Gentrification without Segregation: Race and Renewal in a Diversifying City

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Abstract

Rapid and widespread gentrification in US neighborhoods in recent decades has provoked debate over its relationship to neighborhood racial and ethnic composition. Empirical and theoretical understanding of this relationship, however, is primarily based on contexts of high levels of residential segregation by race—where racial composition severely constrains residential mobility decisions—and neglects the increasing diversification of cities that may ease these constraints. In this article, I examine the relationship between racial and ethnic composition and the evolution of gentrification in Seattle neighborhoods. I demonstrate that heterogeneous neighborhoods are least likely to gentrify early and gentrify slower in a majority-white context lacking residential concentrations of minorities, but neighborhoods with greater shares of blacks and lower shares of Asians are more likely to gentrify as the city diversifies and Asians become increasingly concentrated. These findings suggest that distinct mechanisms operate in low-cost neighborhoods with different racial and ethnic compositions that facilitate or prohibit gentrification. I propose a framework that incorporates the context of the overall affordable housing market and residential selection processes, particularly as they relate to immigration, for understanding the relationship between race and gentrification.

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Gentrification without Segregation:

Race and Renewal in a Diversifying City[1]

Jackelyn Hwang

Introduction

Gentrification—the socioeconomic upgrading of previously low-income, central city neighborhoods—
has generated both scholarly and public debate surrounding its negative consequences, particularly for
racial and ethnic minorities. Despite the importance of race in the development of residential patterns
in the US (Massey and Denton 1993), we have little understanding of the role of race in the location and
trajectory of gentrification in the US (Anderson and Sternberg 2013; Bader 2011; Lees 2000). One reason
for this is that existing studies overwhelmingly take place in highly segregated settings, such as Chicago
and New York City. Because segregation creates a distinct set of primarily racially homogeneous
neighborhoods in which race and class correlate strongly and heterogeneous neighborhoods are less
prevalent, neighborhood racial composition constrains neighborhood change and residential mobility in
such settings (Charles 2006; Crowder, Pais, and South 2012; Massey and Denton 1993). Thus, the
existing body of research may overstate or oversimplify the role of race and diversity in patterns of
gentrification.

Second, studies suggest that the relationship between race and gentrification has changed over
time (e.g., Hyra 2012; Freeman and Cai 2015), but only a handful of scholars have theorized about the
changing nature of this relationship. These accounts, however, do not incorporate the increasing
diversity of cities and neighborhoods resulting from the growth of Asians and Hispanics in the US in
recent decades. Studies on early gentrification document the prevalence of gentrification in specifically
non-black neighborhoods (e.g., Freeman 2009; Hwang 2016; Smith 1996; Wilson and Grammenos 2005),
while many depictions of contemporary gentrification point to its prevalence in predominantly minority
neighborhoods. Scholars have attributed such shifts to the increased role of state and corporate actors
in facilitating gentrification in recent decades (Goetz 2011; Hackworth and Smith 2001; Hyra 2012) or
the growth of middle-class minorities (Bostic and Martin 2003). However, given that accounts of
gentrifiers' preferences emphasize their attraction to racially and ethnically diverse neighborhoods
(Zukin 1987), an understanding of the relationship between race and gentrification is incomplete

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without considering the increase in multiethnic neighborhoods that have come with the growth of Asians and Hispanics (Logan and Zhang 2010).

By focusing primarily on highly segregated cities and neglecting the increasingly multiethnic nature of cities and their neighborhoods, existing theory on the role of race in the development of gentrification is incomplete. This study contributes to the study of gentrification and residential stratification through an examination of the evolution of gentrification in a city without high levels of segregation and with increasing diversity—Seattle. Seattle is a predominantly white city with relatively low levels of segregation compared to other large cities[2] and few predominantly minority neighborhoods. The city has a small but sizeable black population, and, while Asians have been present in Seattle for over a century (Taylor 1994), their numbers have grown substantially in recent decades, surpassing the black population in 1990.

I find that heterogeneous neighborhoods are least likely to gentrify in the early wave of gentrification and gentrify at slower rates in Seattle. Even though most of these neighborhoods are majority white, gentrification favored neighborhoods that were homogeneously white, even after controlling for socioeconomic and housing characteristics, proximity, and crime. In recent decades, however, I find that gentrification is positively associated with neighborhoods that begin the period with greater shares of blacks and is negatively associated with neighborhoods that begin the period with greater shares of Asians. These findings contrast literatures that argue that gentrification favors racially and ethnically diverse or predominantly minority neighborhoods, as well as the literature on residential stratification, which demonstrates a hierarchy of residential selection by race that places black neighbors at the bottom and Asian neighbors just below whites. I argue that these counterintuitive findings offer direction for a new framework for understanding gentrification that considers the pool of gentrifiable, low-income neighborhoods as an interdependent system of low-cost housing markets with distinct mechanisms that facilitate or stall gentrification.

By examining gentrification in a diversifying city in which racial segregation is not prevalent and over an extended period of time, this article aims to broaden our limited understanding of the role of race in how gentrification unfolds. First, I show that race and gentrification are not uniformly related across cities and across time. Second, I incorporate the context of segregation and immigration into

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[2] Across metropolitan areas with over 500,000 residents, Seattle ranked in the bottom third for black-white, Hispanic-white, and Asian-white dissimilarity indices. Calculations by William H. Frey (Brookings Institution) and University of Michigan's Social Science Data Analysis Network using 2010 decennial Census tract data (http://www.psc.isr.umich.edu/dis/census/segregation2010.html).

theories on race and gentrification to better explain the findings. Third, I propose a new framework for understanding low-income neighborhoods' stability and change.

Gentrification and Race

Gentrification is a process by which low-income central city neighborhoods undergo reinvestment and renewal and experience an in-migration of middle- and upper-middle class residents (Smith 1998:198). It is a process of neighborhood selection, in which individual households, commercial businesses, state and corporate actors, and/or institutions make decisions to invest in a low-income neighborhood. As middle- and upper-middle class residents and businesses continue to move into the neighborhood, the neighborhood experiences a socioeconomic transformation, altering the physical, cultural, and political character of the neighborhood.

The literature on the relationship between the development of gentrification and neighborhood racial composition generally lacks a unifying theory, perhaps due to the changing and sometimes contradictory relationship depicted in empirical studies. Accounts of earlier waves of gentrification during the 1970s and 1980s document that gentrification was far more common among non-black neighborhoods (e.g., Hwang 2016; Smith 1996; Spain 1980; Wilson and Grammenos 2005). Smith (1996) attributes the aversion to black neighborhoods in early wave gentrification to the strength of negative reputations surrounding black poverty and public housing. Other ethnographic accounts demonstrate how gentrifiers are attracted to racially and ethnically diverse, particularly non-white neighborhoods (e.g., Zukin 1987; Lloyd 2006). Consistent with this aversion to homogeneously black neighborhoods and distaste for homogeneously white neighborhoods, national-level quantitative studies find that most neighborhoods that gentrified in this period were racially diverse or multiethnic as early as the 1970s (Freeman 2009; Hwang 2016).

Several ethnographic accounts of gentrification in recent decades, however, document gentrification occurring in predominantly black and Hispanic neighborhoods and the contentious race relations that occur within them (e.g., Hyra 2014; Mele 2000). Hackworth and Smith (2001) argue that the gentrification of the 1990s and beyond, in contrast to the gentrification of the past, is rapid and widespread, taking place in more "economically risky" neighborhoods. Scholars explain the shift toward predominantly minority neighborhoods as a result of the increased role of the state in facilitating gentrification through pro-development regimes and public housing policies, such as demolishing public housing and the redevelopment of mixed-income housing (Goetz 2011; Hackworth and Smith 2001; Hyra 2012; Wacquant 2008; Wyly and Hammel 1999). Others have documented the role of middle-class

blacks as important actors driving gentrification in black neighborhoods (e.g., Boyd 2008; McKinnish, Walsh, and White 2010; Moore 2009; Pattillo 2007).

While national trends show that predominantly black neighborhoods experienced small increases in whites from 2000 to 2010 (Freeman and Cai 2015), relatively few black and Hispanic neighborhoods experienced socioeconomic upgrading or racial turnover (Logan and Zhang 2010; Owens 2012; Sampson 2012). Despite the changes increasingly occurring in minority neighborhoods, gentrification is not their dominant trajectory. Other findings also give reason to question gentrifiers' purported attraction to diversity. Survey evidence in Chicago on the preferences of urban whites attracted to redevelopment contrasts these claims (Bader 2011), and Berrey (2005) finds that gentrifiers in a Chicago neighborhood who claim to value diversity prefer a limited share of minorities. Further, Hwang and Sampson (2014) find that neighborhoods beyond a threshold of about 40 percent black are far less likely to continue to gentrify. They argue that a racial hierarchy of preferences that operates within general patterns of neighborhood selection in the US also operates in gentrification, reflecting a limit and hierarchy to diversity preferences in gentrification (Hwang and Sampson 2014).

