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Author
Hipp, John R

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John R. Hipp*

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* Department of Criminology, Law and Society and Department of Sociology, University of California, Irvine. Address correspondence to John R. Hipp, Department of Criminology, Law and Society, University of California, Irvine, 3311 Social Ecology II, Irvine, CA 92697; email: john.hipp@UCI.edu. This research is supported in part by the Metropolitan Futures Initiative (MFI).

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Abstract

This study uses U.S. Census data on average home values in Southern California census tracts from 1960 to 2010. Using growth mixture modeling (GMM), 26 unique groups are detected capturing nonlinear change in neighborhood relative home values over this study period. There were seven broad patterns of changing home values: 1-3) decline and then rise (at high, mid, and low portions of the home value distribution); 4) rise and then decline; 5-6) a monotonic increase (either above or below the region average); and 7) a monotonic decrease. Multinomial regression models found that covariates exhibited a much stronger effect for distinguishing between the average *level* of home values in neighborhoods over the study period, rather than how home values *changed* over time.

Keywords: neighborhood change, context, home values, amenities, New Urbanism

Bio

John R. Hipp is a Professor in the departments of Criminology, Law and Society, and Sociology, at the University of California Irvine. He is the director of the Metropolitan Futures Initiative (MFI). His research interests focus on how neighborhoods change over time, how that change both affects and is affected by neighborhood crime, and the role networks and institutions play in that change. He approaches these questions using quantitative methods as well as social network analysis. He has published substantive work in such journals as *American Sociological Review, Criminology, Social Forces, Social Problems, Mobilization, City & Community, Urban Studies* and *Journal of Urban Affairs*. He has published methodological work in such journals as *Sociological Methodology*, *Psychological Methods*, and *Structural Equation Modeling*.

Typology of Home Value Change Over Time:
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For many households in the U.S., their home represents a long-term investment that is their largest source of wealth. Furthermore, an important component of the value of a home is the characteristics of the neighborhood in which it is located. For this reason, there is considerable interest in understanding which neighborhood characteristics have positive impacts on home values over long periods of time. Whereas hedonic models provide considerable insight into which neighborhood characteristics have a positive association with sales prices at a particular point in time, such studies rarely have access to long-term data. Thus, studies have typically only focused on home value change over a single decade (Monkkonen, Wong, & Begley, 2012; Owens, 2012; Owens & Candipan, 2018). However, the key question here is what explains longer-term trajectories of home values in neighborhoods, rather than single decade changes? In short, do neighborhoods exhibit a relatively consistent ranking in terms of home values over time, or do neighborhoods exhibit different trajectories of rising and falling home values over a 50 year period?

We explore the possibly nonlinear trajectory of home values for neighborhoods over a 50-year period (from 1960 to 2010) in the Southern California region, focused on the following research questions. First, we ask whether a single trajectory form characterizes the relative change in home values in the region over this period, or if there are in fact multiple qualitatively different trajectories over this long time period. Second, we consider theories that might explain the relative standing of neighborhoods based on home values in general, but also theories that provide insight about which neighborhoods might exhibit different trajectories over a long time period. The theories we explore that might explain these changes are filtering theory from housing economics (Lowry, 1960), the changes in amenities and disamenities in neighborhoods over time, and the possible changes in resident preferences over time, either as preferences for residence with same race residents or as preferences for the types of neighborhood characteristics discussed by the New Urbanism perspective (Leccese & McCormick, 1999). Our third question therefore is whether these theories better explain the relative standing of neighborhoods over time, or better explain how these neighborhood trajectories change over time.

Given the nature of our research questions, there are two important features of the analytic strategy that we adopt. First, given that we are studying change in home values over such a long period of time, it is necessary to adopt a strategy that allows for estimating possible nonlinear change; we accomplish this by estimating nonlinear latent trajectories of change in home values over time. Second, given theoretical expectations that there will not simply be a single trajectory of home values across all neighborhoods, we estimate growth mixture models (GMM); these models allow estimating separate trajectories for a number of groups that are empirically determined by the estimating procedure. Furthermore, our subsequent models estimate which characteristics explain membership in a particular group. This approach requires not only measuring characteristics of the neighborhood at the beginning of the study period (in 1960), but how various characteristics have changed over the 50-year period, and the extent to which this change is associated with change in home values.

In the next section, we consider the key theories that provide explanations for why some neighborhoods may be more desirable than others, and how that might change over time. We then discuss the dataset of census tracts in the Southern California region from 1960 to 2010 and how we constructed the measures. We describe our analytic strategy using growth mixture models, along with multinomial logistic regression. After a presentation of the results, we conclude with a discussion of the implications for our findings.

Home values over time

Filtering theory: Consequences of aging housing

A key theoretical perspective for how aging housing can have consequences for the trajectory of home values is filtering theory from the housing economics field (Baer & Williamson, 1988; Lowry, 1960). This theory posits that as housing ages it requires constant maintenance to keep it from becoming dilapidated. This aging housing therefore results in a diminishing quality of housing stock if it is not maintained. For a period of time, residents may consistently maintain the needed repairs of housing. However, studies have shown that as housing ages, residents who move out are more likely to be replaced by residents of modestly lower income (Rosenthal, 2014). This downward filtering occurs at the same time that aging housing needs more maintenance, and in some cases these new residents may have less economic ability to provide the necessary maintenance. A consequence of deferred maintenance can be further degradation of the housing, which can further lower the appeal of the neighborhood and reduce home values. There is evidence that this slow process occurs over long periods of time (Hoyt, 1933; Rosenthal, 2008). This also can result in segmented housing markets in which different classes of buyers choose housing based on its current quality (Galster, 1996; Galster & Rothenberg, 1991).

Whereas one consequence of filtering theory is that we would expect there to be a long slow decline in relative home values in a neighborhood over time, another consequence is that we would expect this process to be interrupted at some point. One possibility is that this interruption occurs when the housing in a neighborhood is removed, as was often the case in urban renewal projects of the twentieth century (Wilson, 1987). The result would likely either be vacancies, or else new housing in a location, and we might expect it to have higher home values simply because of its newness. Another possibility is that persons with more economic resources will invest in the neighborhood and make an effort to provide dramatic improvements to the units—what is often referred to as gentrification (Glass, 1964). In this latter case, new residents or investors purchase the units and make considerable improvements, which often results in sharp increases in relative rents and home values in the neighborhood (Guerrieri, Hartley, & Hurst, 2013). Although scholarship has studied the numerous social changes that can occur in such neighborhoods (Ellen & O'Regan, 2011; Zukin, 2019), our focus here is on the implication of filtering theory that home values will exhibit a long slow decline followed by a sharp increase at some point. Although there are various critiques and challenges for testing filtering theory—most notably that the literature has variously studied either housing units or households as the units of analysis, and that the literature has often diverged on whether it focuses on processes (housing aging) or results (the extent to which lower income residents move into a unit) (Baer and Williamson 1988)—our interest here is in how the process of aging housing impacts relative home value trajectories of these neighborhoods. Furthermore, an implication of filtering theory is that we should observe different trajectories of home value over time depending on the age of housing.

Theories of changing housing preferences

The potential for revitalization of housing based on filtering theory and subsequent gentrification has dovetailed with the observed "back to the city" movement that has resulted in the revitalization of urban centers with older housing stock along with the decline of suburbs

(Golding, 2015; Hanlon & Vicino, 2007; Sweeney & Hanlon, 2017). On the one hand, if these older housing units are simply ripe for the revitalization associated with filtering theory, this would not provide evidence of changing buyer preferences. On the other hand, to the extent that the particular older housing being targeted for revitalization is located in denser urban areas, and this density is what is desirable to potential residents, then this would indicate a shift in buyer preferences. This implies that, independent of housing age, we would observe these sharp upticks in housing value trajectories disproportionately in neighborhoods near traditional downtown locations. Thus, whereas newer housing is typically more valuable initially, this may change when central city housing becomes old enough to undergo gentrification (Brueckner & Rosenthal, 2009). Indeed, although earlier research found that the age of housing stock was associated with home devaluation, implying that age may be a proxy for the structural condition of a home (Franklin & Waddell, 2003; Oates, 1969), Li and Brown (1980) in Boston and Goodman and Thibodeau (1995) in Dallas found that consumers were willing to pay a premium for historic quality homes.

