of segregation at a single geographical scale (Matthews 2011). Instead, patterns of contact and isolation will be influenced by the racial or socioeconomic composition both of your closest neighbors and the population composition of wider neighborhoods encompassing hundreds, thousands, or tens of thousands of neighbors.

Third, in the analysis of segregation processes, residential mobility plays a central role. Here, the spatial context of individual residential locations has a larger impact on household decisions than the aggregate population composition of census tracts, the borders of which are almost certainly unknown to individual residents. In the same way, it can be argued that households consider residential context at different geographical scales when they evaluate a certain location and that this provides a justification for a multiscalar approach to the classification of residential contexts.

Fourth, even if a classification of census tracts gives an approximately correct picture of urban segregation patterns, there are significant potential pitfalls. For example, neighborhood change that occurs close to the border of two adjacent census tracts can remain undetected, whereas similar changes that occur fully within the border of a single census tract will result in a reclassification. This is not merely a theoretical possibility but can be of real significance because shifts in neighborhood composition are more likely to occur in the peripheral parts of an ethnic concentration than at its core. This implies that a classification focused on more detailed locations can become a more sensitive instrument for analyzing neighborhood change and in this way become a better tool for understanding how processes of neighborhood change evolve.

Fifth, a good way to analyze levels of segregation in an urban area is to focus on how different racial groups are distributed across more diverse and more segregated neighborhood types. If neighborhoods are equated with census tracts, though, there is a risk that individuals residing near the borders are assigned to residential context categories that are representative of the entire tract but not of a context that includes the adjacent areas of a neighboring tract. This implies that a tract-based classification can correctly state how many census tracts belong to different neighborhood types, but there is a larger risk for errors if tract-based classifications are used as basis for claims about how different racial groups are distributed across neighborhood types. Instead, a location-based approach, in this case, might provide better results.

The Los Angeles Study

Two decades ago, *Ethnic Los Angeles* (Waldinger and Bozorgmehr 1996) and *The Ethnic Quilt* (Allen and Turner 1997) set out the new demographic reality in Southern California: It was substantially fragmented by ethnicity, social class, and locality. Although there is still fragmentation, there are new realities in the patterns of ethnic groups. As several different authors have established, the new patterns are being driven by the immigration of Asian and Hispanic populations that grew rapidly in the period after 1990 (Bobo, Johnson, and Valenzuela 2000; Allen and Turner 2002; Clark 1996, 2002; Charles 2007).[1] As these and other studies have emphasized, the way in which immigrants integrate and in particular their ability to communicate effectively in English is a critical factor in their residential decision making. Asian and Hispanic preferences, too, play fundamental roles in the outcomes of the residential patterns that we see in Los Angeles. It is no longer the case that white and black preferences and choices create the mixed or lack of mixed neighborhoods in Los Angeles (Clark 2009). This ongoing process of sorting, selection, and patterns of dispersal and concentration is a perfect laboratory to examine four central issues in the current debate about segregation trends in the United States. A large metropolitan area with multiple races and ethnicities is also a laboratory in which we can use our multiscalar approach to examine the way in which segregation varies across spatial scales.

Declining Segregation of Blacks

Where once the literature emphasized the extensive separation in the urban fabric (Iceland, Weinberg, and Steinmetz 2002; Iceland, Sharpe, and Steinmetz 2005), growing evidence now indicates that black–white

racial residential segregation is declining. These changes have generated a spirited debate about whether or not as claimed by Glaeser and Vigdor (2012) the segregated century has ended. The latter authors used the dissimilarity index to suggest that the national level of black–white segregation declined, from about .80 in 1980 to approximately .55 in 2010. They suggested that all-white neighborhoods are effectively extinct, a finding that we confirm (for another example, see Holloway, Wright, and Ellis 2012). These results are consistent with the evidence of a change in white attitudes and a greater tolerance in society as a whole (Goldman 2012) and this in combination with the civil rights achievements have gone a long way to changing the playing field in which minority households seek housing. Certainly the change in mortgage availability, increases in black incomes, and the increase in the number of professionals has influenced the housing opportunity matrix. Still, others suggest that there is a more nuanced story to be told about segregation and that there are still substantially black, Hispanic, white, and Asian neighborhoods scattered across the New York metropolitan region, for example (Alba and Romalewski 2013). It is just this debate that we believe will be elucidated with our individual-based analysis across different scales.

There is no question that ethnic and racial neighborhood change is taking place, and there are certainly more neighborhoods with mixed ethnic and racial combinations. Fasenfest, Booza, and Metzger (2005) demonstrated that both whites and blacks are increasingly living among people of other ethnicities and do not just live in neighborhoods with each other. Overall, black segregation declined (Farrell 2008; Hall 2013; Iceland, Sharp, and Timberlake 2013). Although the reports of changes in average dissimilarity and exposure provide some new information, they do not provide a sense of the spatiality of the mixing and the patterns of integration that are evolving. It is that focus that is central in our analysis.

Decline of Low-Diversity White-Dominated Neighborhoods

More specifically, in view of the expansion of the Hispanic and Asian populations in the Los Angeles area, an important question is whether this demographic shift has led to more or less segregation of these groups with respect to the white population and changes in the level of concentration of white populations. Related to this, has the declining share of the white and black population implied that blacks and whites are increasingly living in more diverse neighborhoods?

Persistence of Mixed Areas

The theories usually outlined to explain the changing patterns of segregation invoke one or a combination of three perspectives on how we might judge the persistence of diverse areas or how these areas are transitioning. One of these emphasizes assimilation and socioeconomic characteristics as the underpinning for ethnic residential outcomes and by extension the pattern of segregation (Alba and Nee 1997; Alba, Logan, and Stults 2000). Another focuses on residential preferences, which emphasizes the personal and life course elements of the residential choice process and the associated outcomes (Clark 2002; Clark and Fossett 2008). A third theoretical strand, place stratification, draws attention to the barriers that minority groups face as they make selections in the metropolitan area (Krysan and Farley 2002; Krysan et al. 2009). There are keen debates about the relative role of these explanations for continuing separation in the residential fabric (Fossett 2006), and if we are to evaluate these perspectives, capturing the diversity of the patterns of segregation is essential.

Recent research has produced important findings that bear on our interest in the changing patterns of segregation and the increase in mixed ethnic areas. First, there is growing evidence that mixed-race individuals and mixed-race households are living outside of ethnic concentrations (Frey 2002; Iceland and Nelson 2010; Wright, Holloway, and Ellis 2011; Clark and Maas 2012). Second, it is clear, and we have argued earlier, that the scale at which the analysis of segregation takes place has important implications for the levels, nature, and extent of both segregation and diversity (Östh, Clark, and Malmberg 2014). Third, research is showing that racial boundaries are being reshaped by the changing meaning of race and ethnicity (Lichter 2013) and that segregation and diversity can exist at the same time (Holloway, Wright, and Ellis 2012; Wright et al. 2014). In this context and following Banton (1998), race is connected to the categorization of people, whereas ethnicity has to do with identification of groups. For the Los Angeles area, we have detailed data on race—that is, race that is self-identified through the census, which can in this case be seen as choosing a group membership.

The Role of Immigration in Los Angeles and Beyond

Ethnic and socioeconomic separation continues to be a defining characteristic of twenty-first-century global cities. At the same time, the patterns and extent of separation are changing as the waves of immigration from the Middle East, Central and South America, and Asia expand the complex mixtures of residents in large global cities. This process, which has accelerated in the last decade, has created new patterns of diversity and complexity in population patterns (Vertovec 2007). Two changes in particular are notable: the increase in Asian and Hispanic foreign-born populations and their offspring in the United States and the growth of Middle Eastern and North African populations in European cities.

Research on both sides of the Atlantic is increasingly focused on how segregation and separation will evolve in the long run (Crul and Mollenkopf 2012). The U.S. experience of strong racial segregation has not been replicated in Europe until recently. Immigrants in Europe are segregated but still not to the extent of the blacks in many U.S. metropolitan areas (R. Andersson 2014). In Europe, large 1960s- and 1970s-era housing estates are the locations with large nonwhite populations. These neighborhoods are also characterized by an overrepresentation of people with fewer resources and lower socioeconomic status and can be described as deprived. Still, overall, residential segregation and separation are much lower in European cities than in U.S. cities due to more comprehensive welfare systems as well as different housing policies (Galster 2002; Friedrichs, Galster, and Musterd 2003; Sampson 2012). New comparative research has drawn attention to just how contextualized much of segregation is and the way in which it is changing (Maloutas and Fujita 2012). Still, although case studies tell us a great deal about the contextualized nature of segregation, there are strong generalities to the patterns and to the forces that underlie these particular instances. It is these generalities that are central to this study, albeit illustrated from a window on Los Angeles.

Data and Methods

Southern California (the five-county area that makes up greater Los Angeles) is a diverse and demographically changing region. Its 18 million people represent approximately half of the population of the entire state. Table 1 shows that overall the population of the region has grown by about 1.5 million in the most recent ten-year period, but it is the nature of the growth that has created the diversity in the region. The increases are almost entirely Hispanic and Asian and are geographically nonuniform.