Altogether, the existing empirical evidence on the pace and location of gentrification and neighborhood racial composition suggest that both homogenously black and white neighborhoods were least likely to gentrify in the early wave of gentrification as a result of residential preferences, though limited, for diversity. And, while gentrification is not the dominant trajectory of low-income predominantly minority neighborhoods, the evidence suggests that these neighborhoods are more likely to experience gentrification in recent decades than in the past, but there are conflicting accounts on whether these neighborhoods are more likely to experience gentrification relative to other low-income neighborhoods with different compositions.

Segregation and Residential Selection

A key issue with these findings is that not all cities have homogeneously minority neighborhoods. These neighborhoods are often more prevalent in cities with high levels of racial segregation and relatively large minority populations. Theories on the relationship between gentrification and race are predicated on the presence of neighborhoods with high concentrations of minorities. Rather than increasing racial integration, larger shares of minorities exacerbate preferences to avoid minority neighbors (Blalock 1967). White and Glick (1999) argue that a similar process occurs in cities with large concentrations of Hispanics or Asians, leading to higher levels of residential segregation. As a result, highly segregated cities contain larger numbers of predominantly minority neighborhoods

that have deteriorated housing, greater levels of crime, and lower quality schools, leading residents with greater socioeconomic ability to avoid them (Charles 2003; Jargowsky 1997; Massey and Denton 1993; Wilson 1987).

In addition to neighborhood quality, studies find that residential preferences are structured by a racial order, in which people generally prefer integrated neighborhoods, but favor white neighbors the most, black neighbors the least, and Asian over Hispanic neighbors in the middle (Charles 2003). Implicit biases against blacks and Hispanics, rather than explicit race-based residential preferences, also bolster the avoidance of minority neighborhoods (Ellen 2000; Krysan et al. 2009; Lewis, Emerson, and Klineberg 2011). People tend to associate areas with large shares of blacks, and sometimes Hispanics, with low neighborhood quality and high levels of crime and disorder, leading residents to avoid these neighborhoods (Quillian and Pager 2001; Sampson and Raudenbush 2004). Elijah Anderson (2012) argues that predominantly black neighborhoods, in particular, carry enduring stigmas as "iconic ghettos" as a result of their persistence for decades as black and poor and the structural conditions of public housing. With few racially integrated neighborhoods in highly segregated contexts, predominantly white neighborhoods tend to be the primary option satisfying the residential preferences of middle- and upper-class residents.

Taken together, the literature implies that segregation constrains the degree to which gentrification takes place in racially mixed or minority neighborhoods. Limited neighborhood options of various racial and ethnic compositions, intensified race-based residential preferences, and lasting neighborhood stigmas influence residential selection decisions in highly segregated cities. In a city with few majority-minority neighborhoods, other factors, such as housing characteristics, socioeconomic characteristics, and proximity to amenities (Ley 1996; Smith 1996), should predict gentrification instead of racial and ethnic composition. Therefore, I hypothesize that a negative relationship would not exist between minority group shares in neighborhoods and the likelihood and rate of gentrification in Seattle. Instead, the prevalence of heterogeneous, low-income neighborhoods rather than highly concentrated minority neighborhoods may actually attract gentrifiers, given that some studies report their attraction to diverse, non-white neighborhoods (Zukin 1987; Lloyd 2006). Thus, I also expect that racially and ethnically diverse neighborhoods would be positively associated with the likelihood and rate of gentrification in Seattle compared to predominantly white neighborhoods.

Diversification and Residential Selection

A second key issue with the scholarship on the development of gentrification and neighborhood racial composition is that it grants little consideration to the increasingly multiethnic nature of cities and neighborhoods. The existing theory and research suggests that there is indeed a changing relationship between the early wave of gentrification during the late 1970s and 1980s and the rapid and intense gentrification beginning in the late 1990s into the 2000s (Hackworth and Smith 2001). But, explanations of these changes focus primarily on the shift to gentrification in predominantly minority neighborhoods, largely through policy changes and the growth of middle-class blacks.

Nonetheless, as a city becomes increasingly multiethnic, residential patterns of mobility also change (Fong and Shibuya 2005). Thus, the changing compositions of cities and neighborhoods with the rapid growth of Asians and Hispanics over this same period calls for increased attention to how these specific groups affect neighborhood compositions and the trajectory of gentrification. Sanchez (1997) finds an increasing aversion to minority groups as immigration rises, and others argue that the growth in the overall minority population leads to greater segregation between whites and all minority groups as whites feel an enhanced motivation to avoid minorities (Blalock 1967; White and Glick 1999). Nonetheless, the increased diversity that the growth of Asians and Hispanics bring to neighborhoods may make neighborhoods more attractive to gentrifiers. Farley and Frey (1994) argue that, in cities with high levels of black-white segregation, whites are more willing to live with blacks when other groups are present by serving as buffers to antagonistic black-white relations.

Additional studies find that in cities with low levels of segregation and growing Asian and/or Hispanic populations, these groups become increasingly segregated as they form their own communities (Fischer et al. 2004; Frey and Farley 1996; Iceland 2004; Logan, Stults, and Farley 2004). This literature documents how new immigrants rely on co-ethnic networks and employers for information on resources and housing and that ethnic landlords often prefer in-group tenants (Ball and Yamamura 1960; Massey 1988; Wong 1998). Moreover, accounts of early Japanese and Chinese immigrants in cities in the West document the high rates of commercial and residential ownership among these groups, enabled by rotating credit associations, in which members of ethnic communities contributed to funds that could then be drawn upon for capital to purchase properties or start small businesses (Light 1972; Taylor 1994). Others have documented the effective political organization of ethnic groups in neighborhoods to prevent development processes and perserve affordable housing (Winnick 1990). Such processes may protect neighborhoods with greater shares of these groups from gentrification.

Thus, while some literature suggests that the growth of Asians and Hispanics may deter gentrification in neighborhoods with minorities, or just the growing immigrant ethnic group, other findings suggest that the diversification from the growth of Asians and Hispanics in neighborhoods may be positively associated with the rate and likelihood of gentrification. Few studies on neighborhood gentrification and racial and ethnic composition consider this dimension either theoretically or empirically.

Strategy

I address these issues in the literature by examining gentrification in Seattle neighborhoods over several decades. Seattle is a city with a relatively low share of minorities and low segregation levels compared to other major cities and high levels of gentrification. Moreover, it has become increasingly multiethnic in recent decades: its share of whites dropped from 86 percent in 1970 to 67 percent by 2013.[3] Notably, low-income neighborhoods in Seattle possess distinct characteristics from those in highly segregated cities: they are mostly majority white yet also have some racial heterogeneity, with many neighborhoods containing blacks and/or Asians. Thus, Seattle offers an opportunity to examine the role of race in how gentrification unfolds where low-cost neighborhood choices are not marked by large concentrations of disadvantaged minorities but are also experiencing rapid growth in their immigrant populations.

Do relationships between neighborhood racial composition and the location and pace of gentrification in highly segregated cities also occur in Seattle? Do theories concerning multiethnic neighborhoods apply to gentrification in Seattle? The findings show that expectations predicted by the literatures on either gentrification or segregation do not hold in Seattle. I find that diverse neighborhoods are unlikely to gentrify in the absence of predominantly minority, low-income neighborhoods during the early wave of gentrification. In the recent wave of gentrification, however, I find that neighborhoods with larger shares of Asians are unlikely to gentrify, while neighborhoods with greater shares of blacks have a high likelihood of gentrification.

The literature on the diversification of cities sheds some light on these findings, but they cannot completely account for the rise of gentrification in neighborhoods with greater shares of blacks. And, although the scholarship on recent gentrification argues that predominantly black neighborhoods have become targets of gentrification, this cannot account for the continued neglect of neighborhoods with

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[3] Population and migration data presented in this and the following section are author's calculations using US Census and American Community Survey data unless otherwise noted.

more Asians, who have been a primary minority group in Seattle. These findings suggest that there are multiple interdependent low-cost housing markets with distinct sets of mechanisms that facilitate or prohibit gentrification. By examining Seattle, I show that an alternative framework for understanding gentrification in the context of an overall affordable housing market and residential selection processes, particularly as they relate to immigration, can enhance our understanding of the evolution of gentrification and its relationship with race.

Below, I describe the racial and ethnic groups in Seattle. I then assess the relationship between neighborhood racial composition and gentrification by examining three aspects of gentrification in Seattle, using distinct datasets that best capture each facet: 1) the location of early gentrification; 2) the rate and spread of early gentrification in recent decades; and, 3) the location of recent gentrification. I show that these relationships are not as expected and test various explanations. Lastly, I propose an alternative framework for understanding gentrification that can explain my findings in Seattle and is consistent with previous research.

Racial and Ethnic Groups in Seattle

Similar to most major cities, the overall white population declined substantially from 1960 to 1990 and has been steadily increasing since 1990. Its share of blacks has wavered between 7 and 10 percent since 1970 and has generally remained steady in size. The Asian population, on the other hand, has increased rapidly in the last several decades, surpassing that of blacks by 1990. By 2013, Asians comprised 14 percent of the total population and had doubled in size from 1980. The Hispanic population in Seattle more than tripled since 1980 but only comprised 6 percent of the population by 2013.