Another source of potential changing buyer preferences may be based on the recent rise of interest in the principles related to New Urbanism. The Congress for New Urbanism notes that their principles are “neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice” (Congress for the New Urbanism, 2001). This perspective attempts to create neighborhoods that have diverse population and various uses, and that are designed for pedestrians and alternative transportation modes (Talen, 2013), although the extent to which diversity in such neighborhoods is actually achieved is questioned (Markley, 2018). There is some evidence that consumers will pay a premium to live in New Urbanism communities (Tu & Eppli, 1999, 2001).

It is important to highlight that New Urbanism implies a number of design features that are simultaneously combined into a community in an effort to achieve the desired goals. We do not attempt to measure such New Urbanism communities here, but rather our narrower question is whether some of the design features that are key to New Urbanism may be more desirable to home buyers recently, which would imply a change in buyer preferences. If such changes have indeed occurred, the implication is that we would observe that neighborhoods that have experienced a more recent relative rise in home values would be ones that contained one or more of these design features.

For example, one primary design element of New Urbanism is high density, mixed development, which implies that high population density may positively impact home values. In this view, high density development facilitates social interaction through ‘vibrant’ public spaces and mixed land uses (Campoli, 2012, p. 14). The extent to which New Urbanist developments are actually able to achieve such social interaction is debated, with empirical evidence finding conflicting results (Kleit, 2005; Oakley, Fraser, & Bazuin, 2014). Nonetheless, if there are indeed changing buyer preferences, we should observe that areas with higher population density experience greater home value appreciation in more recent years (Myers & Gearin, 2001). We would also expect that neighborhoods with more jobs and amenities (measured as retail locations) within walkable distances would be more desirable in recent years. Studies have found mixed results. For example, although Song and Knapp (2003) found a positive relationship between mixed land uses and home values, they found mixed evidence for population density depending on how it is measured. Of course, population density can look very different across different settings (Campoli & MacLean, 2007), and therefore it is only a crude proxy of a New Urbanism principle.

New Urbanism also emphasizes high walkability of a place. In this view, residents not only prefer to have amenities and a work location closer to their home, but they wish to be able to access those amenities by walking. Although defining a “walkable” neighborhood is not easy, an important feature, beyond the presence of a sidewalk, is the street network. That is, a grid street network with relatively short blocks is posited to be friendlier to walkers (Marshall & Garrick, 2010). In such a street network, it is relatively easy for walkers to reach various locations nearby. In contrast, a street network with long blocks, or cul-de-sacs, makes reaching destinations much harder than would be the case if a resident could walk on a straight line to the location. For this reason, some research has measured characteristics of the street network and assessed its relationship to home values. For example, a study in Seattle found that high street connectivity was associated with higher home values (Matthews & Turnbull, 2007). Two more recent studies in Austin found the same pattern (W. Li et al., 2014, 2015). We would expect that such grid street networks will have a particularly strong positive effect on home values in recent years.

Given the focus on mixed housing unit types in New Urbanism, we might expect that neighborhoods with a larger proportion of single family housing units (and thus fewer multifamily units) will experience weaker home value appreciation in recent years (Cao & Cory, 1982; Song & Knaap, 2003). This differs from the common suburban model of creating areas with homogeneity in single family housing. The primary presumption was that segregation of land uses was preferred by residents, although there was also the idea that single family units are more likely to be owner occupied, and homeowners tend to be more invested in the neighborhood and therefore engage in more activity in voluntary organizations (Oliver, 1984; Swaroop & Morenoff, 2006), and express more attachment and satisfaction with the neighborhood (B. A. Lee, Campbell, & Miller, 1991). Note that this does not mean that owners are more civic minded---indeed, it is quite possible that they only engage in such behavior in an effort to preserve their home values (McCabe, 2016) compared to landlords and renters, who have different interests in the neighborhood's future trajectory. Nonetheless, the consequence of such behavior might still be a greater maintenance of home values. However, if New Urbanism principles are related to changing buyer preferences, we would expect to observe larger relative *decreases* in home values in predominantly single family housing neighborhoods in recent years.

Amenities of neighborhoods

Scholars have long noted that housing values depend in part upon nearby amenities and disamenities. Hedonic models have consistently shown that the presence of nearby parks can increase housing values (Troy & Grove, 2008), and that the presence of water features (in the form of a lake or a river, for example) can also increase housing values (Boyle & Taylor, 2001). Relatedly, housing values for neighborhoods near a beach are typically much higher. Given residents' need to commute to workplaces, particularly in Southern California, access to a freeway may be an amenity that would increases housing values, although being too close to a freeway can increase exposure to noxious pollutants and therefore be a disamenity, particularly for detached single family units (Carey & Semmens, 2003).

Some amenities do not change very much over time. For example, nearness to the beach will generally not change over time, and nearness to a park will only rarely change. As a consequence, such amenities would likely impact home values at a single point in time but would not be related to the *change* in home values over time. Any change over time would more likely reflect changing preferences. Indeed, there is evidence that natural amenities exhibit a persistent positive effect on home values over time (S. Lee & Lin, 2018).

On the other hand, some amenities can change over time. For example, the relative availability of jobs in the area is an amenity that economists have long focused on as being of importance for home values (Kain & Quigley, 1975). A study of the Boston area from 1982 to 1994 posited and found that cities maintained relative persistence in their amenity of job opportunities (Case & Mayer, 1996). Nonetheless, whereas some job centers and subcenters can remain fixed over long periods of time, there is evidence that job subcenters can also move over time, which would have implications for job access for a particular neighborhood (Kane, Hipp, & Kim, 2018). Indeed, in the Southern California region there is evidence that the jobs/housing balance has changed even over the shorter time period of 1990 to 2010 (Hipp, Kane, & Kim, 2017).

Changing preferences and neighborhood demographic composition

Whereas the physical characteristics of housing and the neighborhood are important for home values and how they change over time, the social characteristics are important as well. A particularly important social dimension is the racial composition of residents in a neighborhood. Thus, there is evidence that home values appreciate more slowly in minority dominated neighborhoods. For example, a study of census tracts from 1980 to 2015 found evidence that home value appreciation is much greater in white dominated tracts compared to ones dominated by Blacks or Latinos (Howell & Korver-Glenn, 2020). Similarly, a study of block groups in Atlanta found greater home value appreciation in white neighborhoods compared to black neighborhoods from 2000 to 2015 (Markley, Hafley, Allums, Holloway, & Chung, 2020). There is a long legacy of white flight in which the presence of more racial/ethnic minorities moving into a neighborhood resulted in a fear of falling home values and hence a rapid movement out of the neighborhood by white residents (Crowder & South, 2008; Galster, 1990). This often led to a self-fulfilling prophecy in which racial change led to falling home values. This racial transition also led to racial/ethnic mixing, at least for a period of time. A long literature showing a preference by white residents for few racial/ethnic minorities leads to the expectation that mixed race neighborhoods will have lower home values (Bobo & Zubrinsky, 1996). Studies have consistently found that residents living in racially mixed neighborhoods report less neighborhood attachment and neighborhood satisfaction (Connerly & Marans, 1985; Sampson, 1991), implying that such neighborhoods may be less desirable at least for some residents. Thus, Moye (2013) found that white-dominant neighborhoods in Philadelphia experiencing an influx of Black residents experienced weaker home value appreciation compared to other neighborhoods. Nonetheless, recent studies suggest that such racial transition is not inevitable, and that there may be neighborhoods with stable racial/ethnic diversity in recent years (Fasenfest, Booza, & Metzger, 2004; Logan & Zhang, 2010; Smith, 2016). There is also some evidence that the negative relationship between racial/ethnic minorities and home values has weakened in recent years in Southern California (Hipp & Singh, 2014). To the extent that this is the case, we'd expect to see that neighborhoods with more racial/ethnic minorities or heterogeneity will experience better relative home value trajectories in recent years.

Beyond the racial composition of a neighborhood, the socio-economic status of residents is likely important. Arguably, a particularly important characteristic is the education level of residents, which can be distinct from income or home value levels. Given the growth in high tech jobs in recent years, neighborhoods with a higher concentration of more highly educated residents may be more desirable for employer location decisions. For example, one study of Southern California showed that businesses that move are more likely to relocate to a neighborhood in which there are more residents with at least a bachelor's degree compared to their prior location (Hipp, Williams, Kim, & Kim, 2019). This might bring about a virtuous circle in which the location increases in desirability, which will have positive consequences for home values. We would therefore expect such neighborhoods to exhibit particularly sharp increases in their home value trajectories in recent years.