In this study we use census data from 2000 and 2010 to classify individual locations (census blocks) in metropolitan Los Angeles into twenty different neighborhood types based on the ethno-racial composition of the population in bespoke neighborhoods (Macallister et al. 2001; Bolster et al. 2007) of the 12, 25, 50, 100, 200, and doubling to the 51,200 closest neighbors of each block center.[2] The focus is on the four main racial and ethnic groups that are self-identified in the census: white, black, Asian, and Hispanic. We then analyze how the population of these broad groups is distributed across neighborhood types in 2000 and 2010 to determine whether, and to what extent, people from these groups live in homogenous or diverse neighborhoods and whether there are generalizable changes over time in these patterns. In parallel, we also analyze the location pattern of different neighborhood types in 2000 and 2010 and to what extent the locations change their neighborhood categories (clusters) between these years.[3]

To make map comparisons of changes in segregation patterns of block-level data for the censuses 2000 and 2010, the blocks need to be spatially aligned

Table 1. The changing demography of Southern California

	Total population		White		Hispanic		Black		Asian	
County	2010	2000	2010 (%)	2000 (%)	2010 (%)	2000 (%)	2010 (%)	2000 (%)	2010 (%)	2000 (%)
Los Angeles	9,818,605	9,519,338	27.3	31.1	48.2	44.6	9.3	9.8	14.5	11.9
Orange	3,010,232	2,846,289	43.1	51.3	34.1	33.7	2.0	1.7	18.9	13.6
San Bernardino	2,035,210	1,709,518	32.0	45.0	50.5	39.2	9.6	9.1	7.0	4.7
Riverside	2,189,641	1,545,313	38.5	52.0	46.5	36.2	7.0	6.2	6.6	3.7
Ventura	823,318	753,713	47.7	56.9	41.2	33.4	2.2	2.0	7.3	5.4

because the number of and spatial distribution of blocks is not constant over time, as many block coordinates change slightly over the ten-year period. Coordinates representing block midpoints in Census 2010 are used as anchor points retrieving equivalent output values representing year 2000 from the nearest (Cartesian distance) block midpoint as described in Census 2000. In the vast majority of cases the nearest block midpoint was within 100 to 200 feet from each other.[4]

The classification of census blocks into neighborhood types proceeds in four steps. First, we construct bespoke neighborhoods of different population size for every census block center. The bespoke neighborhoods are constructed by extending a buffer around each block center until the buffer contains a total population of 12, 25, 50, 100, . . . , 25,600, and 51,200 nearest neighbors.[5] Thus, in every round, the buffer is expanded until the buffer population is doubled. For every census block, this results in thirteen differently sized bespoke neighborhoods.

Second, we compute the ethno-racial population composition of these bespoke neighborhoods. With four different ethno-racial groups (white, black, Hispanic, and Asian) and thirteen differently sized bespoke neighborhoods, the result is that the residential context of every census block will be described by fifty-two different values; that is, the population share of Asians, blacks, Hispanics, and whites among the nearest 12, 25, 50, 100, . . . , 25,600, and 51,200 neighbors. We name these variables A_{12}, A_{25}, A_{50}, . . ., A_{52100}; B_{12}, B_{25}, B_{50}, . . . , B_{52100}; H_{12}, H_{25}, H_{50}, . . . , H_{52100}; and W_{12}, W_{25}, W_{50}, . . . , W_{52100}. Here it can be noted that only a minority of the blocks have fewer than twenty-five or fifty inhabitants (21 percent and 37 percent, respectively), whereas less than 15 percent of the blocks have more than 200 inhabitants. This implies that in most cases the figures obtained for buffer populations of twelve, twenty-five, and fifty neighbors by construction will have the same value but that this seldom will be the case for buffer populations above 100 neighbors.

Third, we input all fifty-two variables (A_{12}, A_{25}, A_{50}, . . . , A_{52100}; B_{12}, B_{25}, B_{50}, . . . , B_{52100}; H_{12}, H_{25}, H_{50}, . . . , H_{52100}; W_{12}, W_{25}, W_{50}, . . . , W_{52100}) into a factor analysis to extract summary measures of the ethno-racial residential context of each census block. Given that there is strong correlation between ethno-racial group shares across differently defined neighborhood contexts, it is, in fact, possible to capture most of the variation in neighborhood ethno-racial composition using only six factors (see Table A1 in the Appendix). The first three of these factors capture the balance between different ethno-racial groups across all neighborhood scales: Factor 1 essentially captures the balance between Hispanic and white. Factor 2 has high loadings for Asians across all neighborhood scales, and Factor 3 has high loadings for blacks. The remaining three factors capture to what extent there is difference in the share of different ethno-racial groups across different scales. Thus, high values for Factor 4 increase the share of whites for smaller sized neighborhoods and decrease the share of whites for larger sized neighborhoods, and vice versa for Hispanics. Factor 5 has a corresponding effect on Asians, with high values increasing the share of Asians at larger scales and decreasing the share of Asians at smaller scales. Factor 6, finally, affects mainly the balance between whites and Hispanics at medium-scale levels. (Detailed factor loadings for the different contextual variables are given in Table A1 in the Appendix.)

The fourth step is to assign the census blocks of the Los Angeles area to neighborhood types based on the ethno-racial composition of their residential context. Given that the factor analysis has demonstrated that scale and the ethno-racial mixing of residential contexts can be captured by a limited number of underlying factors, we have used the factor scores to assign the census blocks of the Los Angeles area to neighborhood types. This is done using a *k*-means cluster analysis, a common approach that can make the interpretation of the resulting clusters easier (Jolliffe 2002).

Using cluster analysis departs from the procedure used by Johnston, Poulsen, and Forrest (2007) and Holloway, Wright, and Ellis (2012). Their classifications are instead based on fixed cutoffs with respect to patterns of ethnic mixing and dominance. The use of fixed cutoffs for classification purposes has much to recommend it, but because this article aims to explore the possibilities of classifications based on multiscalar measurement of neighborhood ethno-racial context, we consider it justified to use a more inductive approach. Using cluster analysis allows the existing variation in neighborhood contextual variation not only to determine to which category a certain location should be assigned but also to influence the categories used to capture different dimensions in the variation in residential context. Moreover, cluster analysis provides a convenient tool to handle the increased complexity that is introduced by using multiscalar measures of residential context. As demonstrated later,

the cluster analysis yields results that are not too different from the ones obtained by Johnston, Poulsen, and Forrest (2007) and Holloway, Wright, and Ellis (2012). In line especially with the Holloway, Wright, and Ellis results, we also identify both high- and low-diversity neighborhood types dominated by different ethno-racial groups. A difference, however, is that we have chosen to identify a relatively large number of neighborhood types: twenty types instead of the nine used by Holloway, Wright, and Ellis (2012). The reason for having a larger number of clusters is that we introduce scale. Scale adds variation in neighborhood types not only in terms of different levels of diversity and ethnic group dominance but also to possibly contrast the population composition of small and large bespoke neighborhoods.

The factor structure and the cluster structure are both based on the 2010 data. Cluster assignment of the blocks for 2000 data used factor scores computed from the 2010 factor model on the year 2000 ethno-racial population composition. The assignment of year 2000 blocks to different clusters was based on minimizing the Euclidian distance to the cluster centers.

Characteristics and Categorizations of Neighborhood Types

The twenty different neighborhood types found in Southern California are presented in Figure 1 using segregation profiles (see Lee et al. 2008). The graphs shown in Figure 1 give mean values for the population shares of the four races across different neighborhood scales (local neighborhoods to communities), where neighborhood scale is determined by the number of nearest neighbors, k, included in the individualized neighborhood. The resulting clusters are also presented in Table A2 in the Appendix (cluster centers of factor scores). The clusters have been divided into four groups in order from low to high diversity. This is similar to the approach used by Holloway, Wright, and Ellis (2012). They divided neighborhoods into high and low diversity. We distinguish (1) homogenous neighborhoods, (2) semidiverse neighborhoods, (3) diverse neighbhorhoods, and (4) highly diverse neighborhoods. Following Holloway, Wright, and Ellis (2012), we base this division on the entropy index, but given our multiscalar approach, we use the median entropy index across different k levels to rank the

Figure 1. Graphs and the identification of clusters by racial and ethnic combinations. (Color figure available online.)

different neighborhood types. Moreover, in each group there are in fact four clusters where either Hispanics or whites constitute the largest group. These clusters have been ordered based on the balance between Hispanics and whites and they are presented in column one to column four in Figure 1. In each diversity group, there is also one cluster where either blacks or Asians constitute the largest group. These have been assigned to the fifth column of Figure 1. The same ordering as in Figure 1 has also been used in subsequent figures and tables. It should be noted that Figure 1 shows the average population composition for each scale level across all blocks belonging to the different clusters. An indication of the variance in population composition for blocks within each cluster using box plots is given in Figure A1 in the Appendix. Figure A1 shows that the variance can be relatively large for dominating ethno-racial groups but tends to be small for ethno-racial groups that have have low population shares. Figure A1 also shows that there is clear separation between the different clusters, as one would expect given that blocks have been assigned to clusters in a way that minimizes the distance to the cluster center.

The clusters are named based on the presence of different ethno-racial groups. We also identify the way in which the clusters change across scales in Figure 1, from very small k values (local neighborhoods) to large k values representing communities. We use the term *enclave* when a group is a majority for small k values but another group becomes a majority for large k. A *mixed enclave* occurs when there are many groups in the local area but one group becomes dominant for large k. At local scales when one group is dominant but mixing increases at large k values, we call that *small-scale homogeneous*.

As can be seen in Figure 1, most clusters are characterized by relatively flat segregation profiles; that is, by relatively stable population shares of the different ethno-racial groups across neighborhood scales. This finding is significant in relation to the discussion about multiscalar measures of segregation because a flat profile implies that classifications based on different scale levels would give similar results. A potential conclusion from this finding is that neighborhood classifications based on census tracts will not necessarily lead to misleading results in most situations.

At least seven of the clusters, however, have curved, nonhorizontal, segregation profiles, indicating substantial differences in ethno-racial composition across different neighborhood scales. This demonstrates that in many parts of the Los Angeles area, neighborhood population composition varies depending on neighborhood scale (measured by the k level). The existence of clusters with curved segregation profiles provides a strong argument for using a multiscalar approach to neighborhood classification because in these cases the classification otherwise would vary with the scale used for measurement. Thus, a multiscalar classification allows for the identification of intermediate neighborhood types, and having such intermediate types results in a less oversimplified representation of ethno-racial landscape.

As we noted earlier, ethnic and racial patterns reflect socioeconomic status, and Table 2 provides a broad interpretation of the differences of status across the twenty different clusters. In each case the characteristics of the cluster are defined by assigning the tract-level unemployment rate, poverty rate, median income, and share with income of $200,000 or more to the blocks in the cluster. Thus, it shows the status profile of the blocks (based on the tracts in which they are located) in terms of income, poverty, and unemployment.

For the most homogeneous white, black, and Hispanic clusters, the socioeconomic profiles are replications of the status of each of these groups with whites as the most advantaged and blacks and especially Hispanics quite disadvantaged in relative terms. It is when the focus shifts to the various combinations that we find interesting and different findings than those for the homogeneous clusters. Where there are whites, either dominant or as one of several groups, the income is higher than for either of the homogeneous black and Hispanic clusters. Clearly, the mixing reflects the clustering of whites and more affluent black, Hispanic, and Asian populations. Whenever whites or Asians are the largest racial group, the data show lower levels of disadvantage according to the chosen indicators of unemployment, income, and poverty (Table 2). What is potentially the most interesting are the profiles for the six mixed clusters, the last six in the table. Here mixes of white, Hispanic, Asian, and black generate clusters that have substantial median incomes, low poverty, and low unemployment.