Figure 1 presents maps of racial and ethnic compositions in 1980 and 2013 (based on 2009 to 2013 American Community Survey 5-year estimates, referred to as 2013 hereafter) for Seattle census block groups.[4] As Figure 1 illustrates, Seattle's Asian and Hispanic populations grew substantially over recent decades, concentrating in various areas throughout the city but also having a presence in most other areas. Although there are clusters of minority groups, other groups are also present in these same areas. Indeed, no block groups were over 50 percent Asian or Hispanic in 1980, and only 5 percent were in 2013. For blacks, less than 3 percent of block groups were over 50 percent black in either year. Even

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[4] Block groups are divisions of census tracts and the smallest geographic unit for which the US Census provides demographic estimates. Data using identical boundaries over time are available beginning in 1980 for census block groups and in 1970 for census tracts.

Seattle's International District, a cultural center for Asian-Americans, is just about 50 percent Asian. Unlike highly segregated cities, Seattle has few majority-minority and ethnic neighborhoods, relatively more racially diverse neighborhoods, and mostly predominantly white areas.

Figure 1:
Racial and Ethnic Groups in Seattle by Census Block Groups in 1980 (left) and 2013 (right).
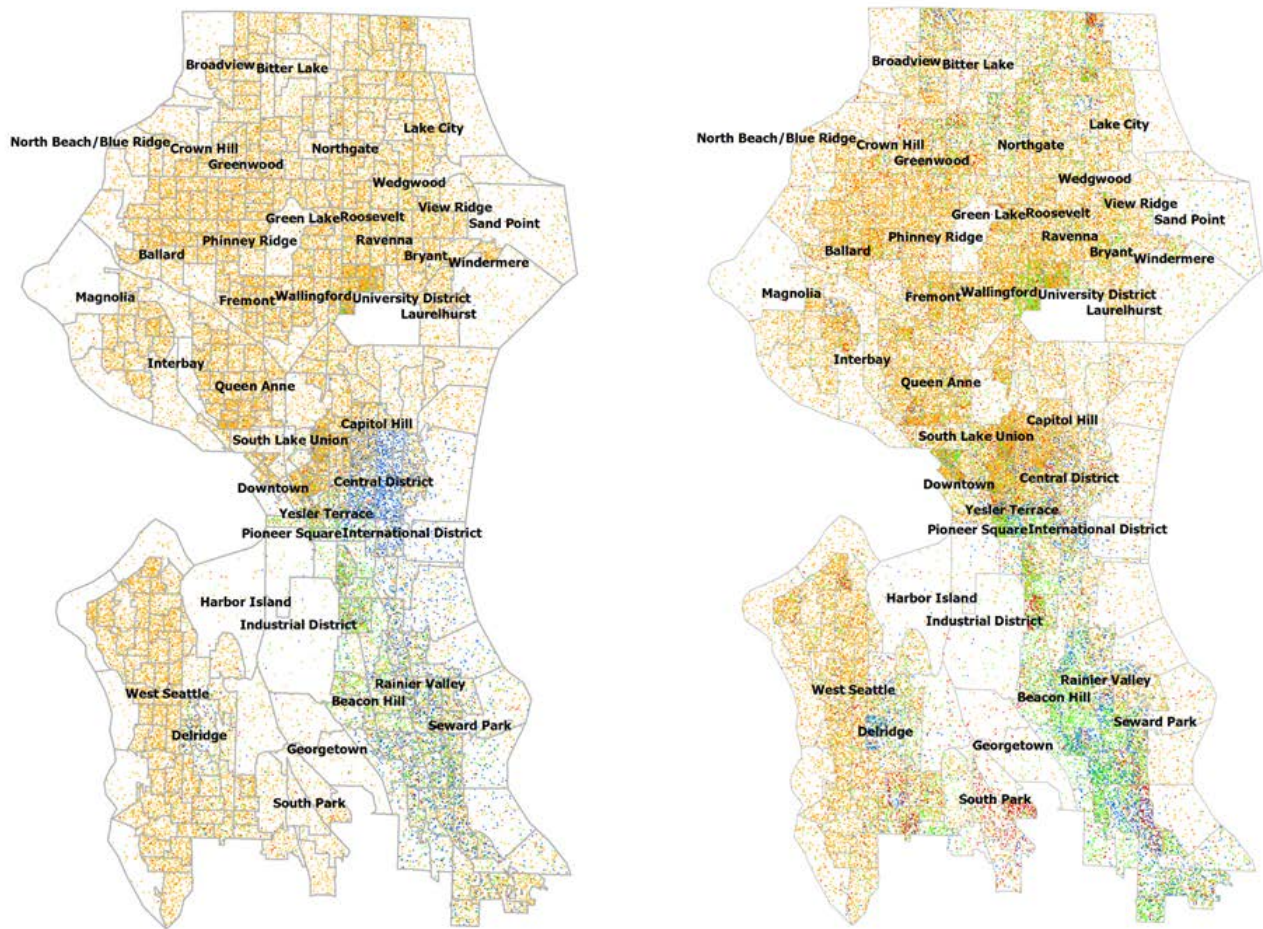
Key: Green = Asians, blue = blacks, red = Hispanics, orange = whites, 1 dot = 10 persons.

Although the Asian population in Seattle is relatively large and diverse compared to other major cities, ethnic origins generally do not distinguish Asians across block groups. Seattle's Asians were primarily Japanese, Chinese, and Filipino prior to major legislative reforms surrounding immigration in 1965.[5] During this period, the Japanese and Chinese had high rates of business and property ownership and were more socioeconomically advantaged than Filipinos (Taylor 1994). Following 1965, the Chinese

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[5] All demographic calculations using data prior to 1970 are from Taylor (1994).

and Filipino populations grew rapidly, and Koreans and Vietnamese began arriving in large numbers. Most of Seattle's Asian growth, however, occurred after 1980, and is attributable to these groups' continued growth and new arrivals from Cambodia, Laos, and India. In 2013, 65 percent of Asians were foreign-born, with slightly more from Southeast Asia, and Asians comprised more than half of the foreign-born population.[6] The Asian ethnic groups are generally spread throughout Seattle with Filipinos least concentrated and more often in neighborhoods with higher shares of blacks. Foreign-born residents and recent immigrants are heavily concentrated in block groups with relatively higher shares of Asians, and both foreign-born and native-born Asians are located in similar areas.

Seattle's Hispanic population has also grown substantially but is relatively small. In 1990, they were more socioeconomically advantaged than both Asians and blacks based on income: Seattle's Hispanics, Asians, and blacks had a median per capita income of $27,271, $22,336, and $19,745 (in 2013 constant dollars), respectively. Thus, the predicted negative effect of these population changes may be greater for Asians, given their larger growth and overall population size and lower socioeconomic status. Only one-third of the Hispanic population was foreign-born in 2013, and about one-third do not have origins in Latin American countries. Approximately half of Hispanics have origins in Mexico, and their growth after 1980 is largely attributable to migrants from Central and South America.

Blacks have comprised a substantial proportion of Seattle's minority population since World War II, which brought large influxes of African-Americans in search of labor opportunities. Despite early claims of Seattle's racial tolerance, both Asians and blacks experienced intense housing discrimination, as the use of restrictive covenants was widespread until the 1968 Fair Housing Act banned the practice. As a result, most blacks lived in the Central District. Nonetheless, few blocks in the area were predominantly black: many whites and Asians were present. Following 1968, blacks moved to other sections of Seattle, particularly the southeast, and the suburbs and became far less concentrated: while 80 percent of Seattle's black population lived in the Central District in 1960, only 38 percent did so by 1980. (Taylor 1994).

In addition to living in more racially integrated areas, blacks are more socioeconomically advantaged on average compared to blacks in other major US cities with high levels of segregation. The median per capita income and poverty rate for blacks in Seattle in 1990 was $19,745 (in 2013 constant dollars) and 25 percent, respectively, while these median figures were $16,390 and 30 percent among

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[6] The remainder came from Europe (15 percent), East Africa (12 percent), Latin America (12 percent), and Central America (9 percent).

the 10 most segregated large US cities.[7] Moreover, both Asians and blacks have historically high ownership rates (Taylor 1994). Therefore, socioeconomic differences between blacks and Asians in Seattle are smaller than in cities with high segregation levels, though this difference between Seattle and other cities is less so today. Nonetheless, if racial differences do exist in the likelihood or rate of gentrification in Seattle, I expect that the differences will follow a hierarchy that reflects the socioeconomic order of race groups in the city.

Lastly, a description of Seattle's racial and ethnic context is incomplete without mention of its public housing. The presence of public housing can deter gentrification by preventing the possibility for higher-income residents to move into these areas through regulations and creating lasting neighborhood stigmas (Anderson 2012). Unlike other major US cities, however, Seattle's public housing is intentionally racially integrated (Taylor 1994). Yesler Terrace, Seattle's largest and only remaining public housing development,[8] originally imposed racial and ethnic group size restrictions, but it primarily houses blacks and Asians. The remaining smaller housing projects, which were all converted to mixed-income housing beginning in 1995, were intentionally built in predominantly white areas. Nonetheless, areas that once contained public housing may be less likely to gentrify in the early wave of gentrification but more likely to gentrify in recent decades.