Setting of study

Southern California is an interesting location to study the change in home values over a long period of time. It is a booming housing market in recent years, and has had its share of booms and busts over the 50 year study period. It has long had a mix of various racial/ethnic groups and immigrants. It is also an interesting area to study given that it is well known for its sprawling development that exemplifies the quintessential "car culture": a question is to what extent the principles of New Urbanism are related to changes in home values here.

Data and Methods

Data

This study uses data aggregated to census tracts for the Southern California region over the period from 1960 to 2010. We define the Southern California region to constitute five counties: Los Angeles, Orange, Riverside, San Bernardino, and Ventura. We obtained data from the U.S. Census for 1960, 1970, 1980, 1990, and 2000, and the 2008-12 American Community Survey five-year aggregation. The data are placed into constant tract boundaries over time: we reconciled all data to 2000 tract boundaries using the appropriate Census tract relationship files, which apportion tracts based on the area of overlap. Our final sample was 3,349 tracts.

Typology of home value change

Dependent Variables

The dependent variable for these analyses was the logged average self-reported home value in a census tract in each decade of the study from the U.S. Census.[1] For all years this was computed by dividing the aggregate home value of all occupied owned units by the number of occupied owned units. In each decade, we transformed this logged average home value into a z-score, with a mean of 0 and a standard deviation of 1. This allows us to assess how the *relative* home values in these neighborhoods change over time, implicitly accounting for inflation and general trends in home values.

Independent variables

For our independent variables, we constructed measures that captured both the level of the measure of interest at the beginning of the study period (1960), as well as the amount of change in the measure over the study period (both linear and quadratic change). We accomplished this by estimating the trajectory of the measure over the study period for each census tract using the techniques described by Bollen and Curran (2006) (for an example of this strategy in an empirical study, see Hipp & Branic, 2017). For each measure this involved estimating the trajectory over the period in the tract as:

$$y_t = \alpha + (t)\beta_L + (t^2)\beta_Q + \varepsilon_t \quad (1)$$

where y_t is the variable of interest (e.g., percent Black) at each time point, α is a latent intercept that captures the estimated value of the measure in the tract in 1960, β_L is a latent variable capturing the linear trajectory over the time period (positive values indicate the measure generally increases over the time period, whereas negative values indicate it generally

[1] Although these home values are based on self-reports, studies find that respondents tend to overestimate the value of their home, nonetheless there is little evidence of systematic bias related to particular neighborhood characteristics (Goodman Jr & Ittner, 1992; Kiel & Zabel, 1999). We therefore believe these self-reported home values operate as relatively reasonable proxies of neighborhood home values.

decreases), t is coded to capture the change in time by showing the number of years since 1960 (the first time point); β_Q is a latent variable capturing the quadratic trajectory over the time period (positive values indicate the measure generally increases more rapidly later in the time period, whereas negative values indicate greater decreases) and time is coded as quadratic values, and ε_t is an error term for the tract at that time point. This equation is estimated for each tract separately, and the estimated α, β_L, and β_Q for each tract are then obtained from these models to be included later in the multinomial models explaining group membership over the study period, as they are unbiased estimates for each tract of the variable at the beginning of the time period and the amount of change over the study period.

The age of housing is likely important, given the insights of filtering theory. We constructed measures of the level and change in *average age of housing units* in the tract.[2] Average age of housing was computed by first assigning unit age to the mid-point of the bin of years in which it was contained, and then computing the average over units in the tract in that year.[3] We measure the *racial/ethnic composition* of the neighborhood: we constructed measures of the level and change of *percent Black* and *percent Latino*. We also captured general racial/ethnic mixing with measures of the level and change in *racial/ethnic heterogeneity*. Racial heterogeneity was measured with a Herfindahl index based on proportions of five racial/ethnic

[2] We also estimated ancillary models in which we instead constructed measures based on age bins of housing: percent aged less than 10 years, and percent aged more than 30 years (with those aged 10-30 years as the reference category). These measures were almost never significant in the models, and the overall model fit was superior when using our continuous measure of average age of housing units. We therefore chose to use the continuous measure in the presented results.

[3] There may be concern that there is disproportionate development in certain types of neighborhoods that would impact this measure over time. We assessed this by plotting the average age of housing by the seven major grouping patterns across the decades, and found that the relative ranking of the groups remained consistent across time.

groups (white, African-American, Latino, Asian, and other races), which is 1 minus a sum of squares, then multiplied by 100.[4]

The presence of highly educated residents may be desirable, so we computed measures of the level and change in *percent with at least a bachelor's degree*. There is evidence that households with children report more social ties in the neighborhood (Sampson, 1988, 1991), which may increase satisfaction and therefore home values, and we capture the presence of children with measures of the level and change in *percent households with children*. Residential stability can imply satisfaction with the neighborhood, and can also itself increase neighborhood satisfaction and attachment (Rice & Steele, 2001), and we capture it with measures of the level and change in *average length of residence*.

We also included other measures that capture amenities. The number of jobs in the broader commuting area is desirable, so we constructed measures of the number of jobs within a 10 mile radius of the tract (with an exponential decay with β= -0.5). For the more recent years of 2000 and 2010 we have business data from Reference USA (Infogroup, 2015), and we compute the number of total jobs within 10 miles of the tract. For the earlier years, we only have 1980 (actually, 1977) and 1990 (actually 1987) data from the Economic Census on the count of retail workers in zipcodes, so we apportioned that data to tracts using a population-weighted apportioning technique and then computed the 10-mile buffer variable. Although using retail employees is not ideal, it is the only data we have available in the earlier years; we compared this approach to using the Reference USA data in the more recent years, and the correlations were relatively reasonable for the 10 mile buffers (above .70). We do not have earlier data, so our

[4] The percent Asian variable is first available from the U.S. Census in 1980. The percent Latino variable is first available in 1970. We therefore only included these measures in the years in which they were available. We also considered including a variable capturing the percent immigrants, but it was too highly correlated with percent Latino to include in the models.

trajectory of jobs within 10 miles is constrained to these four time points; however, given the likely importance of this measure, we nonetheless included it in the analyses. Closeness to the beach is an amenity, so we included a measure of *distance in miles to the nearest beach (log transformed)*. This measure does not change over time so it was included only as a level measure. Nearness to a freeway can be desirable for commuting reasons, so we included a measure of *distance in miles to the nearest freeway (log transformed)*. This measure also effectively does not change over time given the limited freeway building during this period. For each of these distance measures, we computed the distance from each block centroid to the measure, and then computed the average distance within a tract. The presence of nearby parks is desirable, so we capture this by calculating the percentage of land within two miles surrounding each block that is park area (with an exponential decay with β= -0.5 to capture the fact that a nearer park is more desirable), and then computing the average of blocks in each tract of the *percentage nearby park area*. The parks data comes from the *ESRI Data and Maps 10*. We only had this measure in 2010, so we needed to assume that this measure captures park space over the entire time period. Parks are not added or removed frequently, so this is not an entirely problematic assumption. Nonetheless, it is a measurement limitation. Whether vacancies occur due to the desirability of the neighborhood or due to financing limitations in certain neighborhoods, they arguably represent a negative externality and we capture this with measures of level and change in *percent occupied units*.

We constructed several measures that act as proxies for the principles of New Urbanism development. We acknowledge that some New Urbanist developments are considerably smaller than tracts, and therefore these tract-level measures may imperfectly capture the constructs. First, we include measures that capture the level and change in the housing stock: the *percent* *single family housing units*.[5] We constructed measures of the level and change in *population density (per square mile)* in the neighborhood. The New Urbanism model presumes that the density of city streets creates more walkable areas, increasing desirability. We captured this with a measure of the *street intersection density* in the tract, which is measured as the number of street intersections divided by the land area of the tract; a meta-analysis showed that this measure exhibited a strong positive relationship with walking (Ewing & Cervero, 2010). This is measured in 2010; we do not have data for earlier years, so this is a limitation that should be kept in mind. Finally, the presence of nearby jobs, or commercial shopping opportunities, may be desirable. We capture these job opportunities nearby with a measure of the total employees within 0.5 miles of each block in the tract (the number for each block in the tract is averaged into the tract average). We capture the presence of nearby shopping opportunities with a measure of the number of retail employees within 0.5 miles of each block in the tract. We used geodesic distance between the centroid of a block and the centroids of blocks within 0.5 mile of it. Given that we do not have such micro-geographic data for earlier years, we are forced to assume that this measure does not change over time, which is a limitation. We distinguish these measures within ½ mile (what is presumed to be walking distance) versus our measure of the number of jobs within 10 miles (presumed to be auto commuting distance); indeed the correlations are .4 and .5, indicating notable differences.