The cluster map (Figure 2) nicely captures the ethnic and racial diversity of the Southern California region. Although at first sight the clustering provides almost excessive detail, closer inspection emphasizes just how complex the new patterns of diversity are in this metropolitan area. We identify the clusters with a

Table 2. Socioeconomic profiles of the clusters

Number	Cluster 2010	Census blocks	Median (unemployed)	Median (percentage 200,000+)	Median (median family income)	Median (poverty rates)
1	Homogenous Hispanic	18,579	10.3	0.4	46,667	16.2
2	Small-scale Hispanic/white	4,406	9.6	1.6	54,468	12.7
3	White small-scale/Hispanic	10,561	9.0	4.9	74,504	5.4
4	Homogenous white	20,185	6.5	12.3	103,977	3.6
5	Homogenous black	1,654	10.4	1.7	65,946	10.3
6	Hispanic white	8,811	9.6	1.9	63,750	7.8
7	Mixed enclave, Hispanic/white	8,452	9.3	3.4	71,429	6.8
8	White enclave, Hispanic	4,456	9.5	2.1	60,104	9.6
9	White, Hispanic	14,650	8.3	4.5	79,018	5.7
10	Asian, white/Hispanic	3,789	6.3	4.4	71,302	7.7
11	Hispanic dominated, white/Asian	5,301	8.8	1.8	59,167	10.1
12	Hispanic, white/black	13,014	11.2	1.1	50,645	14.6
13	White, Hispanic/Asian	10,308	6.3	9.7	101,429	3.2
14	White small-scale, Hispanic/Asian	5,947	6.2	9.5	99,821	3.4
15	Black/Hispanic mixed	2,085	11.5	0.8	43,202	17.5
16	Mixed enclave Hispanic, Asian/white	5,536	8.7	2.3	64,688	8.5
17	Hispanic, black/white	5,418	11.5	0.7	42,813	19.7
18	Mixed white/Hispanic/Asian/black	2,052	7.8	3.2	76,114	6.3
19	Mixed Asian/white/Hispanic	4,903	6.5	6.1	81,744	5.3
20	Asian small-scale, white/Hispanic	3,168	7.3	6.0	85,590	5.5

set of codes to capture the differences across the twenty clusters. Dominant groups are Clusters 1 through 5 (two thirds or more of the cluster) and a slash between other groups indicates that they are enclaves within the structure.

The patterns of the homogeneous groups reiterate the way in which the main race and ethnic groups occupy different residential environments: the white groups in the Santa Monica Mountains and along the coasts, the few remaining black homogeneous areas still in South Central Los Angeles, the Asian-dominant groups with widely separated distinct locations in the region, and Hispanics in central areas and also in a northwest to southeast axis away from the central areas.

What is most striking in both the regional map and the localized metropolitan map (Figure 3) is the patterning of nondominant areas, the pastel shades in the map. The hypothesis that the mixing is in the interstitial areas at the edges of the homogeneous concentrations shows up clearly. For each group, the mixing occurs in proximity to the major population concentrations. Thus, black and Hispanic mixing occurs around the central core, whereas Hispanic, white, and Asian mixing occurs in the eastern and southern portions of the county. One way to view the map is to contrast the primary colors, blue, yellow, and red, with the pastel tones that pick up the areas with mixing. These pastel zones are clearly visible between the Hispanic and black areas and on the edge of the white-dominant areas. There are many fewer areas of pastel zones near or proximate to the six Asian clusters, however, emphasizing the tendency for considerable own race selection by Asian groups. If these maps of Los Angeles are compared to the one presented in Holloway, Wright, and Ellis (2012), it confirms that a tract-based classification and a multiscalar classification yields results that are not too dissimilar at a broad level.

Changes in Neighborhood Categorizations, 2000–2010

The multiscalar neighborhood classification provides a tool that can be used to map in greater detail than previously, and without artificial boundaries, the actual pattern of mixing across the residential landscape and how segregation patterns have changed in the Los Angeles area during the first decade of the twenty-first century. In the following section we analyze how individual locations changed neighborhood

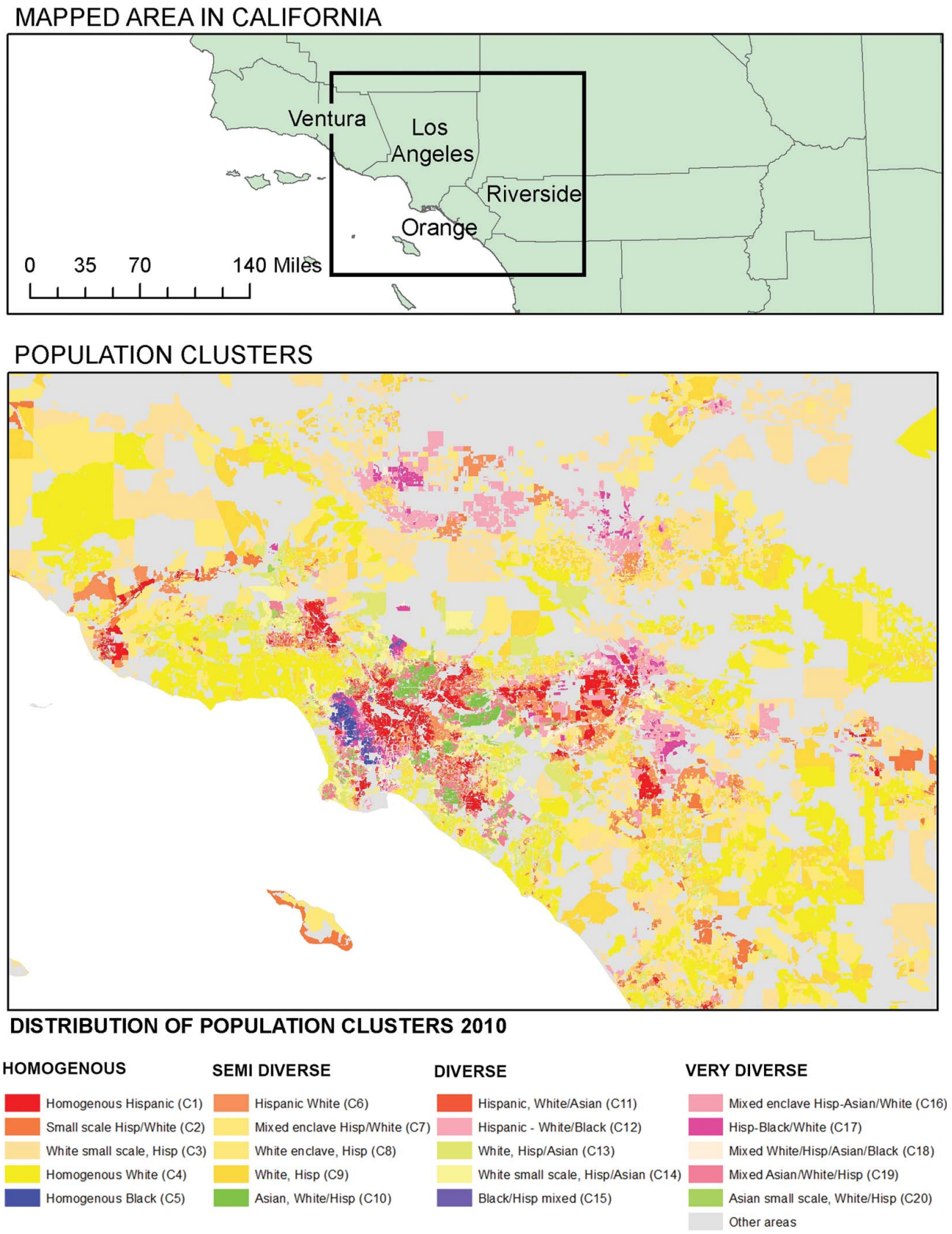

Figure 2. The pattern of clusters at the regional scale. (Color figure available online.)