Early Wave Gentrification and Expansion in Seattle

The literature on early wave gentrification and expansion indicates that homogenously black or Hispanic neighborhoods and homogenously white neighborhoods were unlikely to gentrify. In Seattle, there are no homogeneously black, Hispanic, or Asian neighborhoods but rather low-cost neighborhoods that are either homogeneously white or heterogeneous neighborhoods that nearly all have substantial shares of whites. Does neighborhood racial composition strongly predict the location of gentrification in a city without predominantly minority, low-income neighborhoods? Is gentrification more likely to occur in diverse neighborhoods in this context instead? If racial composition is associated with gentrification at all in Seattle, I expect a positive association between heterogeneous neighborhoods and early gentrification. Moreover, the expansion of such gentrification may be more likely in neighborhoods that are more diverse.

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[7] Segregation ranks are based on the 1990 black-white dissimilarity index, calculated by the Longitudinal Tract Data Base at Brown University (http://www.s4.brown.edu/us2010/segregation2010/Default.aspx).
[8] In 2014, Yesler Terrace began undergoing redevelopment and is being converted to mixed-income housing.

Gentrification Measures

To examine the relationship between neighborhood racial composition and the location of early gentrification, I borrow data from an influential survey conducted by geographers Daniel Hammel and Elvin Wyly in 1998 in Seattle (Hammel and Wyly 1996; see also Wyly and Hammel 1998, 1999). While studies often use census-based variables to identify gentrification across multiple cities and neighborhoods, Hammel and Wyly's (1996) approach is most reliable because it captures direct and distinctly visible indicators of neighborhood upgrading that are inherent to gentrification, such as changes to the built environment, commercial changes, and cultural aesthetics (Hwang and Sampson 2014; Krase 2012; Kreager, Lyons, and Hays 2011; Papachristos et al. 2011).[9]

To more accurately identify gentrification across neighborhoods and cities, Hammel and Wyly (1996) conducted block-by-block field surveys across "gentrifiable" census tracts in several US cities during the 1990s, looking for signs of renovation and new construction in building structures and thereby capturing signs of redevelopment. They considered tracts to be gentrifiable in Seattle if they had a median household income in 1970 below the 1970 citywide median, marking when cities in the West experienced large population declines after steady growth in preceding decades. Among gentrifiable census tracts, they considered tracts to be gentrifying if the majority of blocks had at least one improved structure and at least one block in the tract had at least one-third of its structures improved. Hammel and Wyly (1996) triangulated their findings with archival resources, such as city planning documents and local press. They also compared their findings to census-based variables, confirming that their observations were highly correlated with expected variables, such as the shares of college-educated residents and median home values.

In Seattle, they considered 41 tracts to be "gentrifiable," of which 22 exhibited evidence of gentrification when they conducted their survey in 1998. In Seattle, census tracts span larger geographic areas than in other, denser major cities, but familiar neighborhood identities still span tract boundaries. Figure 2 displays a map of the census tracts that were gentrifying by 1998 according to the surveys. Note that most tracts in Seattle were not gentrifiable based on Hammel and Wyly's criterion, particularly the southeastern areas of the city to which a large number of African-Americans moved over the last several decades and have since become gentrifiable by this standard. In 1970, these areas had median incomes slightly above the city-wide median. I assess these areas in the analysis of recent gentrification and

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[9] Census-based measures capture average-level demographic and housing price shifts over 10-year periods, but such changes can also reflect incumbent mobility, changes in poverty policies, or price spillovers from adjacent neighborhoods (Owens 2012; Waldorf 1991; Wyly and Hammel 1998).

supplementary analysis of early gentrification discussed below. Consistent with other studies, many of the tracts that were gentrifying by 1998 were located in or near the downtown area and the University of Washington, i.e., the University District.

Figure 2: Map of Early Gentrification and Expansion in Seattle from 1998 Gentrification Field Surveys and 2011 Gentrification Google Street View Observations
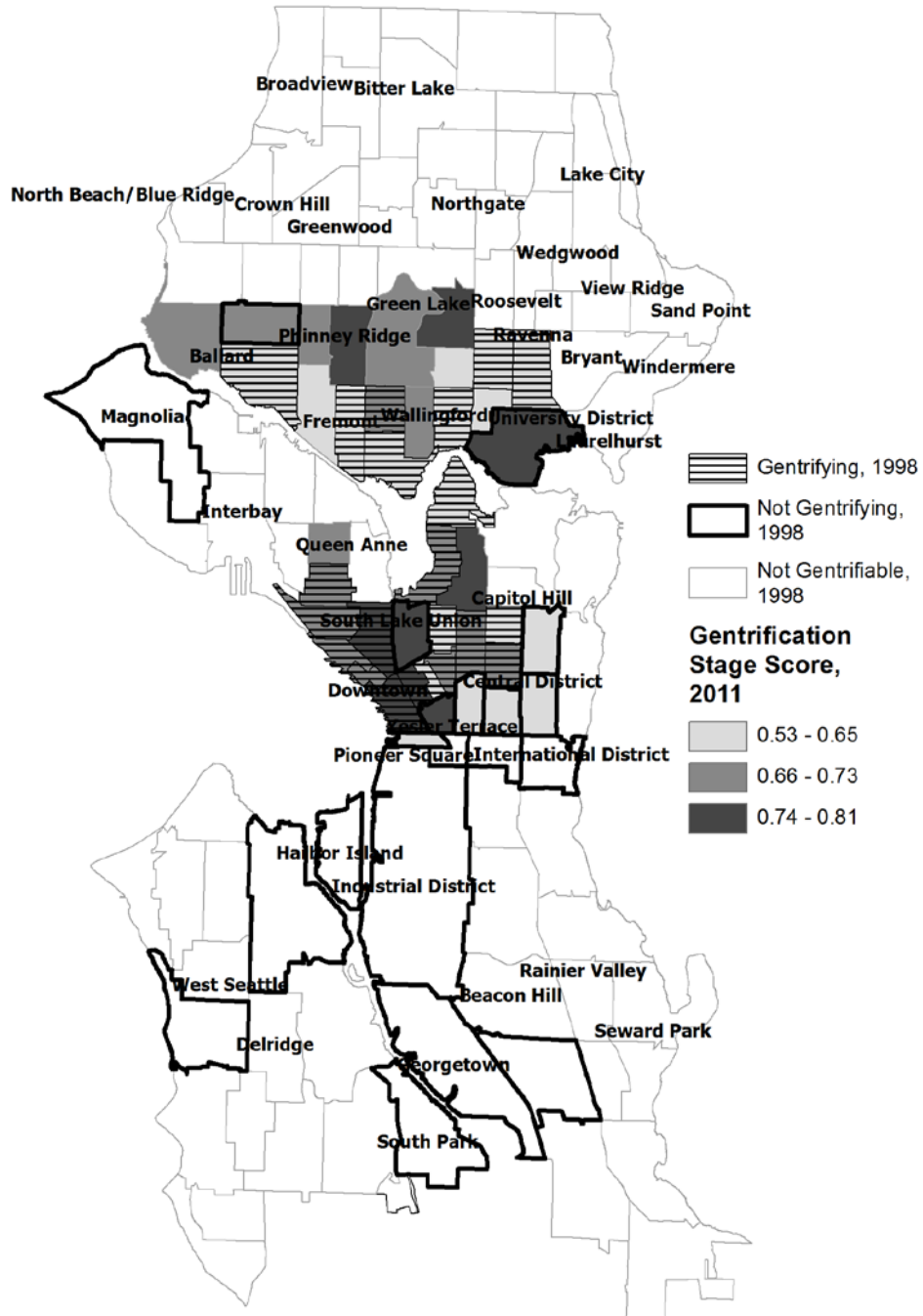
To examine the trajectory of early gentrification into more recent decades following the field surveys, I use original data that builds on previous work by Hwang and Sampson (2014), which used Google Street View—a publicly accessible, free online tool that provides panoramic views of actual streetscapes—to capture various observable aspects of gentrification. Using Google Street View images taken primarily in 2011, I collected data on the degree of gentrification in neighborhoods that were gentrifying in 1998 according to Hammel and Wyly and their adjacent neighborhoods that had median incomes below the citywide median incomes in 1970, 1980, 1990, or 2000. Overall, I observed the 22 tracts that Hammel and Wyly had identified as gentrifying and 20 adjacent tracts.

I use a revised survey instrument from Hwang and Sampson's original data collection to capture indicators of four main characteristics of gentrification that, taken together, define the neighborhood's stage of gentrification: 1) the condition of physical buildings; 2) the degree of new structures; 3) visible beautification efforts; and 4) the lack of disorder and decay. These characteristics capture both visible changes in the built environment and the overall neighborhood upkeep that reflect reinvestment and renewal activity in a neighborhood and correlate well with socioeconomic characteristics and alternative indicators often associated with gentrification. Given the increased role of state and corporate actors, as well as large-scale institutions, such as universities, in facilitating development in the recent wave of gentrification (Hackworth and Smith 2001), the visible streetscape is advantageous for capturing both large- and small-scale and public- and private-led developments. Using specified coding rules and guidelines, observers navigated Google Street View and coded each side of a street block (i.e., a block face) for a sample of census blocks from each census tract included in the analysis. For each tract, blocks were randomly sampled without replacement until data were collected for at least 20 block faces from at least six different blocks in the tract. Seattle census tracts typically contain 20 to 30 census blocks that have building parcels, as opposed to highways, bodies of water, and parking lots.