To assess whether downtowns have become more desirable recently, we computed the distance to the four major downtowns in the region. Specifically, we computed four *distance to downtown (log transformed)* measures capturing the distance of the centroid of the tract to the centroid of the cities of Los Angeles, Santa Ana, Riverside, and San Bernardino. Ventura

[5] We considered including a measure of the percent owners. However, this measure was too highly correlated with the measure of percent single family units to also include in the models. We therefore excluded it.

County lacks such a historic central city, and we therefore do not construct a downtown measure for that county.

The summary statistics for the variables used in the analyses are presented in Table 1, and illustrate the changes over time in the region. The intercept captures the latent intercept for a measure in 1960, and thus the tracts in the region were on average 3.8% Black and 8% Latino in 1960, and they showed a consistent increase, on average, over the 50 years. The average racial heterogeneity value was 17.1 in 1960, and there was a general increase over the study period. For some measures, a linear change adequately captured the change over time, and in those cases the quadratic term was highly negatively correlated with the linear term and therefore excluded from the final models (and therefore not listed in Table 1).

<<<Table 1 about here>>>

Methods

To assess the long-term trajectory in home values between 1960 and 2010, we estimated growth mixture models (GMM). We emphasize that in this approach we only focus on average home values across decades in estimating the groups, and that later we will predict membership in these groups based on the variables already described. This strategy generalizes the latent trajectory model approach that estimates one trajectory for all cases, and instead estimates separate latent trajectories for several different latent groups (Muthén & Muthén, 2000). These latent groups are empirically determined in the statistical approach. Given that we expected nonlinear change in home values over this time period, we estimated nonlinear (quadratic) trajectories over time. Thus, the equation for each latent group (g) is:

(2) $$y_t = \alpha_{(g)} + (t)\beta_{L(g)} + (t^2)\beta_{Q(g)} + \varepsilon_{t(g)}$$

where y_t is the standardized value of logged average home values at time point *t*, α is a latent intercept of average home values in tracts in 1960, β_L is a latent variable capturing the linear trajectory over the time period, *t* is coded to capture the change in time by showing the number of years since 1960 (the first time point); β_Q is a latent variable capturing the quadratic trajectory over the time period (positive values indicate the measure generally increases more rapidly later in the time period, whereas negative values indicate later decreases) and time is coded as quadratic values, and ε_t is an error term for the tract at that time point. These coefficients are subscripted by (g) to indicate that they are estimated separately for each of the groups detected. We set the variances of the latent variables to zero for each group. An alternative approach estimates these variances for each group as well: we chose not to use this approach as it would require not only including variables predicting group membership (as we do) but also the same set of variables predicting variability *within* each group. Such an approach would simply complicate the interpretation of the results. We instead utilize the approach of Nagin (1999) that sets the variances to zero: the solution therefore yields more latent groups, but the subsequent conditional models are more interpretable given that we do not need to also model the variability within groups.

We estimated GMM's with incrementally additional latent groups, and chose the optimal solution for number of latent groups based on the minimum Bayesian Information Criterion (BIC) value and the entropy score. There is simulation evidence that the BIC performs very satisfactorily in selecting the number of groups in such models (Nylund, Asparouhov, & Muthen, 2007). We found that the 26 group solution was the optimal solution, which, as comparison, is a similar number of groups to a study looking at crime at micro locations in Seattle over a 14 year period (Weisburd, Bushway, Lum, & Yang, 2004).

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Based on this solution, we are able to assign each tract to the latent group that it is most strongly associated with. Average entropy for the optimal model was .86. As we describe in the Results section, these 26 groups generally captured seven broad trajectories that encompassed the tracts. We therefore collapsed them down to the seven patterns and estimated multinomial logit models to determine which neighborhood characteristics most strongly predict membership in a particular latent group. Therefore the model is:

(3) $$\text{Prob}(C_{(g)}) = B_1X_{\alpha} + B_2X_{\beta L} + B_3X_{\beta Q}\ 2$$

where the outcome variable is the probability of group membership in group g of G groups, X_{α} is the estimated intercept (for 1960) for each of the independent variables (from equation 1) and B_1 is a vector with the parameters capturing their effect on the probability of group membership, $X_{\beta L}$ is the estimated linear trajectory for the independent variables (from equation 1) and B_2 contains the parameters for them, and $X_{\beta Q}$ is the estimated quadratic trajectory for the independent variables (from equation 1) and B_3 contains the parameters. Given the evidence that gentrification has a spatial effect in which neighborhoods next to recently gentrified neighborhoods are more likely to experience gentrification themselves (Guerrieri et al., 2013), we also tested models including spatial lags of our variables of interest (based on an inverse distance decay capped at five miles), and the model fit was not improved (the BIC from the multinomial logistic regression model was larger than the model without these spatially lagged measures). Therefore, the spatial lag measures do not improve model fit, and are excluded.

Results

Latent trajectories of home values over time

We begin by describing the 26 latent groups detected in the optimal solution. The latent groups can be characterized by seven general trends: 1) down/up and low, in which home values fell early and then rose later, but generally remained below the region average; 2) down/up and mid, with the falling and then rising pattern but generally remaining near the region average over the study period; 3) down/up and high, with the falling and then rising pattern but generally remaining above the region average over the study period; 4) increasing and high, a single latent group in which neighborhoods had very high home values that steadily increased over the study period; 5) up/down, in which home values rose in the earlier years but then fell in the later years; 6) down, in which home values tended to steadily decline over the study period; 7) increasing and low, a single latent group of neighborhoods with relatively low home values that steadily increased over the study period (the reference category in the multinomial regression models). Given the similarity in the trajectories within each of these seven general trends, we collapsed the groups into these seven patterns for the multinomial analyses. We visually display in Figure 1 the weighted average of the trajectories of the groups that constitute each of the general patterns we observed in our data.[6] These weighted trajectories show that each of the seven patterns match their descriptor.

<<<Figure 1 about here>>>

Mapping these latent groups

We map the neighborhoods based on these seven broad categories for Los Angeles County in Figure 2. We see that the “up and high” and “down/up and high” neighborhoods are in orange and turquoise, and tend to cluster along the coast as well as the Santa Monica mountains area that extends to the west. A prototypical “down/up and high” neighborhood is tract 271200, located in West Los Angeles and it has average home value z-scores of 0.66 in 1960, fell to 0.20 in 1970 and 0.23 in 1980, then rose to 0.33 in 1990, 0.64 in 2000, and 0.87 in

[6] This is constructed by computing the model implied trajectory for each group, and then combining the trajectories for groups within a particular pattern by weighting them by the number of observations in a particular group.

2010. The "down/up and mid" neighborhoods are in tan and are scattered throughout the county, as are the "down" neighborhoods (olive green). A prototypical "down/up and mid" neighborhood is tract 462700 located in Pasadena. This tract's home value z-scores were -0.47 in 1960, fell to -0.60 in 1970, then rose to -0.26, -0.08, 0.10, and 0.26 in the subsequent decades. The "down/up and low" neighborhoods (pink) are generally around downtown LA (east and north), as well. One prototypical neighborhood is tract 534403 in Cudahy—south of downtown LA—with home value z-scores of -0.85, -1.32, and then -1.19, -0.88, -0.24, and -0.29. The "up and low" neighborhoods (yellow) are generally clustered south and east of downtown, which are traditionally disadvantaged areas. The "up/down" neighborhoods (blue) are clustered in the eastern stretches of LA City and further south of LA City---all of which are older suburban areas. A prototypical "up/down" neighborhood is tract 651400 in Torrance, with home value z-scores of -0.07, 0.15, 0.74, 0.95, 1.04, and 0.76.

<<<Figure 2 about here>>>

Although our focus here is on relative home values per decade, and therefore we standardized home values each decade, we also present the trajectory of real home values over time (adjusted to 1982 dollars) for the total sample and each of the broad patterns in Figure 3. As seen there, the region experienced some decreases in real home values during the 1960s, whereas since 1970 the groups with the highest home values exhibited the largest increases. The down/up and high group has shown a particularly strong increase since 1990 and now has the highest average real home values of the groups. Even the groups in the "down" pattern have shown a modest increase in real home values since 1990, although the small size of the increase compared to the other groups explains why they have experienced falling *relative* values.

<<<Figure 3 about here>>>

Typology of home value change

What explains group membership?