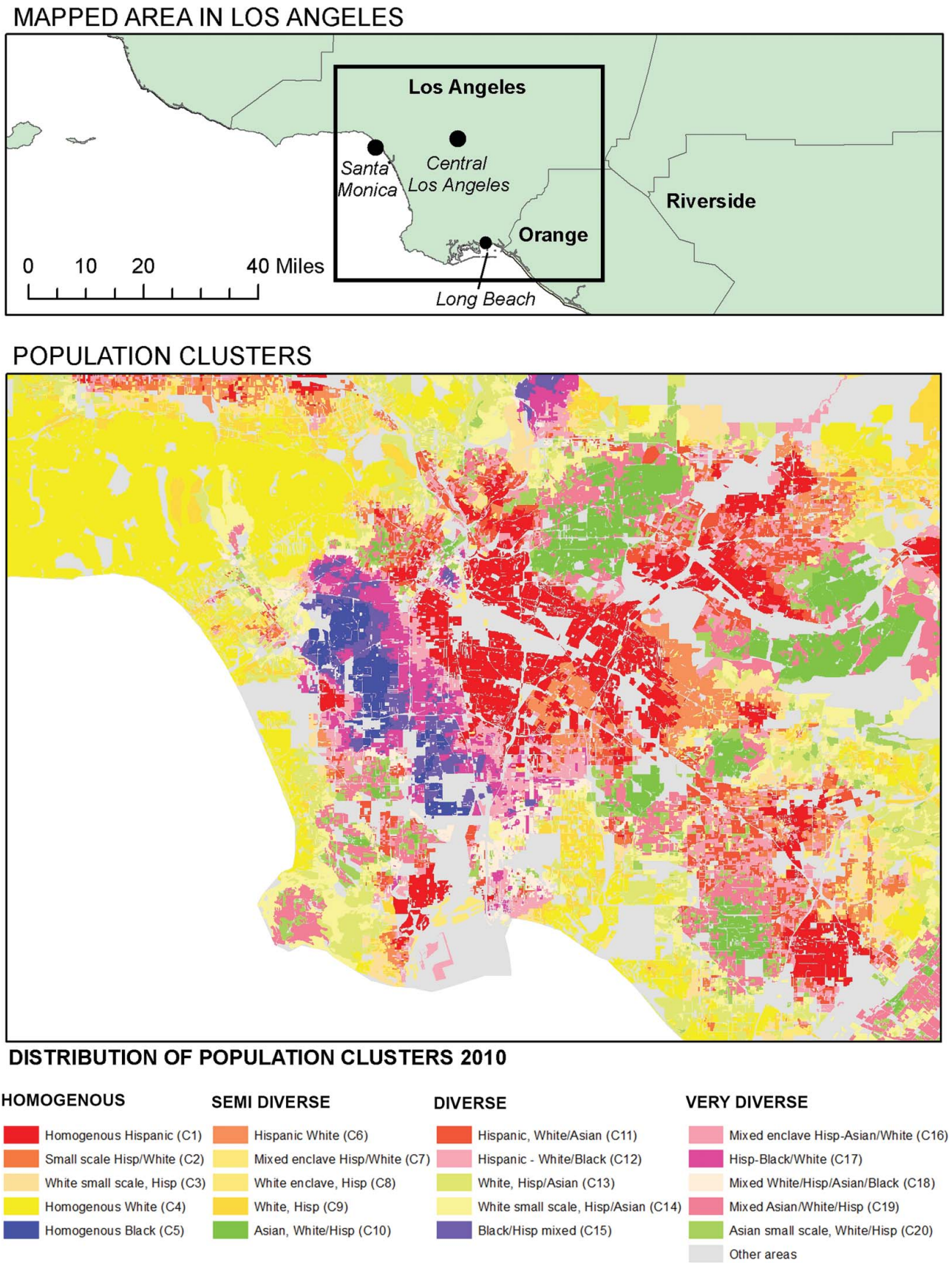

Figure 3. The pattern of clusters at the local scale. (Color figure available online.)

				Year 2010 clusters																					
				Homogenous and semi-homogenous					Semi diverse					Diverse					Highly diverse						
		Year 2000 clusters	Loss to homogenous. (Share of 2000 locations in homogenous categories 2010)	Homogenous Hispanic	Small scale Hispanic/White	White small scale/ Hisp	Homogenous White	Homogenous Black	Hispanic White	Mixed enclave, Hisp/White	White enclave, Hisp	White, Hisp	Asian, White/Hisp	Hispanic dominated, White/Asian	Hispanic, White/Black	White, Hisp/Asian	White small scale, Hisp/Asian	Black/Hisp mixed	Mixed enclave Hispanic, Asian/White	Hispanic, Black/White	Mixed White/Hisp/Asian/Black	Mixed Asian/White/Hisp	Asian small scale, White/Hisp	Census blocks in 2000	Share same clusters in 2000 and 2010
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Homogenous and semi-homogenous	1	Homogenous Hispanic		**13097**	28	52	0	0	132	7	85	0	0	300	72	0	1	0	210	8	1	0	8	14001	**94%**
	2	Small scale Hispanic/White	20%	953	**2665**	26	0	0	152	111	204	110	0	223	184	39	1	0	103	8	22	0	19	4820	**55%**
	3	White small scale/ Hisp	2%	1	7	**6122**	225	0	1163	463	601	418	0	24	360	388	303	0	249	34	47	0	23	10428	**59%**
	4	Homogenous White		0	69	2725	**18908**	0	69	3328	108	6190	0	0	77	2720	718	0	11	0	4	1	75	35003	**54%**
	5	Homogenous Black		0	0	0	0	**1646**	0	0	0	0	0	0	0	0	0	533	0	0	0	0	0	2179	**76%**
Semi diverse	6	Hispanic White	34%	2115	57	58	0	0	**2880**	39	299	14	0	308	56	12	6	0	429	0	0	0	9	6282	**46%**
	7	Mixed enclave, Hisp/White	5%	62	569	457	365	0	1276	**2622**	197	1281	0	280	549	641	144	0	137	23	41	6	33	8683	**30%**
	8	White enclave, Hisp	9%	359	181	178	2	0	794	14	**1541**	127	0	135	124	19	11	0	309	20	3	2	21	3840	**40%**
	9	White, Hisp	2%	2	503	749	311	0	1283	1529	1057	**5857**	0	140	1651	1489	389	0	195	113	126	2	58	15454	**38%**
	10	Asian, White/Hisp	0%	0	0	0	0	0	0	0	0	0	**1891**	0	0	0	0	0	0	0	0	66	10	1967	**96%**
Diverse	11	Hispanic dominated, White/Asian	6%	231	11	3	0	0	50	15	34	2	4	**2351**	27	35	37	0	494	0	14	225	96	3629	**65%**
	12	Hispanic, White/Black	12%	1451	274	67	0	0	704	54	172	141	0	282	**7017**	45	14	1	228	919	237	6	41	11653	**60%**
	13	White, Hisp/Asian	4%	0	26	83	299	0	108	251	34	464	36	210	48	**4173**	1181	0	507	0	83	575	461	8539	**49%**
	14	White small scale, Hisp/Asian	1%	0	0	19	75	0	10	11	15	28	25	277	9	575	**3005**	0	202	0	93	1029	182	5555	**54%**
	15	Black/Hisp mixed	0%	0	0	0	0	8	0	0	0	0	0	0	8	0	0	**1514**	0	1632	11	0	0	3173	**48%**
Highly diverse	16	Mixed enclave Hispanic, Asian/White	7%	272	13	8	0	0	190	5	73	2	1	655	47	61	41	0	**2150**	1	10	144	290	3963	**54%**
	17	Hispanic, Black/White	1%	35	3	8	0	0	0	0	32	13	0	1	2583	5	3	33	6	**2605**	308	0	17	5652	**46%**
	18	Mixed White/Hisp/Asian/Black	0%	0	0	4	0	0	0	2	3	3	0	62	199	41	49	1	112	49	**1006**	45	145	1721	**58%**
	19	Mixed Asian/White/Hisp	32%	0	0	0	0	0	0	0	0	0	1256	26	0	1	20	0	10	0	2	**2277**	288	3880	**59%**
	20	Asian small scale, White/Hisp	20%	1	0	0	0	0	0	0	1	0	576	27	3	64	24	3	184	6	44	525	**1392**	2850	**49%**
		Census blocks in 2010		18579	4406	10561	20185	1654	8811	8452	4456	14650	3789	5301	13014	10308	5947	2085	5536	5418	2052	4903	3168	153275	
		Share new clusters in 2010		**30%**	**40%**	**42%**	**6%**	**0%**	**67%**	**69%**	**65%**	**60%**	**50%**	**56%**	**46%**	**60%**	**49%**	**27%**	**61%**	**52%**	**51%**	**54%**	**56%**		

Figure 4. Classification of census blocks based on neighborhood ethno-racial population composition in 2000 and 2010. (Color figure available online.)

type between 2000 and 2010. This is done using a transition matrix (Figure 4) and maps that show the expansion and contraction of homogenous white, homogenous black, homogenous Hispanic, and Asian-dominated neighborhood types. In addition, we analyze changes in the distribution of different ethno-racial groups across neighborhood types.

Our main conclusion from this analysis is that the Los Angeles area during the 2000 to 2010 period was characterized by what can be described as dynamic diversity. The term *dynamic diversity* indicates that diversity is not in general a stable state but instead neighborhood populations are often in a state of transition. Sometimes change is toward increasing diversity, when the population shares of dominant ethno-racial groups are declining. Sometimes, when a larger ethno-racial group increases its share of the neighborhood population, change is in the direction from higher to lower diversity. As demonstrated in the following analysis, dynamic diversity in the Los Angeles area is to a large extent driven by increasing diversity in neighborhoods that in 2000 were classified as homogenous white. Increasing diversity also characterizes many neighborhoods that in 2000 were classified as homogenous black. In addition, many moderately diverse neighborhoods became more diverse, whereas some locations shift from more to less diverse neighborhood types. Finally, some locations shift from diverse neighborhood types to homogenous Hispanic and to Asian-dominated neighborhood types. More details on these shifts, based on an analysis of Figure 4, are provided next.

We find that the rapid decline in the number of locations that have neighborhoods with a homogenous white (cluster no. 4) population and a homogeneous black (5) population is especially noteworthy. In 2000, about a third of the census blocks had neighborhoods with populations that could be categorized as homogenous white, black, or Hispanic. In 2010 only a fourth of the census blocks were classified into these categories. This is a clear trend toward decreasing homogeneity and increasing patterns of diversity. Moreover, the small share of the blocks that belong to the homogeneous neighborhood types underlines the importance of neighborhood change between different diverse types of neighborhoods.

The dynamic diversity of the Los Angeles area is further evidenced by the low ethno-racial stability of the diverse neighborhoods. For the diverse neighborhood categories, the share having a new classification in 2010 is generally above 40 percent. The one exception is Cluster 15 black/Hispanic mixed, where seventy-three of the 2010 locations in this category were in the same category in 2000 (only 27 percent having

a new classification in 2010). Few of the homogeneous classifications had become homogeneous since 2000 (see bottom row of Figure 4, "Share new clusters in 2010"). That is, in the Los Angeles area, shifting neighborhood population composition is the rule and stability is the exception (Figure 4).

It is also the case, though, that some locations in diverse neighborhood categories in 2000 lost this status in 2010. For example, 34 percent of the locations in the Hispanic white neighborhood category (6) and 20 percent of the locations in the small-scale Hispanic/white category (2) shifted to the homogenous Hispanic category between 2000 and 2010 (Figure 4, column "Loss to homogenous"). Similarly, 32 percent of the mixed Asian, white, and Hispanic (19) locations and 20 percent of the Asian small-scale, white/Hispanic (20) locations shifted to the Asian-dominated category (10) between 2000 and 2010 (Figure 4, column "Loss to homogenous"). These transition rates are high but can, we would argue, still be considered a dimension of dynamic diversity. That is, dynamic diversity should not be considered as a unidirectional trend toward increasing diversity but rather a process of urban change that includes stable homogenous neighborhoods, homogenous neighborhoods that become more diverse, shifting demographic composition in diverse neighborhoods, and some transition from diverse neighborhoods to homogenous neighborhoods.