For each block face, I combined indicators into scaled scores that can range from 0 to 1 for each of the four main characteristics and then averaged these measures, resulting in a continuous "gentrification stage score," indicating the degree of revitalization on a block face. I average the gentrification stage scores for all of the block faces of a block, and subsequently average the block stage scores across all of the observed blocks in a census tract. The gentrification stage scores in Seattle among the observed tracts had an average of .68 and ranged from .53 to .81.[10] The supplement, which is

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[10] This range is higher and narrower than in Chicago, where Hwang and Sampson (2014) collected similar data, and the variation is smaller (*s.d.*=.08). This difference is due to the intensity of gentrification's continuation and spread in Seattle relative to the pace of development in Chicago, where some neighborhoods in the sample

available online at http://scholar.harvard.edu/jackelynhwang/projects/ggo, includes a copy of the coding guide and survey instrument, including explanations of coding changes from Hwang and Sampson (2014), item frequencies, results testing inter-rater reliability, descriptive statistics for measures and scores and their reliability properties, construct validity results, and correlations with alternative specifications for the gentrification stage score.

Figure 2 also displays the gentrification stage scores for the observed census tracts. The figure shows that tracts that were adjacent to those that were gentrifying in 1998 have particularly higher levels of gentrification compared to tracts that were already experiencing gentrification. Differences in beautification efforts and the lack of disorder and decay scores, rather than the physical structures, explain this pattern. Tracts that had already gentrified, which had lower scores on these dimensions, had greater proportions of commercial areas and renter-occupied housing, which likely accounts for these differences. Nonetheless, results are similar in models using stage scores that exclude these two measures.

Methods

To examine the relationship between racial composition and early gentrification, I use a logistic regression model predicting the binary measure of whether or not a tract was gentrifying by 1998 on composition characteristics in 1980 among gentrifiable tracts, and I control for alternative characteristics that predict gentrification, which I describe in further detail below. Given that only 41 tracts were considered gentrifiable and therefore observed by Hammel and Wyly in their field surveys, I use Firth's (1993) penalized likelihood approach to adjust for bias in the estimates that can result from having a small sample size and separation—when predictors with values above a certain point have the same outcome.[11] The method uses an alternative function in the maximum likelihood estimation to reduce the bias that occurs in logistic regression that is particularly problematic for small sample sizes and guarantees finite estimates when separation exists.

To examine the relationship between racial composition and the degree of gentrification, I use a weighted least squares regression model predicting tracts' standardized gentrification stage scores, a continuous measure, on racial and ethnic composition characteristics in 1990, controlling for alternative factors predicting gentrification and whether or not the tract was gentrifying by 1998 according to

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disproportionately experienced the negative fallout of the housing crisis, racial and ethnic composition plays an important role in the trajectories of gentrification, and populations are still declining (Hwang and Sampson 2014).
[11] Gentrifiable tracts with shares of Asians above 6 percent did not gentrify.

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Hammel and Wyly's field surveys. The models are precision-weighted using the number of blocks that were observed for gentrification in each census tract to induce homoscedastic errors.[12]

Data for racial and ethnic, socioeconomic, and housing characteristics are from the 1980 to 2000 decennial US Censuses and American Community Survey 5-year estimates from 2009 to 2013, harmonized to 2000 Census boundaries from the Geolytics Neighborhood Change Database and harmonized American Community Survey data using the crosswalk file from the Longitudinal Tract Database developed by the Spatial Structures in the Social Sciences at Brown University. For the few variables that are not available in the Neighborhood Change Database, I use Longitudinal Tract Database variables instead.

The main racial and ethnic compositional variables that I include in the models are the shares of Asians, blacks, and Hispanics. To test the hypothesis that racially and ethnically diverse neighborhoods will be more likely to gentrify than predominantly white neighborhoods, I use a dummy indicator for neighborhoods that are less than the overall share of whites in Seattle (78 percent in 1980 and 74 percent in 1990). While some studies measure racial and ethnic diversity using entropy indices, it is more plausible that the type of diversity that attracts gentrifiers in a predominantly white city like Seattle are neighborhoods that are not predominantly white.[13]

To control for additional factors that may predict variation in where and to what degree gentrification occurs, I construct measures using principal component analysis from relevant factors to deal with the relatively small sample sizes of the analyses. This approach transforms a set of related variables into linearly uncorrelated variables and, therefore, minimizes multicollinearity and preserves statistical power. Previous literature on gentrification identifies characteristics associated with an available, affordable, and older housing supply to which gentrifiers are attracted and provide entry points in neighborhoods for newcomers of higher socioeconomic status relative to its existing residents (Ley 1996; Smith 1996; Zukin 1987). To capture these factors, I include median rent and home value (logged), residential turnover, homeownership rate, vacancy rate, the share of multiunit housing, and the share of buildings over 30 years old in constructing the principal components. Moreover, proximity to downtown and institutions, where jobs are primarily located, may also serve as an important factor

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[12] Results using a penalized linear regression model with both lasso and ridge penalties yield similar results for the racial composition variables.

[13] Analyses using Blau's diversity index: $D = (1 - \sum i^2) * 100$, where i = {proportion non-Hispanic white, proportion black, proportion Hispanic, proportion Asian, proportion other race}, yield similar results to the findings presented. The diversity index coefficient is negative and statistically significant ($p<.05$) in the models examining gentrification trajectories.

for attracting gentrification (Ley 1996). I constructed a measure of the square root of the distance to either Seattle's Downtown or the University of Washington. In addition, while gentrifiers may be attracted to low-cost neighborhoods, among the pool of gentrifiable neighborhoods, neighborhoods that have relatively higher socioeconomic status may be more likely to gentrify. Therefore, I also include variables for income per capita (logged), median household income (logged), poverty rate, the share of college-educated residents, and the share of residents in professional or managerial occupations.

Using all of the variables mentioned, I obtain the first two components from the principal component analysis for each census year for tracts and block groups. The first component reflects high residential opportunities—such as low housing costs and homeownership; high vacancies, multiunit housing, and older buildings; and close proximity to downtown. The second component reflects high socioeconomic status—such as high shares of college-educated residents and professionals. Together, the first two components explain over 90 percent of the variance for characteristics associated with 1980 tracts, 1990 tracts, and 1990 block groups.[14] Factor loadings and correlations for each variable included in constructing the principal components are presented in Appendix Table A1.

Crime is an additional factor that affects residential selection and therefore may impact which neighborhoods gentrify and their pace of gentrification. For the first analysis examining early gentrification, I use crime rates reported in 1980 by Miethe's Testing Theories of Criminality and Victimization Study in Seattle. Crime rates are not reported for the area occupying the University of Washington, and I therefore exclude it from the analysis. For subsequent analyses, I use tract-level logged crime rates per 100,000 residents reported by the Seattle Police Department in 1996—the earliest and closest year to 1990 for which the tract-level data are publicly available.[15] Crime rates are not available for block groups located in two census tracts that are partially outside of the city boundaries, and therefore, the three block groups in these tracts are also excluded.[16]

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[14] Models using the first principal components constructed separately for the residential and geographic location variables and socioeconomic status variables yield similar main results.

[15] In models only including property crimes (burglary and vehicle theft) or only violent crimes (homicide, rape, robbery, and assault), the main results are similar to those presented.

[16] The main results are similar for models excluding crime rates and including tracts and block groups with missing crime data.

Table 1. Descriptive Statistics for Additional Variables by Gentrification Measures and Categories

	Not Gentrifying/ Low Gentrification		Gentrifying/ High Gentrification		Not Gentrifiable/ Not Observed	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Early Gentrification						
Diversity dummy	0.68**	0.48	0.23	0.43	0.18	0.39
Distance (in feet) (sq. rt.)	53.0**	54.8	20.2	31.0	99.3**	46.6
First PC (residential opportunity)	33.9*	63.4	78.2	34.8	-28.5**	46.9
Second PC (socioeconomic status)	-11.63	21.9	-13.3	19.5	6.19**	31.0
Crime rate (logged)	8.94	0.72	8.69	0.73	7.91**	0.46
N		19		22		83
Gentrification Trajectories						
Diversity dummy	0.33	0.48	0.19	0.40	0.31**	0.47
Distance (in feet) (sq. rt.)	40.6	36.9	25.4	39.9	101**	47.7
First PC (residential opportunity)	48.5	42.3	65.9	51.3	-29.3**	47.6
Second PC (socioeconomic status)	-5.63	23.6	-4.62	25.3	2.63	34.3
Crime rate (logged)	9.24	0.48	9.57	1.15	8.80**	0.60
N		21		21		82
Recent Gentrification						
Diversity dummy	0.48	0.50	0.42	0.50	0.20**	0.40
Distance (in feet) (sq. rt.)	91.3**	62.1	68.6	53.2	103**	43.1
First PC (residential opportunity)	15.8*	66.2	34.8	60.3	-25.9**	44.0
Second PC (socioeconomic status)	-27.5**	29.9	-12.6	25.2	21.8**	27.4
Crime rate (logged)	9.25	0.66	9.36	0.68	8.64**	0.40
N		133		111		231

Note: **$p<0.01$, *$p<0.05$, †$p<0.10$ (two-tailed t-test). T-tests compare ungentrified tracts to gentrifying tracts and non-gentrifiable tracts to gentrifying tracts. All early gentrification variables are from 1980, and variables for gentrification trajectories and recent gentrification are from 1990 except crime rates are from 1996.