We next estimated multinomial regression models to explore which characteristics of these neighborhoods explain the particular latent trajectory group membership of the seven broad patterns. In these models, we used as the reference category pattern 5 neighborhoods that exhibited modest improvement over the study period, although they remained below the region average at all time points. The results are shown in Table 2.

<<<Table 2 about here>>>

We begin by describing the results of the groups in patterns 3 and 4, the two highest home value patterns. Pattern 3 tracts experienced an initial decline in home values in the earlier part of the study period, and then a strong increase more recently, whereas the pattern 4 tracts have high home values that only increased during the study period. It is notable that the determinants of these two patterns of tracts are quite similar: these neighborhoods experienced a drop in percent Black and racial/ethnic heterogeneity over the study period, had the highest concentrations of residents with a Bachelor's degree at the beginning of the study and the largest increases, and had high residential stability and high concentration of single family housing units. They had relatively newer housing, along with decreasing population density, were near the beach, relatively nearer to downtown Los Angeles, and experienced large increases in jobs within 10 miles. Very few characteristics distinguished neighborhoods between these two patterns: those in pattern 4 did experience a larger drop in percent Latino and a larger drop in average housing age (which might indicate the greater placement of new housing), whereas those in pattern 3 were closer to downtown Santa Ana and experienced a larger increase in vacancies. Thus, there appears to be little in our model that distinguishes between those in the upper tier that only experienced a recent rise in home values versus those that did not experience a drop in the earlier years.

As further evidence that our model does not explain change in home values very well, we see that pattern 6 neighborhoods (experiencing an initial rise in home values but a subsequent fall) have surprisingly similar characteristics as those in pattern 3 with the opposite trajectory (an early fall and a more recent rise). The few differences are that pattern 6 neighborhoods had fewer Latinos in 1960 than pattern 3 neighborhoods, fewer children, and did not experience the sharp drop in racial/ethnic heterogeneity. Pattern 6 neighborhoods also experienced a larger drop in average housing age (indicating new development), and were not near downtown Santa Ana. Nonetheless, it is striking how similar are the characteristics that predict membership in both patterns 3 and 6.

We next turn to the pattern 2 neighborhoods, which experienced an initial decline, and then a subsequent increase in home values over the study period—similar to pattern 3 except that these neighborhoods had home values closer to the region average rather than in the upper tier. Notably, there are more differences between these neighborhoods and pattern 3 neighborhoods, than there were between pattern 3 and pattern 6. The pattern 2 neighborhoods experienced the largest increase in Latinos and racial/ethnic heterogeneity of any tracts, and had only average levels of residential stability and population density. Although they were not closer to any downtowns or the beach, and experienced a more modest increase in jobs within 10 miles, they do have more street intersection density.

Notably, the determinants of the pattern 1 neighborhoods are quite different from those for the pattern 2 and 3 neighborhoods. This despite the fact that these three groups experienced similar down/up trajectories, but differ only based on their average home values over the study period. The pattern 1 neighborhoods had the highest concentrations of Blacks and Latinos in 1960, and the lowest concentrations of single family housing units and residential stability over the study period. They were more likely to have older housing, and the larger increase in housing age is consistent with the possibility that these homes were renovated, as filtering theory would predict, rather than replaced. These neighborhoods were closer to downtown San Bernardino, and although they have more jobs within ½ mile and a larger increase in jobs within 10 miles, they have fewer retail opportunities nearby.

The pattern 7 neighborhoods generally experienced declining relative home values over the study period. These neighborhoods tended to experience a larger increase in Black residents over the study period, with fewer children and highly educated residents. These neighborhoods are mixed regarding amenities: whereas they have many jobs within ½ mile, they tend to be further from the beach and have fewer jobs within 10 miles. They are near downtown San Bernardino, but they have low street intersection density. .

Finally, we briefly note the characteristics of pattern 5 neighborhoods (up and low), which served as the reference category in the models. They had a low percentage of highly educated residents throughout the study period and are relatively close to freeways. Whereas there is much retail within ½ mile, they generally experienced smaller job growth within 10 miles.

Discussion

This study has focused on trajectories of home values over a 50 year period in the Southern California region. By utilizing a growth mixture modeling strategy, we have demonstrated that different patterns of trajectories exist across neighborhoods. The model detected 26 different trajectory groups, with some of them occurring for a relatively large number of neighborhoods, whereas others had a very small number of neighborhoods constituting the group. These 26 groups were further collapsed into 7 broad patterns. We also explored whether membership in these groups is determined by certain key measures, based on both their level at the start of the study period, and their level of change over the study period. We next highlight several key findings.

A first key finding was that there were indeed seven broad patterns of relative home value trajectories in the study area over this time period. This is an important finding, as it highlights that where neighborhoods are in their historical trajectory matters, and therefore a single trajectory is insufficient to capture this pattern. Three patterns of neighborhoods exhibited a down/up pattern in which relative home values fell in the early part of the study period, but then rose in the latter half (only differing in whether they tended to stay at the relatively high, mid, or low portion of the home value distribution), and combined constituted 22% of the neighborhoods. Another pattern of neighborhoods exhibited an opposite pattern, up/down, in which values rose in the early years but have fallen more recently: these were the most prevalent as they constituted just over half of the neighborhoods. Another pattern of neighborhoods showed a general decline in relative home values over the study period: these were relatively rare as they constituted just 5% of the neighborhoods, indicating that few neighborhoods exhibit a monotonic decline in relative home values over time. The final two patterns showed steady increases in relative home values over the study period (one with relatively high home values, and the other with relatively low home values), and they constituted 15% of the neighborhoods. Clearly, it is not reasonable to characterize the trajectories of home values in Southern California neighborhoods over this time period with a single trajectory form.

Typology of home value change

A second key finding was that the covariates exhibited a much stronger effect for distinguishing between the average *level* of home values in neighborhoods over the study period, rather than how home values *changed* over time. For example, demographic characteristics such as the presence of highly educated residents, or an increase in Black residents, better discriminated between the average home values over time rather than the trajectories of home values. Whereas the presence of highly educated residents is presumably desirable given the increasing prevalence of high tech jobs, we see more evidence here that these highly educated residents are moving into higher home value neighborhoods, rather than them serving as a feature that can boost the fortunes of a neighborhood over time. Likewise, the evidence that the Black population appeared to increase in neighborhoods with the lowest average home values makes it appear that there is stickiness in racial segregation, a finding consistent with the racial segregation literature showing that same-race and similar-SES households tend to replace similar households in a unit (Ellen, 2000; Ellen & O'Regan, 2011; Hipp, 2019).

We also found evidence that amenities have a positive impact on home values, but less evidence that they impact trajectories. Neighborhoods nearer to the beach had the highest home values, as did those further from freeways (which appear to operate as a disamenity). For the high and increasing home value neighborhoods, the consistency of the positive value of amenities such as nearness to the beach mirrors the findings from prior research (S. Lee & Lin, 2018). It was also notable that the increase in jobs within 10 miles was an amenity that was associated with higher home value neighborhoods, and those that experienced increasing trajectories in more recent years. The fact that these larger commuting job increases were associated with neighborhoods with higher home values at the starting point is suggestive that these changes are *in response to* these neighborhoods, and not driving the changes in home values. As further evidence of this, the high home value neighborhoods that experienced steadily increasing home values had relatively fewer surrounding jobs initially, but experienced relatively large increases in jobs.

We found evidence that the some of the features of New Urbanism have stronger effects on home values in more recent years, but this was only the case for neighborhoods towards the lower end of the home value distribution. The neighborhoods that were most characterized by our New Urbanism measures were the lower home value neighborhoods that experienced a down/up trajectory, as they had greater population density, higher street network density, and a low percentage of single family housing. In contrast, the group of low home value neighborhoods that saw consistently declining relative home values, instead of a rebound, lacked these New Urbanist features. It may be that changing preferences, in part, explain why these groups of neighborhoods with these New Urbanist features showed a turnaround. In contrast, the higher home value neighborhoods had very few New Urbanist features—including the group that showed such strong recent home value increases—indicating that other amenities also are quite important for home value trajectories. Furthermore, the fact that the down/up and low neighborhoods had relatively few general amenities might explain why they have relatively lower home values despite the access to several New Urbanism features—in short, there may be countervailing effects occurring that impact their home values. Nonetheless, it was notable that of the improving neighborhoods, only the ones with home values at or above the region average tended to be located near downtown Los Angeles and downtown Santa Ana, whereas these improving but lower home value neighborhoods were further away from downtown.