Moreover, it can be noted that many of the locations that in 2010 were characterized as belonging to highly diverse neighborhoods[6] belonged to semi-diverse neighborhood types in 2000. That highly diverse neighborhoods are the outcome of increased diversification of semidiverse neighborhoods is another indication of dynamic diversity. In contrast, there are also many examples of locations that in 2000 belonged to highly diverse categories and in 2010 had become less diverse. Again, though, this fits with the idea that dynamic diversity is not a unidirectional trend toward increased diversity.

What should be noted in this transition matrix is that clusters with curved segregation profiles—that is, clusters where the ethno-racial composition varies markedly with scale—play an important role for neighborhood dynamics. Thus, Cluster 2, white small-scale/Hispanic, and Cluster 7, mixed enclave Hispanic/white, are both important destination clusters for blocks that between 2000 and 2010 lost their status as homogenous white. Cluster 7, mixed enclave Hispanic/white, and Cluster 8, white enclave, Hispanic, are the clusters that have the lowest share in the same cluster in 2000 and 2010. The same two clusters at the same time are among the top three with respect to the share of 2010 cluster members that in 2000 had a different classification. Finally, two of the four clusters that had the largest loss to homogenous clusters have curved segregation profiles: Cluster 2, small-scale Hispanic/white, and Cluster 20, Asian small-scale, white/Hispanic. This suggests that neighborhood types with scale-varying ethno-racial composition can be an important feature of metropolitan areas with a changing demographic setup.

Mapping Changing Patterns of Segregation

An alternate presentation that captures the tendency toward diversity is to map the reverse of diversity; that is, to map the location of homogenous clusters in 2000 and 2010 (Figures 5 and 6). In each map, blocks are coded as stable (same neighborhood type in 2000 and 2010), decreasing homogeneity (location belonged to homogenous type in 2000 but not in 2010), or increasing homogeneity (location did not belong to homogenous cluster in 2000 but shifted to a homogenous cluster in 2010). At the regional level—a five-county region centered on Los Angeles—the homogeneous clusters now form a small part of the residential mosaic (Figure 5). What emerges is the very limited distribution of homogenous clusters, whereas the nonhomogenous clusters cover the majority of the map. At the regional level, the homogeneous white population is peripheral, stable, or declining, with only small pockets of increases at the edge of the region. At this scale the black population is almost invisible, whereas both Asian and Hispanic population clusters are stable and increasing.

Figures 5 and 6 show where the homogenous clusters (1, 4, 5) and the Asian-dominated (10) cluster have expanded, declined, or persisted. For the white homogenous cluster, we can see that the losses are primarily located along the fringes of extended areas with homogenous white areas. The same pattern can be seen for the black homogenous areas with losses primarily to the east of the black concentration and some gains to the east. The gains for the homogenous Hispanic cluster are concentrated at the periphery of the existing concentrations and the

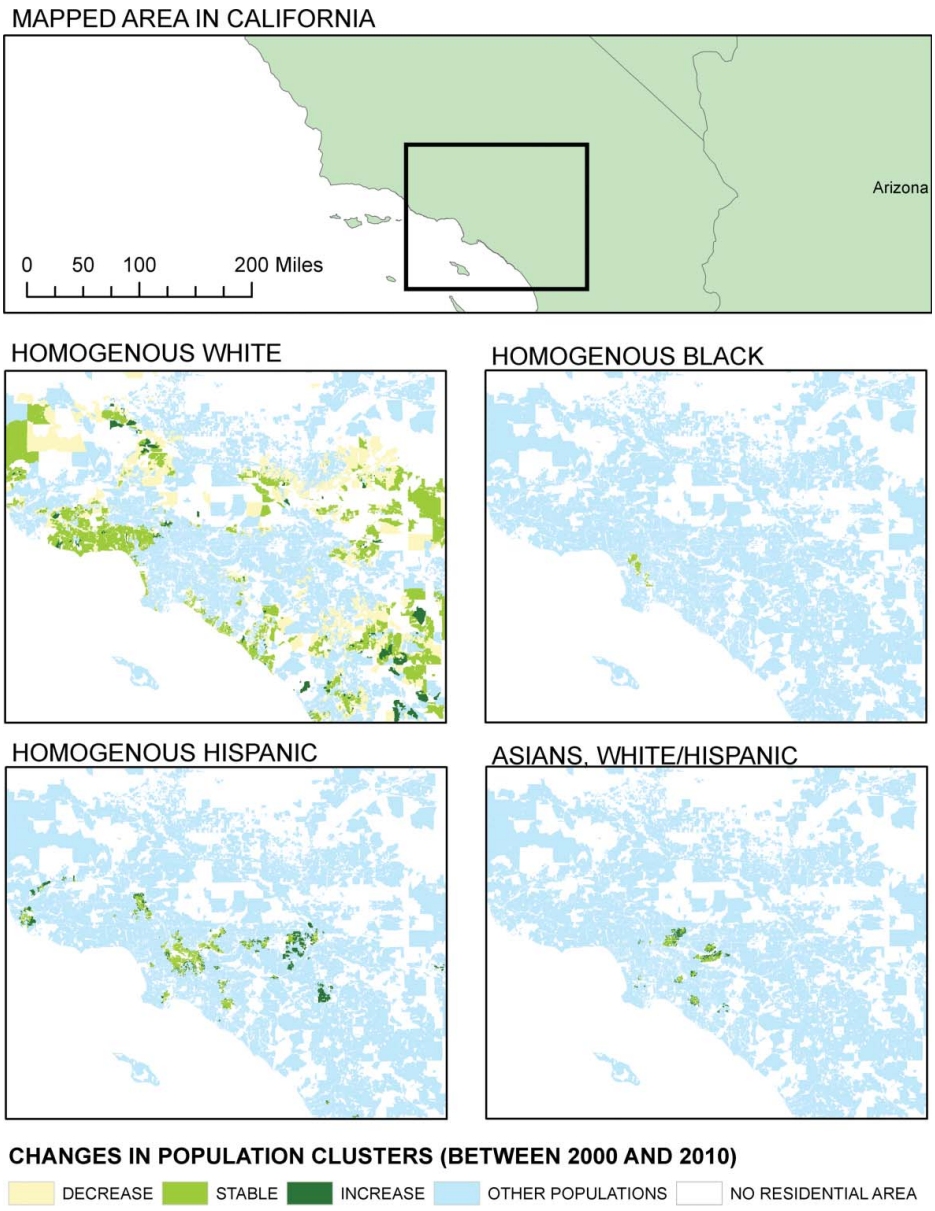

Figure 5. Homogeneity at the regional level. (Color figure available online.)

same is true for the Asian-dominated clusters. There are also a few examples of Hispanic losses, primarily located in areas facing expanding concentrations of Asians in eastern areas of the Los Angeles metropolitan region.

What the maps show is that neighborhood change, in relation to the homogenous areas, in many ways corresponds to the classical ecological processes discussed by the Chicago School (Park, Burgess, and McKenzie 1925). These patterns do suggest a tendency for expanding demographic groups to increasingly colonize neighboring areas. It could be argued that this type of neighborhood change becomes easier to detect with an approach that is based on a classification of separate locations and not on fixed geographical aggregates. With fixed geographic aggregates it can be difficult to discover change in neighborhood status that affects only parts of the area. The approach based on locations can instead be seen as capable of capturing change at a more detailed level. In addition, the fact that change occurs on the periphery of existing concentrations can be seen as indicating that a classification based on multiscalar measurement of demographic composition works well as a tool for predicting where it is most likely for change to occur.

When we turn to the distributions centered on metropolitan Los Angeles, we are able to discern more clearly the details of the cluster populations (Figure 6).

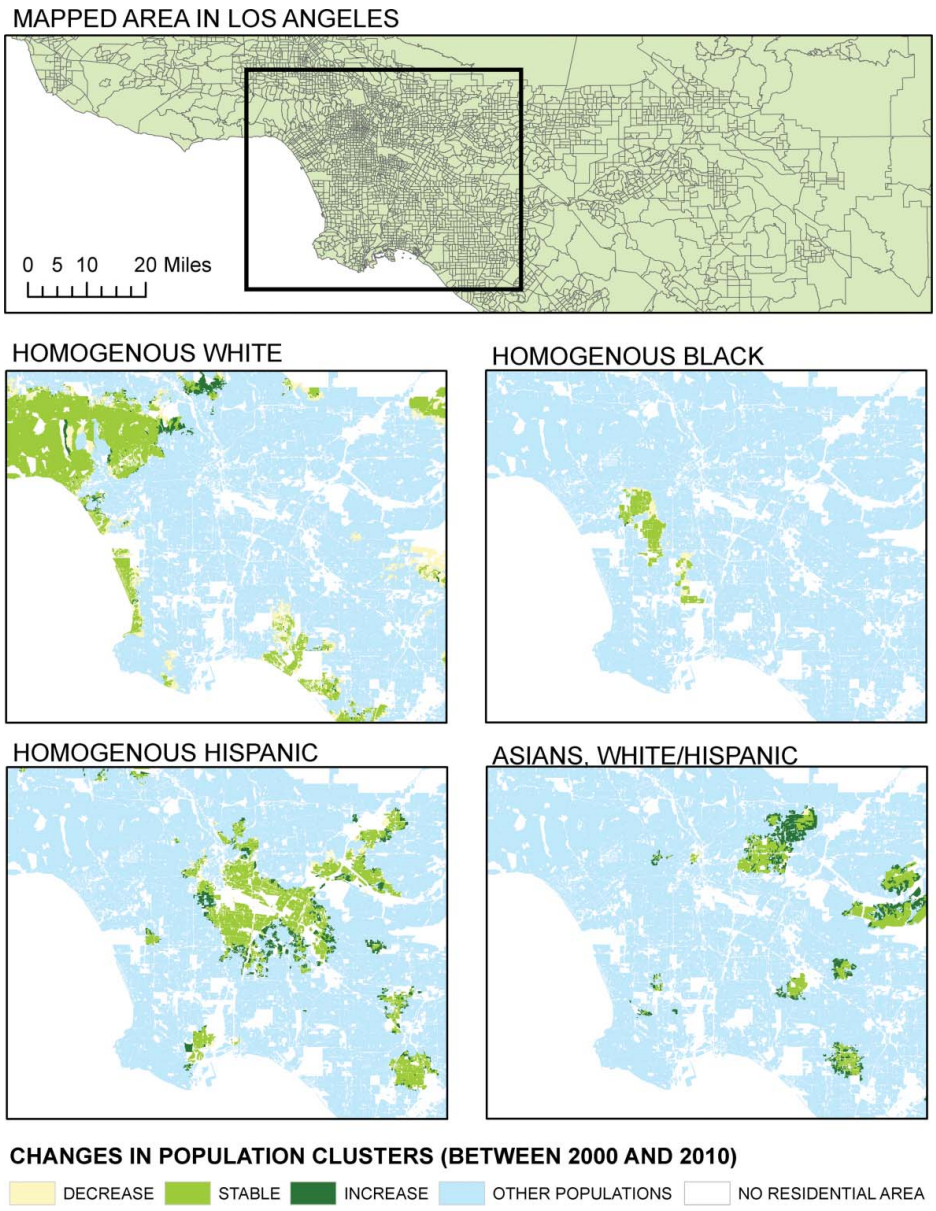

Figure 6. Homogeneity at the metropolitan scale. (Color figure available online.)