The first two sets of rows in Table 1 presents descriptive statistics for the control variables for these analysis. Tracts that gentrify early began with lower diversity levels, higher levels of the first principal component, and were closer to downtown or the University of Washington. There were no differences between these tracts' crime rates, but their crime rates were higher than the rest of Seattle. However, there was little variation among these variables across gentrification stage scores.

Diversity Avoidance

The first set of columns in Table 2 present average racial and ethnic, socioeconomic, and housing characteristics in 1980 and 2000 for the tracts that were gentrifiable and not gentrifying by 1998, those that were gentrifying by 1998, and those that were not gentrifiable.[17] Although gentrifiable tracts were over 50 percent white on average, gentrifying tracts had higher shares of whites and lower shares of blacks, Asians, and Hispanics compared to tracts that did not gentrify. In addition, gentrifying tracts had more college-educated residents and professionals, but low residential stability, with lower homeownership rates and higher residential turnover.

Although both groups of gentrifiable tracts had similar incomes, rent values, and foreign-born residents in 1980, gentrifying tracts had higher incomes per capita and rents and lower shares of immigrants by 2000. In 1980, gentrifying tracts had similar shares of whites, blacks, college-educated residents, and professionals as non-gentrifiable tracts. Comparisons using 1970 data reveal similar patterns. Compared to both tracts that did not gentrify and non-gentrifiable tracts, gentrifying tracts had lower shares of Asians, children, and homeownership rates and higher shares of new residents and multiunit structures in 1980. While these tracts were surveyed in 1998, these tracts had been gentrifying for many years. These gentrifying tracts had greater increases in their share of college-educated residents compared to nongentrifying tracts as early as the 1970s and experienced declines in poverty rates during the 1980s, while nongentrifying tracts experienced large increases. Their median incomes and rents, however, remained generally similar.

The second set of columns in Table 2 present characteristics for the tracts that were gentrifying in 1998 and their adjacent gentrifiable neighborhoods in 2000 and 2013. These tracts generally had similar levels of socioeconomic and housing characteristics in 2000, but those with higher gentrification stage scores had higher incomes per capita than tracts with lower gentrification levels in 1990. Still, all of these tracts had large shares of whites.

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[17] Early gentrification in many cities began taking place during the 1970s (Hackworth and Smith 2001). Because 1970 marks the wake of urban decline based on Hammel and Wyly's criterion and Seattle's population did not begin to rebound until after 1980, I present results for this analysis beginning in 1980. The main findings using 1970 data are similar and are available upon request.

Table 2. Average Tract Characteristics Based on 1998 Gentrification Field Survey Categories and 2011 Google Street View Gentrification Observations

| | Observed by Hammel and Wyly (1998) | | | | | | Observed with Google Street View (2011) | | | |
| | Not Gentrifying | | Gentrifying | | Not Gentrifiable | | Below Median | | Above Median | |
	1980	2000	1980	2000	1980	2000	2000	2013	2000	2013
% white	53.7**	48.9**	83.1	77.7	83.5	72.9	71.0	71.5	78.0	72.4
% black	24.4*	19.9**	7.2	7.2	6.2	7.2	11.6	6.1	7.0	4.4
% Hispanic	4.3*	9.0*	3.0	4.7	2.2*	4.5	5.5	5.2	4.4	6.5
% Asian	12.0**	19.7*	2.7	9.1	4.4†	14.5**	10.6	11.6	9.0	11.2
% foreign-born	15.4	22.9*	11.3	12.7	10.8	15.8*	13.2	13.7	12.5	15.4
% below poverty	22.6	22.6	20.2	17.0	8.1**	8.9**	19.0	20.8	15.3	16.1
Median household income	$47,653	$47,818	$46,196	$50,439	$73,420**	$76,259**	$53,066	$57,544	$56,779	$63,598
Income per capita	$22,542	$29,222**	$25,914	$47,708	$30,301*	$43,957	$36,520*	$39,061**	$49,873	$51,818
% college-educated	17.7**	31.5**	31.1	55.7	29.1	49.3*	52.6	64.7	53.4	63.8
% professional/managerial	19.4**	37.0**	29.1	51.6	29.4	49.9	48.1	54.9†	52.8	61.1
Median home value	$167,889*	$301,474**	$220,774	$451,805	$224,847	$402,765	$396,598	$424,747	$467,642	$465,461
Median gross rent	$658	$846†	$720	$960	$963**	$1,134**	$995	$1,053	$973	$1,085
% new resident in last 10 years	73.8**	76.8**	83.4	86.1	62.7**	65.2**	80.5	82.0	82.5	82.3
% homeownership	34.6*	33.5†	18.6	22.9	63.8**	61.0**	30.7	32.0	28.0	31.0
% vacant units	8.4	6.2	6.7	6.8	3.5**	3.5**	4.5†	6.1*	6.7	8.7
% multiunit structures	55.3**	59.1**	80.4	83.9	27.4**	31.3**	66.9	65.0	74.7	74.3
% units built over 30 years ago	65.7	70.7	66.9	64.5	55.8**	74.9**	72.5	70.9	69.8	64.8
% units built in last 20 years	22.3	20.4	22.6	26.4	24.2	15.4**	18.5	21.6	23.4	28.2
% over 65 years old	16.1	11.7	20.5	10.5	14.9*	12.9†	9.6	12.7	10.0	15.8
% under 18 years old	18.9**	15.0**	7.2	5.6	19.1**	17.4**	9.3	9.3	7.7	8.3
N	19		22		83		21		21	

Note: **p<0.01, *p<0.05, †p<0.10 (two-tailed t-test). T-tests compare gentrifying tracts to nongentrifying and non-gentrifiable tracts and above median GGO score tracts to below median GGO score tracts, respectively. Dollars are in 2013 constant dollars.

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Table 3 presents regression results testing the relationship between racial and ethnic composition and early gentrification and the rate and spread of early gentrification. For each outcome, I separately examine minority composition—using percent black, percent Asian, and percent Hispanic—and racial diversity—using a dummy variable for having a share of whites less than the city-wide share. The first two columns show logistic regression results predicting the log-odds of early wave gentrification on minority composition and racial diversity, respectively.

The results show that neighborhoods with greater shares of blacks, Asians, and Hispanics and those that are not predominantly white are negatively associated with the likelihood of early gentrification in Seattle census tracts after controlling for residential and socioeconomic characteristics. In Model 1, the coefficient for Hispanics is largest and indicates that a one percentage point increase in the share of Hispanics in a tract reduces the odds of gentrification by 73 percent (e-1.31=.27), and the coefficients for Asians and blacks indicate decreases in the odds of gentrification by 51 percent and 9 percent for a one percentage point increases in the shares of Asians and blacks, respectively. Only the coefficient for Asians is statistically significant at the p<.05-level. The coefficient for diverse neighborhoods in Model 2 supports the results from Model 1 and indicates that heterogeneous neighborhoods were very unlikely to gentrify. Areas with higher levels of the first principal component (residential opportunities) were more likely to gentrify, and although neighborhoods with higher shares of blacks and Asians had higher values of this variable on average, those with higher shares of Asians did not gentrify. The findings for Asians and diversity also hold when I exclude the 8 census tracts where whites are not the majority racial group, for which most are majority black. Thus, neighborhoods with very high shares of blacks are unlikely to gentrify, but even small shares of Asians deter gentrification.

Table 3. Regression Coefficients and Standard Errors Predicting Early Gentrification, Gentrification Trajectories, and Recent Gentrification on Racial and Ethnic Composition

	Early Gentrification (Gentrification Field Surveys, 1998)		Gentrification Trajectories (Gentrification Stage Score, 2011)		Recent Gentrification (Census-Based Gentrification, 1990-2013)	
	(1)	(2)	(3)	(4)	(5)	(6)
	% Minority Groups	Diversity	% Minority Groups	Diversity	% Minority Groups	Diversity
% black	-0.096†		-0.024**		0.029**	
	(0.056)		(0.008)		(0.010)	
% Asian	-0.722**		-0.083**		-0.040**	
	(0.347)		(0.030)		(0.012)	
% Hispanic	-1.313†		-0.097		-0.029	
	(0.763)		(0.079)		(0.039)	
Diversity indicator (<75% non-Hispanic white)		-3.170**		-0.541		-0.314
		(1.328)		(0.412)		(0.278)
First PC (residential opportunity)	0.062**	0.033**	0.013**	0.006	0.000	0.001
	(0.026)	(0.011)	(0.005)	(0.004)	(0.003)	(0.003)
Second PC (socioeconomic status)	-0.046	-0.010	-0.011	-0.004	0.017**	0.018**
	(0.048)	(0.023)	(0.007)	(0.008)	(0.006)	(0.005)
Crime rate (logged)	4.286	-0.394	0.107	0.217	0.060	0.110
	(3.086)	(0.732)	(0.200)	(0.219)	(0.242)	(0.233)
Prior Gentrification			-1.25**	-0.632	0.158	0.332
			(0.386)	(0.395)	(0.362)	(0.345)
AIC	-21.3	-14.2	114.5	125.4	311.9	326.0
N	40		42		241	
Model	Penalized logistic regression		Weighted least squares regression		Logistic regression	

Note: **$p<.01$; *$p<.05$; †$p<.10$ (two-tailed test).