We found some support for filtering theory. For one thing, the presence of different trajectories of home values over time, rather than a single one, is potentially consistent with the expectations of filtering theory. Furthermore, neighborhoods with older housing were most likely to be in the down/up and low pattern, which is consistent with the idea that at some point these older housing units can be renovated to increase their home values. However, these neighborhoods were only those that were towards the lower end of the home value spectrum, which may indicate that higher home value units are not allowed to decline as much, particularly in an area such as Southern California that has such a tight housing market (Rosenthal, 2014). Neighborhoods with newer housing were most likely to be in the up/down groups: the falling pattern in recent years is consistent with filtering theory, although the increases in the earlier decades is contrary to expectations. The next most likely neighborhoods with new housing were those in the high and increasing pattern; the higher home values are consistent with expectations, although the increasing values are in direct contradiction to filtering theory. These neighborhoods have a large number of other amenities, which may help their values. One possibility is that their residents have enough resources to adequately maintain the housing so that quality does not slip, and may even be engaged in housing improvements. Exploring this further with information on building permits in these neighborhoods would be useful.

It is important to highlight that the patterns exhibited by these neighborhoods came within a larger metropolitan context that was undergoing some rather large scale changes. Similar to other metropolitan areas, the region experienced a rather large white flight pattern beginning in the 1950s and continuing in subsequent decades. Whereas the region was about 95% White in 1960, by 2010 this had fallen below 40%. This change was accompanied by a large influx of immigrants, as the Counties in the Southern California region went from about 15% Latino in 1970 to about 45% in 2010, with rising racial/ethnic heterogeneity. As well, the housing market has endured large scale setbacks, including around 1990 with the crash of the aerospace industry due to the end of the Cold War—which disproportionately impacted the Southern California region—as well as the housing crash in 2008 caused by the financial crisis. Despite these broad patterns, it is notable that we detected these neighborhood groups, some of which exhibited consistent patterns of relative home values over this time period.

We acknowledge some limitations of this study. First, we relied on survey responses reporting home values from the Census. Although it would be preferable to actually have sales data, we noted that studies have not detected systematic bias in these reports based on characteristics of neighborhoods. Second, we used tracts to delineate "neighborhoods"; although a favorable feature of tracts is the ability to create constant boundaries over time, they are just one possible definition of neighborhood that one might define. Third, our focus on three adjacent metropolitan areas raises questions about generalizability of the results to other areas of the country. Utilizing the same approach in other metropolitan areas is a needed direction for future work. We are particularly interested in whether the pattern of results found in a growing region such as Southern California will be similar when assessed in metropolitan regions that have exhibited relative stagnation or even decline over this same study period, and should be a focus of future research.

Despite these limitations, this study has provided important new insights. Neighborhoods exhibit multiple distinct trajectories of home values over this long 50-year period of time, and therefore assuming a single trajectory is not reasonable. An important result was that change in a measure over time rarely helped in predicting membership in these latent groups beyond the level of the measure at the beginning of the study period. This implies that in general changes in our key measures do not lead to changes in relative home values. One implication is that there may be additional measures that need to be theorized and then included in such models to explain change in home values over time. Furthermore, future research will need to assess whether a similar pattern of home value trajectories, and the determinants of them, is found across other metropolitan regions.

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Tables and Figures

Table 1. Summary statistics of variables used in analyses

	Intercept		Linear slope		Quadratic slope	
	Mean	SD	Mean	SD	Mean	SD
Percent Black	3.8	14.3	0.3	0.8		
Percent Latino	8.0	13.5	0.7	1.2		
Racial heterogeneity	17.1	17.0	1.1	1.3	-0.009	0.024
Percent bachelor's degree	9.2	7.7	0.4	0.6	-0.001	0.009
Percent with children	58.4	17.0	-0.3	1.2		
Average length of residence (years)	5.8	2.1	0.1	0.2	0.001	0.003
Percent single family housing units	82.6	23.5	-1.5	1.3		
Average age of housing	14.3	7.0	0.2	0.5		
Population density (per sq. mile)	4806	5270	122	251		
Percent occupied units	93.2	5.8	0.05	0.49		
Street intersection density (per sq. mile)	0.6	0.3				
Distance to nearest freeway (logged miles)	0.2	0.3				
Distance to nearest beach (logged miles)	3.0	1.0				
Distance to Downtown LA (logged miles)	3.3	1.0				
Distance to Downtown Santa Ana (logged miles)	3.5	0.7				
Distance to Downtown Riverside (logged miles)	3.8	0.6				
Distance to Downtown San Bernardino (logged miles)	3.9	0.6				
Proportion nearby park area (2 mile exponential decay)	0.03	0.04				
Total employees within .5 mile (in 1000s)	2.5	4.8				
Retail employees within .5 mile (in 1000s)	0.6	0.8				
Employees within 10 miles (exponential decay)	5921	4812	-62	170		
Note: N = 3,349 tracts						

Table 2. Coefficients for multinomial logit model estimated on tracts in Southern California

	Pattern 1: down/up and low		Pattern 2: down/up and mid		Pattern 3: down/up and high		Pattern 4: up and high		Pattern 6: up/down		Pattern 7: down	
Percent black, 1960	0.06	**	-0.01		-0.05		-0.06		-0.05	**	-0.05	†
	(5.76)		-(0.61)		-(1.16)		-(1.04)		-(4.62)		-(1.91)	
Linear change percent black	-0.08		-0.15		-0.92	**	-1.26	**	-0.25	†	0.63	**
	-(0.49)		-(1.06)		-(3.69)		-(2.67)		-(1.67)		(3.17)	
Percent Latino, 1960	0.07	**	0.02		0.00		-0.08		-0.06	**	-0.01	
	(4.91)		(1.59)		(0.03)		-(1.58)		-(4.16)		-(0.29)	
Linear change percent Latino	0.14		0.56	**	-0.31		-1.75	**	-0.11		0.11	
	(0.69)		(3.14)		-(0.91)		-(2.77)		-(0.64)		(0.46)	
Racial heterogeneity, 1960	0.00		0.04	**	-0.05	*	-0.05		0.01		0.01	
	(0.28)		(3.38)		-(2.30)		-(1.35)		(0.93)		(0.69)	
Linear change Racial heterogeneity	-0.18		1.76	**	-3.04	**	-1.91	**	-0.31		0.18	
	-(0.38)		(4.38)		-(4.94)		-(2.85)		-(0.78)		(0.33)	
Quadratic change Racial heterogeneity	-28.80		95.32	**	-156.22	**	-101.27	**	2.04		33.04	
	-(1.23)		(4.67)		-(4.74)		-(2.98)		(0.10)		(1.27)	
Percent bachelor's degree, 1960	0.24	**	0.30	**	0.55	**	0.49	**	0.31	**	0.12	**
	(5.61)		(7.73)		(12.86)		(11.56)		(7.93)		(2.63)	
Linear change Percent bachelor's degree	2.63	**	3.73	**	9.58	**	9.32	**	3.80	**	-3.04	**
	(3.27)		(5.18)		(10.42)		(10.08)		(5.28)		-(2.90)	
Quadratic change Percent bachelor's degree	98.47	**	130.69	**	402.00	**	373.42	**	124.22	**	-165.39	**
	(2.60)		(3.93)		(9.25)		(8.37)		(3.78)		-(3.53)	
Percent with children, 1960	0.01		-0.03	†	-0.02		-0.03		-0.04	*	-0.05	*
	(0.49)		-(1.84)		-(0.80)		-(1.04)		-(2.48)		-(2.44)	
Linear change Percent with children	0.60	*	-0.07		0.43		-0.03		-0.47	†	-0.52	†
	(2.30)		-(0.28)		(1.18)		-(0.09)		-(1.96)		-(1.96)	
Average length of residence, 1960	-1.09	**	-0.18		0.45	*	0.81	**	0.85	**	-0.06	
	-(6.24)		-(1.18)		(2.27)		(3.94)		(6.03)		-(0.30)	
Linear change Average length of residence	-28.49	**	-3.23		11.00	**	17.92	**	16.31	**	-2.56	
	-(6.57)		-(0.98)		(2.69)		(4.40)		(5.49)		-(0.69)	
Quadratic change Average length of residence	-997.3	**	89.5		643.6	**	874.5	**	718.9	**	-105.4	
	-(5.07)		(0.61)		(3.38)		(4.75)		(5.45)		-(0.63)	