Much of the residential change is in very specific pockets in the metropolitan area, but what stands out is the contrast between white and black on the one hand and Hispanic and Asian on the other. White and black homogeneous areas (4, 5) are stable or declining. There are almost no areas of homogeneous increase for these populations. For whites there is a very small area of increase in the northern parts of the metropolitan area, but for areas that are homogeneous black there are simply no areas in the county that have an increase. The contrast for Hispanic and Asian homogeneous areas (1, 10) is significant. There are large areas of both Asian and Hispanic homogeneous clusters that are stable, but more important for understanding how segregation changes, there is considerable expansion of homogeneous Asian and Hispanic clusters adjacent to solidly Hispanic and Asian clusters. We are seeing the outcomes of preferences being revealed in the urban mosaic. Both Asian and Hispanic populations are growing and the strong preference to select neighborhoods that have similar populations is creating expanding homogeneous areas at the margin of concentrations of these groups (Clark 2009).

At the same time, even a cursory inspection of the maps suggests that a very large proportion of the urban

mosaic is not homogenous—not white, black, Hispanic, or Asian (Figures 5 and 6). Half of the metropolitan area is either a combination of clusters or some subset of dominance and association. Figures 5 and 6 show the major areas that have changed from homogeneity to heterogeneity, and they are considerably more common than the opposite (yellow in the map). Blue colored areas, representing stable homogenous areas, are more common in the northern and western parts of Los Angeles.

Change in Distribution of Ethno-Racial Groups Across Neighborhood Types

The previous sections focused on changing neighborhood ethno-racial composition of different locations in the Los Angeles area. In this section we instead look at how the neighborhood context of different racial groups has been changing, That is, we shift from a focus on location to a focus in the residential context of individuals belonging to different racial groups. Thus, Table 3 and Table 4 show the distribution in 2000 and 2010 of the four racial groups across the twenty neighborhood types that resulted from the cluster analysis. Comparing the values from 2000 and 2010 it is possible to track shifts in the patterns of segregation for these racial groups. A summary of the changes is presented in Figure 7, where green colors indicate neighborhood types that have increased their share of the racial group, and red colors indicate neighborhood types that have declining shares of the racial group population.

For Hispanics, we can see that 31 percent of the population in this group lived in what can be classified as a homogenous Hispanic neighborhood type (Table 3). By 2010, this neighborhood type increased its share of the Hispanic population to 33 percent (Table 4). The gain of this neighborhood type is almost equal to the loss from this racial group of the population share living in the small-scale Hispanic/white type of neighborhood. There has also been a decline in the share of Hispanics living in the black/Hispanic mixed neighborhood types. In contrast, there has been an increase in the share of Hispanics living in neighborhood types with a significant Asian population, as well as in the diverse Hispanic, white, and black neighborhood type. To summarize, for Hispanics there is a weak change in distribution toward more segregated neighborhoods but there are also more mixed neighborhood types to which Hispanics are attracted.

For Asians, the trend toward increased segregation is more pronounced. Here a large increase in the share of Asians living in the cluster that is most dominated by Asians—the Asian, white, Hispanic neighborhood type—occurred between 2000 and 2010. Only 12 percent of the Asians lived in this neighborhood type in 2000, but in 2010 almost 18 percent of the Asians in the five-county area could be found in this neighborhood type. In contrast, the share of Asians living in homogenous white type neighborhoods and in the mixed neighborhood type of Asian small-scale and white and Hispanic has declined (Figure 7).

The black population has a very different residential pattern from the Asian population. The share of the black populations that lives in the most black-dominated neighborhood type declined sharply from 14 percent in 2000 to 10 percent in 2010 (Tables 3 and 4). An even larger decline occurred in the second neighborhood type where blacks constitute the largest group: black and Hispanic mixed. The share of the black population that lived in this type of neighborhood declined from almost 19 percent in 2000 to below 12 percent by 2010. The neighborhood types that increased their share of the black population are instead many mixed types, including Hispanic, white, and black; white, Hispanic, and Asian; and Hispanic, black, and white. Furthermore, the share of the black population that lives in the homogenous Hispanic neighborhood type increased from 3.5 percent to 5.6 percent (Table 4). Thus, for the black population there is a clear trend away from living in segregated black neighborhood types.

The trend for the white population in the Los Angeles five-county area is similar to that for the black population. In 2000, 32 percent, almost every third white individual, lived in a homogenous white neighborhood type. Ten years later this share had fallen by eleven percentage points to 21 percent. Instead of living in homogenous white areas, the white population increasingly lives in more mixed neighborhoods such as white, Hispanic/Asian, white, Hispanic; Hispanic, white, and mixed Asian, white, Hispanic.

Finally, Figure 7 summarizes the changes in the distribution of the total population (excluding mixed races throughout) across the clusters between 2000 and 2010. Here, with two main exceptions, the trend is generally toward redistribution from less diverse neighborhood types in the top rows to more diverse neighborhood types lower down in the table. The exception is the increasing share of the strongly segregated homogenous Hispanic (1) neighborhood type and the declining

Table 3. The distribution of Hispanics, Asians, black, and white population across neighborhood types, Los Angeles five-county area, 2000

Number	Neighborhood type/cluster 2000	Hispanic population in cluster	Cluster share of Hispanic population (%)	Asian population in cluster	Cluster share of Asian population (%)	Black population in cluster	Cluster share of black population (%)	White population in cluster	Cluster share of white population (%)	Total population	Cluster share of total population (%)
1	Homogenous Hispanic	2,039,290	31.12	56,146	3.31	43,407	3.50	139,159	2.19	2,278,002	14.38
2	Small-scale Hispanic/white	460,513	7.03	23,846	1.41	21,715	1.75	134,567	2.12	640,641	4.05
3	White small scale/Hispanic	110,181	1.68	34,262	2.02	18,920	1.52	485,151	7.64	648,514	4.10
4	Homogenous white	228,488	3.49	115,126	6.79	37,004	2.98	2,028,423	31.96	2,409,041	15.21
5	Homogenous black	30,155	0.46	4,057	0.24	176,044	14.19	6,667	0.11	216,923	1.37
6	Hispanic white	453,419	6.92	44,723	2.64	30,738	2.48	249,706	3.93	778,586	4.92
7	Mixed enclave, Hispanic/white	267,410	4.08	27,949	1.65	24,354	1.96	274,248	4.32	593,961	3.75
8	White enclave, Hispanic	70,741	1.08	16,081	0.95	9,883	0.80	161,845	2.55	258,550	1.63
9	White, Hispanic	209,203	3.19	52,413	3.09	48,299	3.89	757,865	11.94	1,067,780	6.74
10	Asian, white/Hispanic	54,918	0.84	206,413	12.17	5,462	0.44	43,317	0.68	310,110	1.96
11	Hispanic dominated, white/Asian	472,303	7.21	74,187	4.38	22,082	1.78	95,948	1.51	664,520	4.20
12	Hispanic, white/black	719,014	10.97	57,012	3.36	190,461	15.35	341,238	5.38	1,307,725	8.26
13	White, Hispanic/Asian	173,897	2.65	224,012	13.21	36,015	2.90	639,177	10.07	1,073,101	6.78
14	White small scale, Hispanic/Asian	81,201	1.24	63,546	3.75	13,012	1.05	362,458	5.71	520,217	3.28
15	Black/Hispanic mixed	190,633	2.91	11,187	0.66	232,216	18.71	27,222	0.43	461,258	2.91
16	Mixed enclave Hispanic, Asian/white	273,395	4.17	171,260	10.10	24,667	1.99	129,944	2.05	599,266	3.78
17	Hispanic, black/white	420,478	6.42	34,355	2.03	232,874	18.77	126,806	2.00	814,513	5.14
18	Mixed white/Hispanic/Asian/black	69,907	1.07	58,472	3.45	41,534	3.35	71,715	1.13	241,628	1.53
19	Mixed Asian/white/Hispanic	154,302	2.35	193,379	11.40	15,653	1.26	170,992	2.69	534,326	3.37
20	Asian small scale, white/Hispanic	74,203	1.13	227,260	13.40	16,566	1.33	99,556	1.57	417,585	2.64
Total population of racial group		6,553,651		1,695,686		1,240,906		6,346,004		15,836,247	

Table 4. The distribution of Hispanics, Asians, black, and white population across neighborhood types, Los Angeles five-county area, 2010