Models 3 and 4 present results predicting the degree of gentrification in tracts that were gentrifying by 1998 and their adjacent gentrifiable tracts. Similar to Model 1, the shares of Asians and blacks are negatively associated with the degree of gentrification in a neighborhood. The coefficients indicate that a one percentage point increase in the share of Asians and blacks decreases the gentrification stage score by .08 and .02 standard deviations, respectively. Although the coefficient for diverse neighborhoods is negative in Model 4, it is not statistically significant. The standard errors of the estimates are generally larger than in Model 2 since there are some diverse neighborhoods that have higher gentrification levels. Nonetheless, an analysis of predicted stage scores of neighborhoods by their share of non-whites indicates that the degree of gentrification in a neighborhood declines with increasing minority shares. Figure 3 displays the predicted probabilities of early gentrification and the standardized gentrification stage score by the share of minorities in the census tracts, illustrating this negative relationship.[18]

Figure 3: Predicted Probability of Early Gentrification (left) and Predicted Standardized Gentrification Stage Score (right) by Percent Minority

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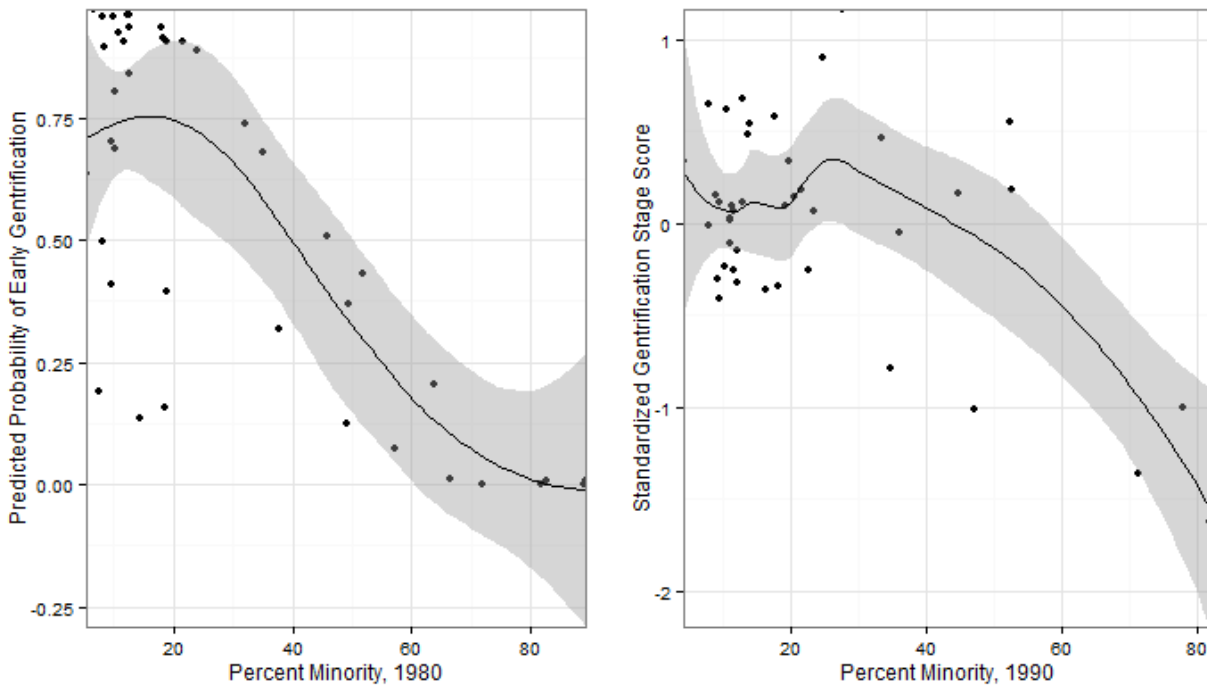
[18] Models using census-based measures of gentrification from 1970 to 1990 for the early gentrification sample and census-based measures of the degree of gentrification from 1990 to 2010 produce distinct coefficient sizes but similar conclusions. These results are presented in Appendix Table A2.

Counter to prior findings exhibiting a racial hierarchy of residential preferences (Charles 2003) and inconsistent with the racial hierarchy of socioeconomic status within Seattle, the negative coefficient for the share of blacks is weaker that the coefficient for the share of Asians (p<.05) in Models 1 and 3. Indeed, tracts with shares of blacks as high as 44 percent in 1980 eventually gentrified. However, no tracts more than 6 percent Asian (n=9) and only one tract more than 6 percent Hispanic (n=6) in 1980 were gentrifying by 1998.[19] Further examination shows that three census tracts that did not gentrify by 1998, which had black shares over 50 percent but did not contain public housing, drive the results for blacks.

Contemporary Gentrification in Seattle

Counter to expectations, early gentrification in Seattle took place in affordable neighborhoods that were more homogeneously white. Further, among the neighborhoods that gentrified and their surrounding ones, neighborhoods with less minorities gentrified to a greater degree by 2011. The literature on the recent wave of gentrification, which scholars consider to be rapid and widespread, suggests that gentrification is more likely in recent decades to occur in neighborhoods with more minorities relative to other neighborhoods with less. Further, the literature on immigration suggests that neighborhoods with growing Asian and Hispanic populations may be less likely to gentrify through mechanisms that lead these neighborhoods to become increasingly segregated as their populations grow over time. By contrast, the growth of these groups may attract gentrifiers as these neighborhoods become increasingly diverse.

Gentrification Measures and Method

To identify gentrification in recent decades, I rely on a measure using census-based variables harmonized to 2010 Census boundaries from the Geolytics Neighborhood Change Database. While visible indicators are preferable to census-based measures for identifying gentrification, there are limitations to relying on observable data on gentrification. In particular, systematic measures over extended periods of time do not exist.[20] Census data offer a way to compare similar aggregate measures and spatial units over time. Because census tracts are large spatial areas in Seattle, I conduct this

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[19] These thresholds are generally low relative to other criterion used for identifying ethnic enclaves (Alba, Logan, and Crowder 1997; Logan, Zhang, and Alba 2002).

[20] Google Street View images are only available from 2007 to 2015, though gentrification often takes much longer and began before 2007.

analysis using census block groups. Unlike the prior analysis, this analysis is not restricted to aggregated units of data collected by others.

Following Hammel and Wyly (1996), I first identify block groups that are gentrifiable based on whether their median household income is below the citywide median household income in either 1990 or 2000.[21] I selected criteria for identifying gentrification to best match Hammel and Wyly's survey results using 1970 to 1990 Census data. Thus, I consider a block group to be gentrifying if it had an increase in either its median rent or median home value above the citywide median increase and an increase in either its share of college-educated residents or median household income above the citywide median increase from either 1990 to 2013 or from 2000 to 2013, allowing for both slower and more rapid gentrification. Comparisons with correlates of gentrification are presented in Appendix Table A3, including both demographic and housing census-based variables, as well as coffee shops and building permits. Although census-based variables do not necessarily capture characteristics associated with gentrification, the construct validity comparisons lend support for these indicators in Seattle. Figure 4 displays a map of recent gentrification using this measure. There is substantial overlap with the areas that Hammel and Wyly had identified as gentrifying in 1998, but there is also considerable expansion beyond the adjacent areas observed with Google Street View into non-adjacent areas.

To assess how neighborhood racial composition predicts the neighborhoods that gentrify in the recent wave of gentrification, I use a logistic regression model predicting a binary measure of whether or not a block group was gentrifying by 2013 on racial and ethnic composition in 1990, using the same control variables as in the analysis above. The last set of rows in Table 1 present descriptive statistics for the variables used in the analysis. Block groups that gentrified in recent decades had higher levels of the first and second principal components and were closer to Downtown or the University of Washington compared to those that did not gentrify. These gentrifiable block groups had higher diversity, residential opportunities, and crime rates, and lower levels of socioeconomic status than the remainder of the city in 1990.

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[21] I also constructed gentrification measures using gentrifiable tracts based on the metropolitan area median household income, and the main findings are similar.