Typology of home value change

Percent single family housing units, 1960	-0.03	**	0.03	*	0.09	**	0.13	**	0.11	**	0.00	
	-(2.70)		(2.29)		(5.00)		(6.51)		(9.15)		(0.33)	
Linear change Percent single family housing units	-0.50	*	0.43	*	1.58	**	2.03	**	1.80	**	0.23	
	-(2.57)		(2.53)		(6.91)		(8.81)		(11.51)		(1.36)	
Average age of housing, 1960	0.11	*	-0.07	†	-0.17	**	-0.32	**	-0.38	**	-0.12	*
	(2.52)		-(1.77)		-(2.84)		-(5.19)		-(9.23)		-(2.36)	
Linear change Average age of housing	0.42		0.45		0.99		-1.83	*	-2.70	**	-1.58	**
	(0.86)		(0.97)		(1.47)		-(2.57)		-(5.72)		-(2.76)	
Population density, 1960 (/ 1000)	0.04		0.06	†	-0.28	**	-0.15	†	-0.16	**	-0.01	
	(1.28)		(1.88)		-(4.90)		-(1.92)		-(3.83)		-(0.24)	
Linear change Population density (/ 1000)	-0.21		0.04		-1.85	*	-2.50	*	-1.69	**	0.22	
	-(0.51)		(0.11)		-(2.18)		-(2.19)		-(3.08)		(0.34)	
Percent occupied units, 1960	-0.10	†	-0.02		-0.03		0.02		0.01		0.04	
	-(1.94)		-(0.42)		-(0.63)		(0.44)		(0.38)		(1.06)	
Linear change Percent occupied units	-0.19		-0.43		-1.62	**	-0.36		-0.38		0.03	
	-(0.39)		-(1.06)		-(3.06)		-(0.63)		-(1.04)		(0.08)	
Street intersection density	0.72	*	0.66	*	-0.55		-2.01	**	0.36		-1.35	*
	(2.02)		(2.01)		-(1.03)		-(3.06)		(1.01)		-(2.53)	
Distance to Downtown Los Angeles, logged	-0.05		-0.41		-1.10	*	-1.47	**	-0.58	*	1.14	**
	-(0.16)		-(1.45)		-(2.52)		-(2.88)		-(2.29)		(3.36)	
Distance to Downtown Santa Ana, logged	0.50	*	-0.12		-1.28	**	-0.48		-0.02		0.00	
	(2.22)		-(0.52)		-(2.60)		-(1.57)		-(0.11)		-(0.02)	
Distance to Downtown Riverside, logged	0.79		1.52		6.13	†	-0.55		0.14		1.46	**
	(1.39)		(1.32)		(1.73)		-(0.50)		(0.34)		(3.14)	
Distance to Downtown San Bernardino, logged	-1.30	*	-0.84		-2.98		1.41		-0.06		-1.57	**
	-(2.24)		-(0.72)		-(0.85)		(1.04)		-(0.15)		-(3.60)	
Distance to nearest freeway, logged	-1.64	†	0.83		1.63	*	0.90		-0.27		0.26	
	-(1.65)		(1.22)		(2.03)		(1.19)		-(0.48)		(0.43)	
Distance to nearest beach, logged	-0.04		-0.07		-1.08	**	-0.47	*	-0.18		0.40	†
	-(0.21)		-(0.41)		-(4.83)		-(2.00)		-(1.08)		(1.85)	
Percent park area	2.75		4.90		-0.63		1.93		2.85		7.13	
	(0.72)		(1.56)		-(0.16)		(0.50)		(0.87)		(1.53)	

Typology of home value change

Total employees within .5 mile (in 1000s)	0.01		0.00		-0.06		-0.22	†	-0.13	†	0.14	**
	(0.36)		(0.06)		-(1.23)		-(1.81)		-(1.91)		(3.16)	
Retail employees within .5 mile (in 1000s)	-0.31	†	-0.20		-0.54	†	0.27		-0.23		-0.06	
	-(1.74)		-(1.10)		-(1.93)		(0.75)		-(0.97)		-(0.26)	
Employees within 10 miles, 1960 (in 1000s)	2.07	*	-1.25		-2.89	*	-3.53	*	-0.55		-4.01	*
	(2.25)		-(1.48)		-(2.18)		-(2.12)		-(0.58)		-(2.56)	
Linear change employees within 10 miles (in 1000s)	0.12	*	0.08	†	0.31	**	0.14	*	0.15	**	-0.09	
	(2.40)		(1.65)		(4.76)		(1.99)		(2.89)		-(1.04)	
Intercept	10.08	†	-3.42		-9.28	†	-9.03		-2.46		-3.86	
	(1.92)		-(0.73)		-(1.67)		-(1.48)		-(0.63)		-(0.88)	

*** p < .01(two-tail test), * p < .05 (two-tail test), † p < .05 (one-tail test). T-values in parentheses. Pseudo R-square = 0.619. Omitted category is up and low.*