Number	Neighborhood type/cluster 2010	Hispanic population in cluster	Cluster share of Hispanic population (%)	Asian population in cluster	Cluster share of Asian population (%)	Black population in cluster	Cluster share of Black population (%)	White population in cluster	Cluster share of White population (%)	Total population	Cluster share of total population (%)
1	Homogenous Hispanic	*2,636,581*	33.13	77,893	3.54	69,311	5.57	174,434	2.91	2,958,219	17.00
2	Small-scale Hispanic/white	401,094	5.04	22,529	1.02	19,235	1.54	119,923	2.00	562,781	3.23
3	White small scale/Hispanic	107,244	1.35	31,772	1.44	16,016	1.29	445,026	7.41	600,058	3.45
4	Homogenous white	*156,858*	1.97	84,851	3.86	23,212	1.86	1,249,060	20.80	1,513,981	8.70
5	Homogenous black	22,603	0.28	3,496	0.16	129,166	10.37	4,456	0.07	159,721	0.92
6	Hispanic white	582,145	7.32	58,740	2.67	40,168	3.23	313,246	5.22	994,299	5.71
7	Mixed enclave, Hispanic/white	283,905	3.57	33,108	1.51	25,424	2.04	282,184	4.70	624,621	3.59
8	White enclave, Hispanic	71,981	0.90	15,428	0.70	9,785	0.79	165,271	2.75	262,465	1.51
9	White, Hispanic	243,773	3.06	66,423	3.02	46,424	3.73	806,067	13.42	1,162,687	6.68
10	Asian, white/Hispanic	*105,263*	1.32	392,543	17.85	9,600	0.77	74,122	1.23	581,528	3.34
11	Hispanic dominated, white/Asian	644,602	8.10	107,598	4.89	31,549	2.53	126,939	2.11	910,688	5.23
12	Hispanic, white/black	971,288	12.21	79,450	3.61	234,953	18.87	327,671	5.46	1,613,362	9.27
13	White, Hispanic/Asian	264,339	3.32	279,478	12.71	51,690	4.15	801,052	13.34	1,396,559	8.02
14	White small scale, Hispanic/Asian	105,289	1.32	75,783	3.45	15,980	1.28	395,271	6.58	592,323	3.40
15	Black/Hispanic mixed	119,822	1.51	7,721	0.35	145,057	11.65	17,337	0.29	289,937	1.67
16	Mixed enclave Hispanic, Asian/white	378,981	4.76	233,747	10.63	36,688	2.95	180,043	3.00	829,459	4.77
17	Hispanic, black/white	471,738	5.93	32,426	1.47	247,590	19.88	102,543	1.71	854,297	4.91
18	Mixed white/Hispanic/Asian/black	97,873	1.23	72,379	3.29	50,746	4.08	81,843	1.36	302,841	1.74
19	Mixed Asian/white/Hispanic	198,034	2.49	256,280	11.65	21,723	1.74	228,589	3.81	704,626	4.05
20	Asian small scale, white/Hispanic	93,923	1.18	267,541	12.17	20,869	1.68	109,277	1.82	491,610	2.82
Total population of racial group		7,957,336		2,199,186		1,245,186		6,004,354		17,406,062	

Number	Neighborhood type/Cluster	Hispanic	Asian	Black	White	All
1	Homogenous Hispanic	2.02%	0.23%	2.07%	0.71%	2.61%
2	Small scale Hispanic/White	-1.99%	-0.38%	-0.21%	-0.12%	-0.81%
3	White small scale/ Hisp	-0.33%	-0.58%	-0.24%	-0.23%	-0.65%
4	Homogenous White	-1.52%	-2.93%	-1.12%	-11.16%	-6.51%
5	Homogenous Black	-0.18%	-0.08%	-3.81%	-0.03%	-0.45%
6	Hispanic White	0.40%	0.03%	0.75%	1.28%	0.80%
7	Mixed enclave, Hisp/White	-0.51%	-0.14%	0.08%	0.38%	-0.16%
8	White enclave, Hisp	-0.17%	-0.25%	-0.01%	0.20%	-0.12%
9	White, Hisp	-0.13%	-0.07%	-0.16%	1.48%	-0.06%
10	Asian, White/Hisp	0.48%	5.68%	0.33%	0.55%	1.38%
11	Hispanic dominated, White/Asian	0.89%	0.52%	0.75%	0.60%	1.04%
12	Hispanic, White/Black	1.23%	0.25%	3.52%	0.08%	1.01%
13	White, Hisp/Asian	0.67%	-0.50%	1.25%	3.27%	1.25%
14	White small scale, Hisp/Asian	0.08%	-0.30%	0.23%	0.87%	0.12%
15	Black/Hisp mixed	-1.40%	-0.31%	-7.06%	-0.14%	-1.25%
16	Mixed enclave Hispanic, Asian/White	0.59%	0.53%	0.96%	0.95%	0.98%
17	Hispanic, Black/White	-0.49%	-0.55%	1.12%	-0.29%	-0.24%
18	Mixed White/Hisp/Asian/Black	0.16%	-0.16%	0.73%	0.23%	0.21%
19	Mixed Asian/White/Hisp	0.13%	0.25%	0.48%	1.11%	0.67%
20	Asian small scale, White/Hisp	0.05%	-1.24%	0.34%	0.25%	0.19%

Figure 7. Changes in neighborhood type share of racial group population 2000–2010, Los Angeles five-county area. (Color figure available online.)

share of the diverse black and Hispanic mixed (15) neighborhood type. It is interesting to note, for example, that the five most diverse neighborhood types all experience an increasing population share, as well as nine of the eleven most diverse neighborhood types.

Conclusions

In this article we have presented an analysis of changing segregation patterns in the Los Angeles area that uses a combination of a classification methodology and multiscalar measures of segregation. This approach reveals that although most locations in the Los Angeles area have relatively flat segregation profiles—that is, the ethno-racial composition of the neighborhood populations is similar across different scales—a set of neighborhoods with curved segregation profiles—that is, locations for which the ethno-racial composition of the neighborhood population does vary with scale—have a substantial presence in the Los Angeles area. This supports the claim that the analysis of segregation patterns should be based on multiscalar measures. Our analysis shows that neighborhood types with curved segregation profiles play an important role as transitory categories and that this indicates that neighborhood change often does not occur simultaneously across all scales As a consequence, having intermediate neighborhood categories with curved segregation profiles allows for a better analysis of neighborhood dynamics.

A neighborhood classification based on multiscalar measures of population composition, in addition, is helpful because, being based on a classification of individual locations, it can link changing segregation patterns to individual-level experiences of changing ethno-racial compositions in their residential context.

Specifically, we have confirmed the declining importance of both white homogenous and black homogenous neighborhoods and show how this decline results in an increasing number of more diverse neighborhoods. Our analysis has shown that this increase in diversity is linked to an increasing presence of Hispanic population groups. Formerly homogenous black and white neighborhoods have become mixed neighborhoods with substantial proportions of Hispanics and, to some extent, Asians. Our analysis also shows, though, that many mixed neighborhoods have become less diverse as the share of Hispanics and Asians has increased even more.

The analysis demonstrates how diversity can be viewed as a dynamic phenomenon. Instead of applying a statistical construct to data for a given year, we show that diversity in an urban context should be

categorized as changes in neighborhood composition over time. For inhabitants of a certain census block, the lived experience of a predominantly white surrounding neighborhood can be changed to a mixed white and Hispanic one during the relatively short period of ten years. Although it is hardly revolutionary, it is clear that the Los Angeles area is characterized by dynamic diversity, an ongoing process of neighborhood change. Between 2000 and 2010 almost half of the census blocks, 45 percent, experienced a change in the ethno-racial classification of their neighborhood population. Using a larger number of clusters, although at first sight more complex, captures the reality of local changes and reflects the need in urban research for measures that are sensitive to shifts in population composition. Our research strategy, therefore, opens up a better understanding of how an urban area is affected by shifts in the overall population composition.

Substantively, this article shows that there is now substantial racial and ethnic mixing across greater Los Angeles. There are decreasing areas of homogeneous populations and a rapid increase in areas that are a mixture of all the racial and ethnic groups. Diversity and heterogeneity is the new structure of urban society in Los Angeles and will be in cities with large numbers of more than two ethnicities, certainly the situation now in most global cities. The research using multiscalar neighborhoods is able to capture the opposing trends in dynamic diversity—that there is both a trend toward desegregation (for blacks and whites) and a trend toward increased segregation (for Asians and Hispanics). The existence of these simultaneous trends points to a need for further elaboration of segregation theory. What is the basis for these divergent trends? Is it simply a reflection of aggregate group trends (the expanding Asian and Hispanic population) in relation to the relatively declining black and white groups? Or is the difference due to changes in the spatial behavior of ethnic groups over time in response to changing patterns of ethnic identification? These are not questions that we can address in this article. The results thus far demonstrate, however, that multiscalar segregation measures are a reliable tool for providing a detailed and reliable picture of these trends, including the dual processes of increased segregation and growing diversity. Without attention to the basic measurement of these patterns we cannot reliably speak about the future of segregation and desegregation in U.S. urban areas.

Notes

1. Engh (2000) also offers a broad historical survey of research on Los Angeles.
2. The value 51,200 is the value derived from doubling the neighborhood sizes. It is the largest value used in our scale analysis and represents a small city-sized scale.
3. The U.S. Census variables were derived from population subject files P1 to P10 as well as for the geography files for the two years. Variables describe county, block, coordinates, total block population, and population categorized as Asians, blacks, non-Hispanic whites, and nonblack Hispanics.
4. The smallest spatial units used in the two data sets are 250 feet × 250 feet.
5. For further details see Östh (2014).
6. For example, mixed enclave Hispanic, Asian, white (16); Asian small-scale white, Hispanic (20); Hispanic, white, black (12); mixed Asian, white, Hispanic (19); mixed white, Hispanic, Asian, black (18).