Figures

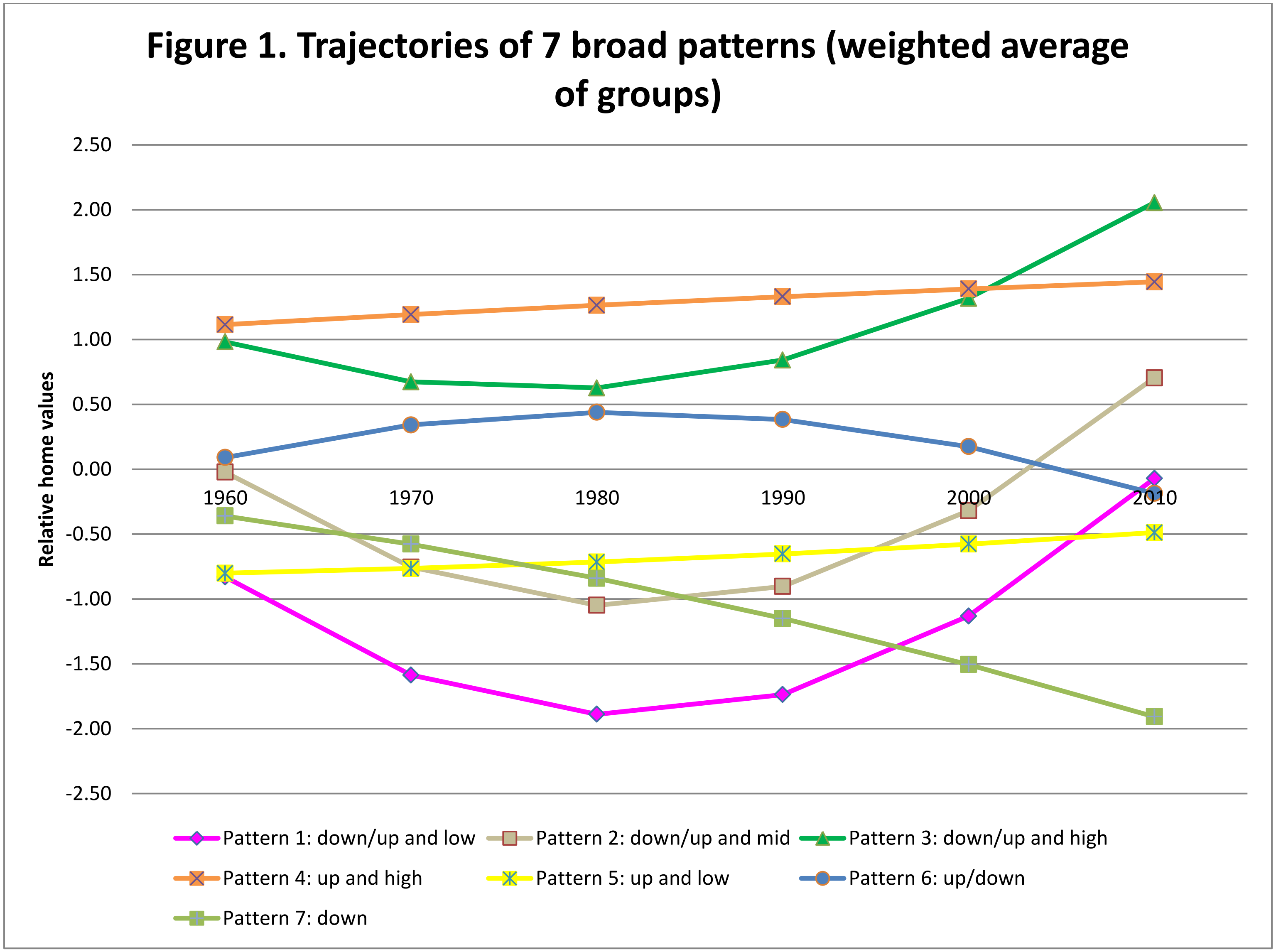
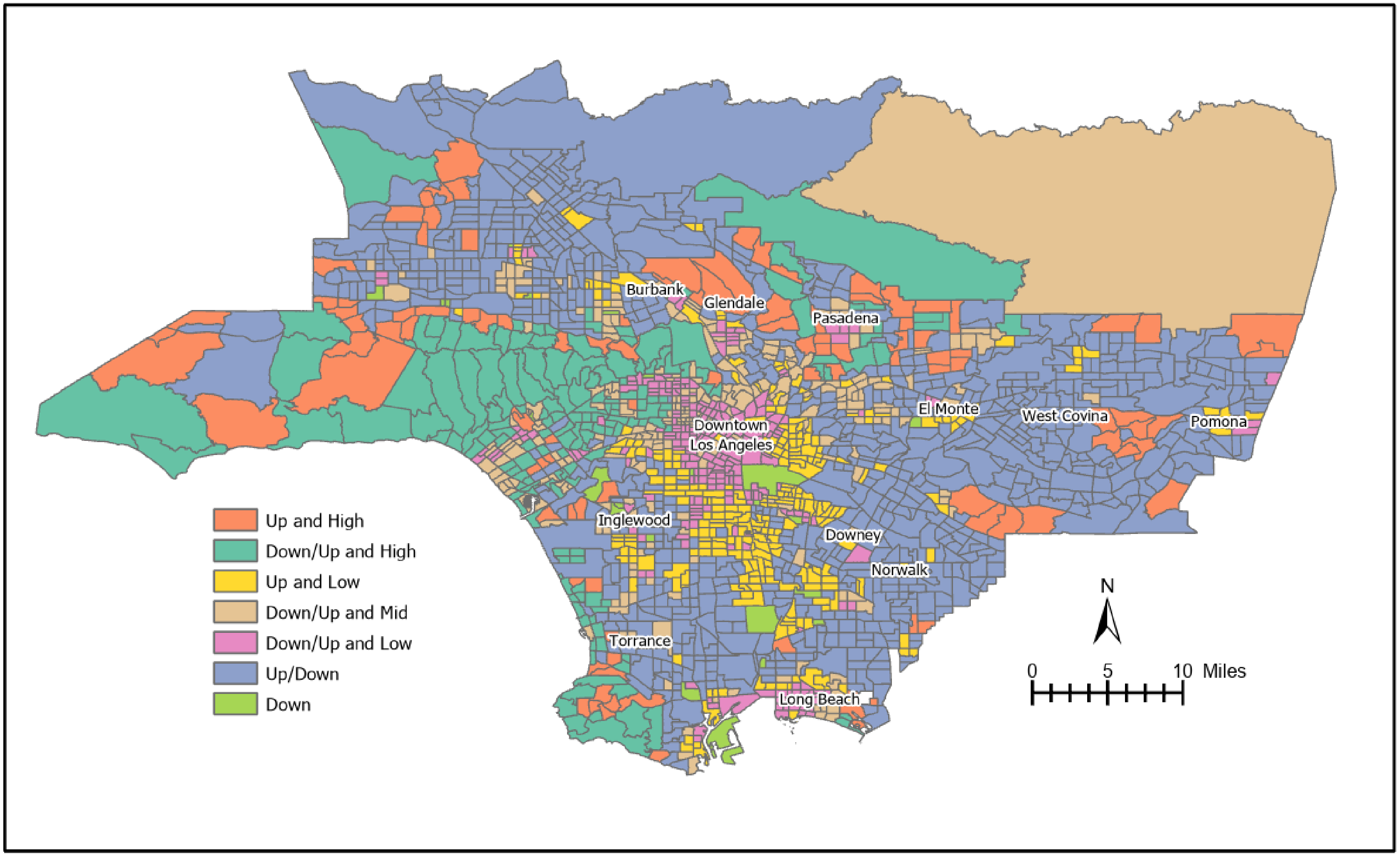


Figure 1. Trajectories of 7 broad patterns (weighted average of groups)
Relative home values
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
1960
1970
1980
1990
2000
2010
Pattern 1: down/up and low
Pattern 2: down/up and mid
Pattern 3: down/up and high
Pattern 4: up and high
Pattern 5: up and low
Pattern 6: up/down
Pattern 7: down

Typology of home value change

Figure 2. Map of Los Angeles County tracts in seven aggregated general patterns



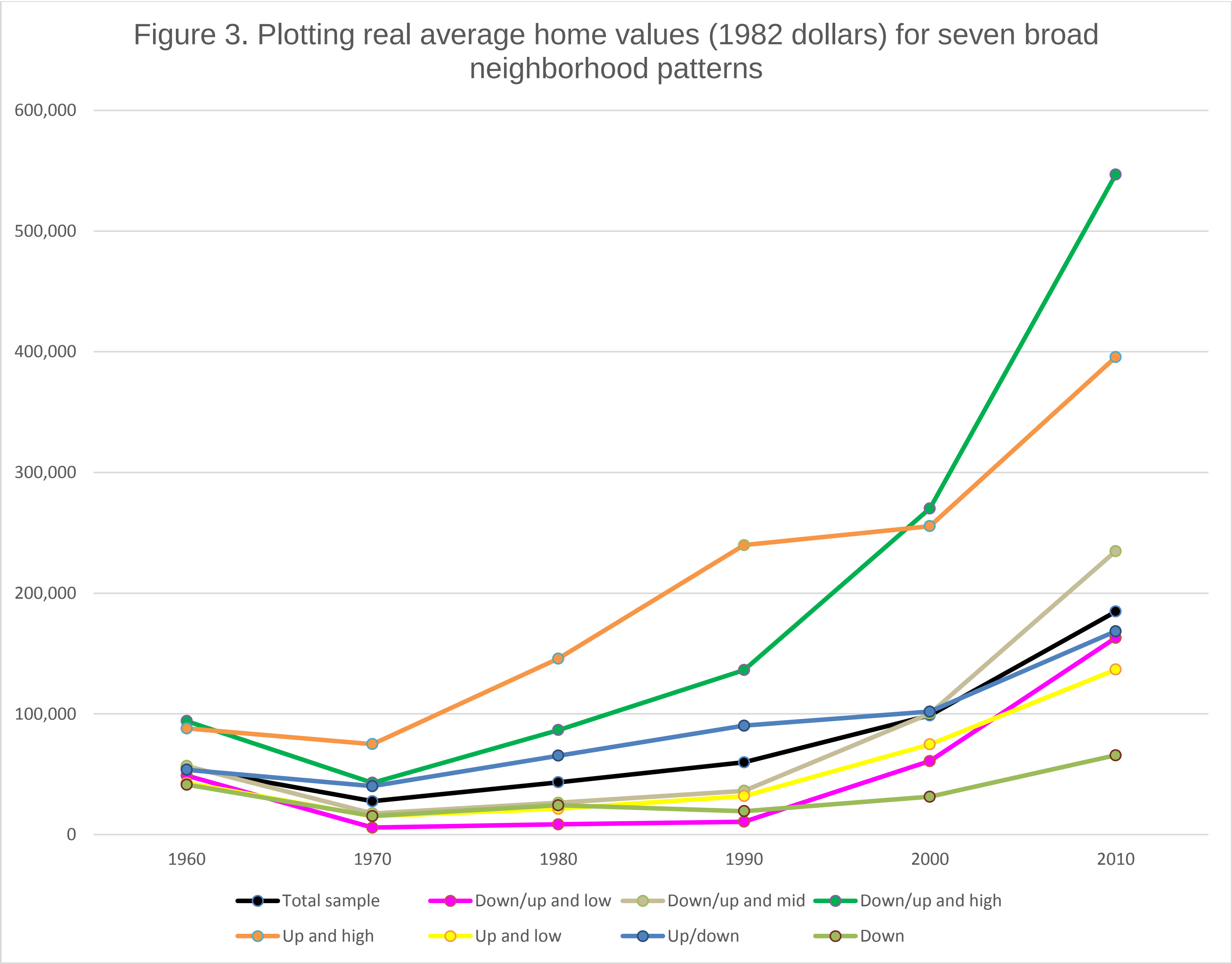


Figure 3. Plotting real average home values (1982 dollars) for seven broad neighborhood patterns
600,000
500,000
400,000
300,000
200,000
100,000
0
1960
1970
1980
1990
2000
2010
Total sample
Down/up and low
Down/up and mid
Down/up and high
Up and high
Up and low
Up/down
Down