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Appendix

Table A1. Factor loadings for residence context variables

Ethno-racial group	Neighborhood size	Factor 1 Hispanic/ white balance	Factor 2 Asian presence	Factor 3 Black presence	Factor 4 Small-scale white/ large-scale Hispanic	Factor 5 Large-scale Asian	Factor 6 Medium-scale white/ small-scale Hispanic
Hispanics	12	0.884	−0.205	−0.034	−0.102	0.076	0.254
Hispanics	25	0.905	−0.212	−0.036	−0.107	0.077	0.248
Hispanics	50	0.924	−0.219	−0.038	−0.112	0.074	0.215
Hispanics	100	0.938	−0.223	−0.037	−0.113	0.065	0.144
Hispanics	200	0.946	−0.225	−0.037	−0.106	0.047	0.056
Hispanics	400	0.951	−0.227	−0.037	−0.091	0.025	−0.028
Hispanics	800	0.954	−0.228	−0.037	−0.063	0.002	−0.102
Hispanics	1,600	0.953	−0.230	−0.037	−0.016	−0.020	−0.156
Hispanics	3,200	0.948	−0.230	−0.034	0.053	−0.042	−0.177
Hispanics	6,400	0.938	−0.231	−0.029	0.148	−0.063	−0.162

(*continued on next page*)

Table A1. Factor loadings for residence context variables *(Continued)*

Ethno-racial group	Neighborhood size	Factor 1 Hispanic/ white balance	Factor 2 Asian presence	Factor 3 Black presence	Factor 4 Small-scale white/ large-scale Hispanic	Factor 5 Large-scale Asian	Factor 6 Medium-scale white/ small-scale Hispanic
Hispanics	12,800	0.923	−0.232	−0.021	0.254	−0.080	−0.117
Hispanics	25,600	0.899	−0.230	−0.011	0.331	−0.089	−0.069
Hispanics	51,200	0.867	−0.223	0.002	0.365	−0.092	−0.035
Whites	12	−0.827	−0.279	−0.272	0.110	0.088	−0.240
Whites	25	−0.847	−0.283	−0.277	0.115	0.089	−0.235
Whites	50	−0.864	−0.286	−0.282	0.120	0.084	−0.204
Whites	100	−0.876	−0.287	−0.288	0.121	0.070	−0.138
Whites	200	−0.883	−0.287	−0.293	0.115	0.050	−0.057
Whites	400	−0.889	−0.285	−0.297	0.100	0.026	0.023
Whites	800	−0.892	−0.283	−0.300	0.072	0.002	0.092
Whites	1,600	−0.893	−0.280	−0.302	0.025	−0.021	0.143
Whites	3,200	−0.890	−0.277	−0.303	−0.043	−0.043	0.161
Whites	6,400	−0.883	−0.273	−0.303	−0.136	−0.063	0.145
Whites	12,800	−0.870	−0.268	−0.302	−0.237	−0.078	0.101
Whites	25,600	−0.850	−0.263	−0.301	−0.311	−0.088	0.052
Whites	51,200	−0.821	−0.258	−0.299	−0.340	−0.092	0.020
Asians	12	0.000	0.896	0.004	0.005	−0.272	0.000
Asians	25	−0.002	0.914	0.004	0.004	−0.273	−0.001
Asians	50	−0.003	0.935	0.005	0.005	−0.261	−0.002
Asians	100	−0.005	0.954	0.005	0.004	−0.222	−0.004
Asians	200	−0.007	0.966	0.005	0.004	−0.159	−0.003
Asians	400	−0.009	0.973	0.004	0.003	−0.081	−0.003
Asians	800	−0.010	0.977	0.002	0.002	0.000	0.000
Asians	1,600	−0.012	0.978	0.001	0.001	0.077	0.003
Asians	3,200	−0.014	0.976	−0.002	−0.001	0.151	0.004
Asians	6,400	−0.016	0.969	−0.005	−0.003	0.221	0.005
Asians	12,800	−0.017	0.957	−0.007	−0.008	0.274	0.004
Asians	25,600	−0.018	0.938	−0.009	−0.015	0.304	0.004
Asians	51,200	−0.018	0.911	−0.012	−0.022	0.314	0.002
Black	12	0.082	0.004	0.836	−0.017	−0.034	−0.012
Black	25	0.084	0.003	0.857	−0.018	−0.034	−0.012
Black	50	0.086	0.003	0.882	−0.018	−0.034	−0.011
Black	100	0.089	0.003	0.908	−0.018	−0.031	−0.007
Black	200	0.092	0.002	0.933	−0.018	−0.023	−0.004
Black	400	0.096	0.002	0.953	−0.016	−0.015	−0.003
Black	800	0.100	0.001	0.969	−0.012	−0.005	−0.005
Black	1,600	0.104	0.000	0.979	−0.004	0.006	−0.005
Black	3,200	0.107	−0.002	0.981	0.006	0.017	−0.002
Black	6,400	0.112	−0.004	0.974	0.021	0.029	0.004
Black	12,800	0.116	−0.005	0.961	0.040	0.039	0.016
Black	25,600	0.121	−0.008	0.939	0.056	0.044	0.027
Black	51,200	0.121	−0.008	0.911	0.060	0.046	0.035

Table A2. Neighborhood types in Los Angeles

Neighborhood type	Factor 1 Hispanic/ white balance	Factor 2 Asian presence	Factor 3 Black presence	Factor 4 Small-scale white/ large-scale Hispanic	Factor 5 Large-scale Asian	Factor 6 Medium-scale white/ Small-scale Hispanic
Homogenous Hispanic	1.955	−0.542	−0.556	0.083	−0.048	0.007
Small-scale Hispanic/white	0.986	−0.501	−0.393	−2.082	0.033	−0.333
White small scale/Hispanic	−0.594	−0.474	−0.239	1.756	−0.003	0.381
Homogenous white	−1.106	−0.510	−0.368	−0.260	−0.107	0.112
Homogenous black	−0.667	−0.629	8.100	0.192	−0.140	0.151
Hispanic white	0.836	−0.416	−0.325	0.670	−0.110	0.281
Mixed enclave, Hispanic/white	−0.119	−0.441	−0.262	−0.579	−0.112	1.483
White enclave, Hispanic	0.282	−0.464	−0.299	0.741	−0.025	−2.330
White, Hispanic	−0.551	−0.384	−0.086	−0.271	0.056	−0.709
Asian, white/Hispanic	0.129	4.002	−0.375	0.052	0.107	−0.031
Hispanic dominated, white/Asian	1.194	0.401	−0.248	−0.326	1.217	0.393
Hispanic, white/black	0.690	−0.356	0.945	−0.057	0.062	0.081
White, Hispanic/Asian	−0.590	0.501	−0.164	−0.349	−0.694	0.244
White small scale, Hispanic/Asian	−0.615	0.514	−0.159	0.338	1.613	−0.175
Black/Hispanic mixed	0.086	−0.360	4.724	−0.033	0.062	−0.033
Mixed enclave Hispanic, Asian/white	0.820	0.841	−0.179	0.479	−1.363	−0.333
Hispanic, black/white	0.511	−0.286	2.393	−0.089	0.084	−0.030
Mixed white/Hispanic/Asian/black	−0.045	1.015	1.373	−0.023	0.098	0.017
Mixed Asian/white/Hispanic	−0.047	2.128	−0.253	−0.045	1.464	0.013
Asian small scale, white/Hispanic	0.016	2.391	0.108	−0.012	−2.260	0.005

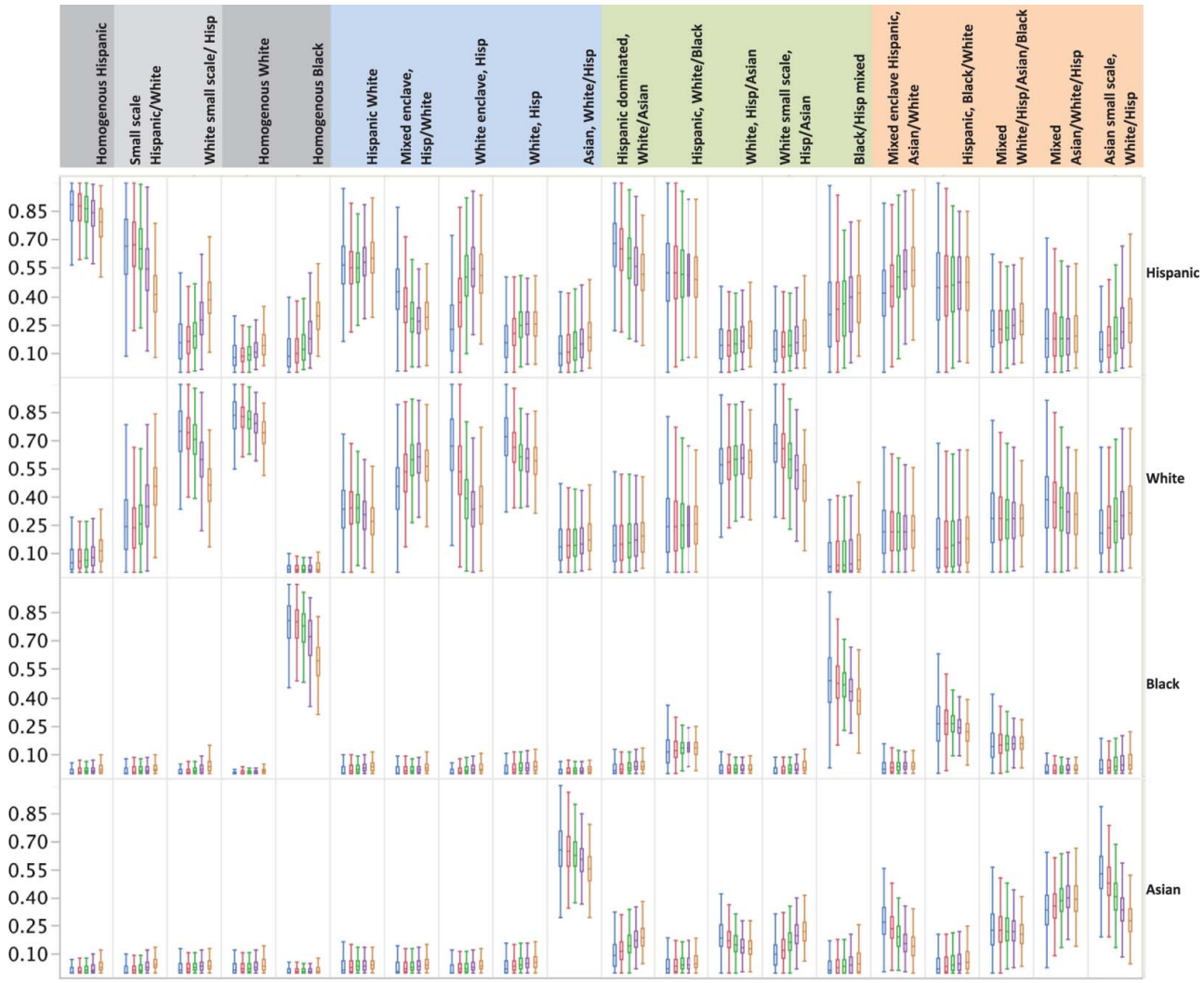

Figure A1. Box plots (variances) for ethno-racial group shares (vertical axis) in different neighborhood types by *k* values (12–50, 100–400, 800–1,600, 3,200–12,800, 25,600–51,200) on the *x* axis. (Color figure available online.)