Figure 4: Map of Recent Gentrification in Seattle for 1990-2013 Census-Based Block Group Gentrification Measures
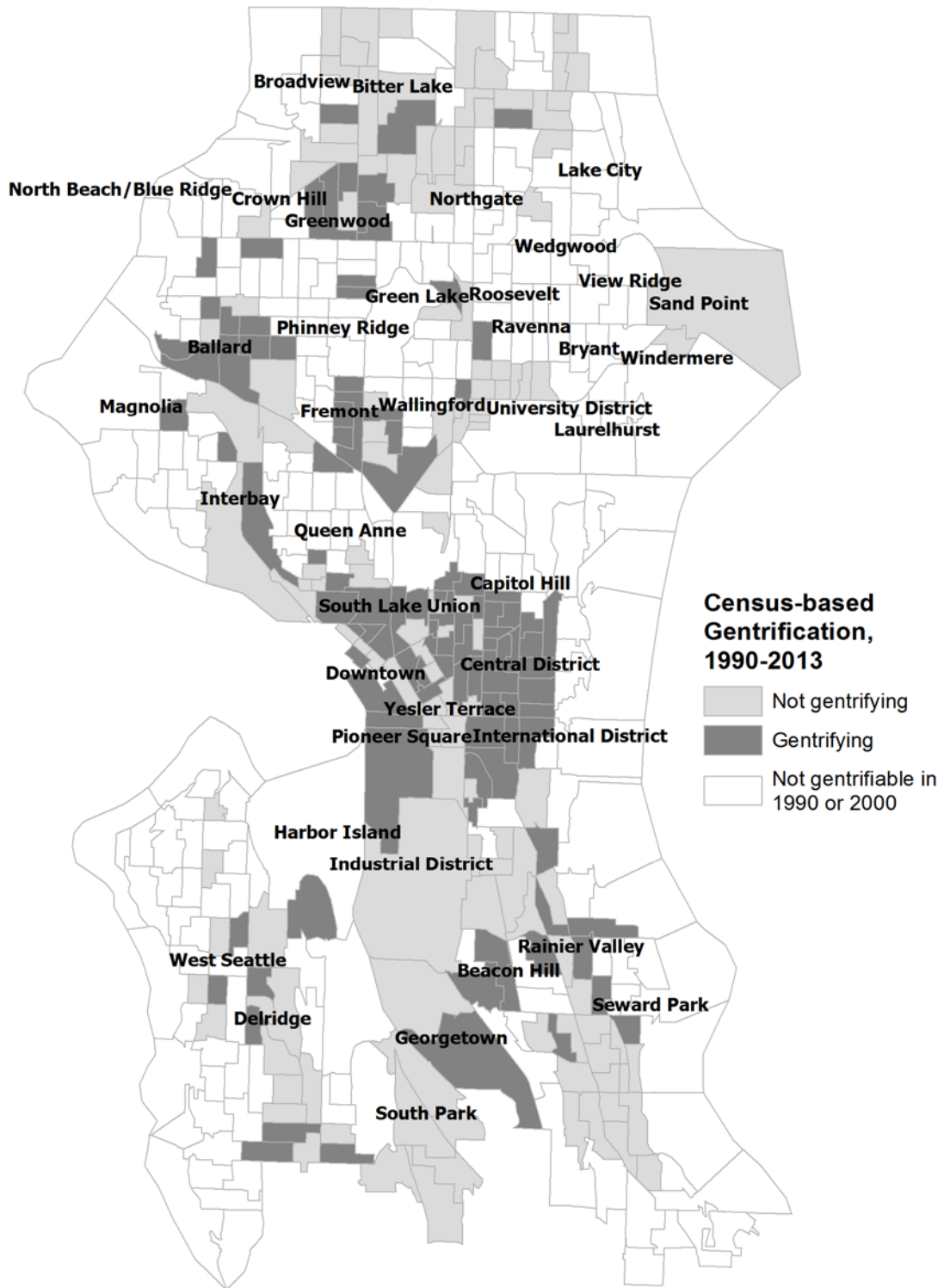
Hierarchy Reversal

Table 4 displays characteristics in 1990 and 2013 for recent gentrification. Among gentrifiable block groups, those that gentrified and those that did not were similar on many dimensions in 1990, including the share of whites and Hispanics, poverty and income levels, college-educated residents, housing and rental values, homeownership rates, and multiunit structures. Block groups that gentrified, however, had higher shares of blacks, lower shares of Asians and foreign-born residents, and an older housing stock in 1990. By 2013, block groups that gentrified had higher shares of whites, college-educated residents, income levels, and ownership rates and lower shares of blacks and Hispanics compared to tracts that did not gentrify—consistent with changes commonly associated with gentrification. These block groups differed from non-gentrifiable block groups on nearly every characteristic. Though whites still comprised nearly two-thirds of the population on average in these block groups, they also had greater shares of minorities compared to non-gentrifiable block groups.

Table 4. Average Block Group Characteristics in 1990 and 2013 of Contemporary Gentrification Based on 2013 Census-Based Gentrification Measures

	Not Gentrifying		Gentrifying		Not Gentrifiable	
	1990	2013	1990	2013	1990	2013
% white	64.5	53.3**	65.0	64.9	82.2**	76.5**
% black	11.5*	11.9*	17.7	8.4	5.7**	3.7**
% Hispanic	4.4	9.4**	3.9	6.4	2.6**	4.5**
% Asian	17.5**	19.6**	11.6	14.5	8.4*	10.6*
% foreign-born	18.4**	--	13.2	--	10.4**	--
% families below poverty	4.1	7.0**	3.4	3.9	0.8**	2.2**
Median household income	$44,549†	$47,060**	$41,867	$64,341	$73,403**	$90,352**
Income per capita	$27,640	$31,035**	$28,150	$42,823	$40,432**	$51,961**
% college-educated	30.8	44.8**	30.6	59.9	42.4**	63.4*
% professional/managerial	--	44.9**	--	54.5	--	60.5**
Median home value	$234,505	$345,731**	$221,929	$416,426	$301,518**	$515,206**
Median gross rent	$846	$892**	$815	$1,039	$1,083**	$1,206**
% new resident in last 10 years	77.2	80.3	76.6	80.3	59.1**	62.1**
% homeownership	33.5	33.9†	32.5	38.1	69.5**	68.7**
% vacant units	5.7*	6.7	6.8	7.3	3.2**	5.3**
% multiunit structures	61.7	62.6	62.7	60.8	20.1**	21.7**
% units built over 30 years ago	53.2**	64.2	64.7	64.5	76.4**	82.1**
% units built in last 20 years	29.2**	25.0	23.2	28.2	13.3**	12.0**
% over 65 years old	14.4	11.2	15.3	10.0	16.0	12.7**
% under 18 years old	15.7	13.9†	14.5	11.5	17.4**	18.5**
N	133		111		231	

Note: **p<0.01, *p<0.05, †p<0.10 (two-tailed t-test). T-tests compare ungentrified tracts to gentrifying tracts and non-gentrifiable tracts to gentrifying tracts. Dollars are in 2013 constant dollars. % poverty for individuals is not available for block groups; missing values are not available in normalized block group data.

The last two columns of Table 4 present logistic regression results predicting the likelihood of gentrification across Seattle's gentrifiable block groups, examining minority composition and racially diverse neighborhoods, respectively. In Model 5, the share of Asians remains negatively associated with the likelihood of gentrification, and, in contrast to findings on early gentrification, the results reveal a positive association between the share of blacks and gentrification. The magnitude of these coefficients is much smaller than in the model predicting early gentrification because the sample has greater variation, more units of analysis, and a less conservative measure of gentrification. The coefficients indicate that a one percentage point increase in the share of Asians (*mean*=14.7 *s.d.*=15.1) decreases the odds of gentrification by 4 percent, and a one percentage point increase in the share of blacks (*mean*=14.4, *s.d.*=18.9) increases the odds of gentrification by 3 percent.[22]

The latter findings for blacks are consistent with claims that gentrification in recent decades is increasingly occurring in minority neighborhoods (e.g., Hackworth and Smith 2001; Hyra 2012), but given that Asians are also a primary minority group in Seattle, this scholarship does not explain why gentrification is more likely in black neighborhoods while unlikely in Asian neighborhoods. Figure 5 displays the predicted probabilities of gentrification in early and recent gentrification by the shares of blacks and Asians in a neighborhood with all other control variables held at their means. The lines show the distinct shifts between race groups and their relationship to gentrification in Seattle. Further, the gentrification in recent decades is largely driven by neighborhoods that are majority black, while even small shares of Asians deter gentrification.

Racially diverse neighborhoods in Model 6 are negatively associated with gentrification but the coefficient is not statistically significant. As with the analysis on the trajectories of gentrification, the standard errors of the estimates are generally larger, as there are also many diverse neighborhoods that gentrify in more recent decades.

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[22] Models using 2006-2010 block group data instead produce similar results for recent gentrification. Results using coffee shops per 100 residents as a measure of gentrification produce similar results for Asians, but I find no relationship between race groups and building permits. Results from models using tract-level data with similarly constructed measures are not statistically significant but have coefficients in the same direction, and these results are presented in Appendix Table A2.

Figure 5. Predicted Probability of Early Gentrification (left) and Recent Gentrification (right) on Asian and Black Shares
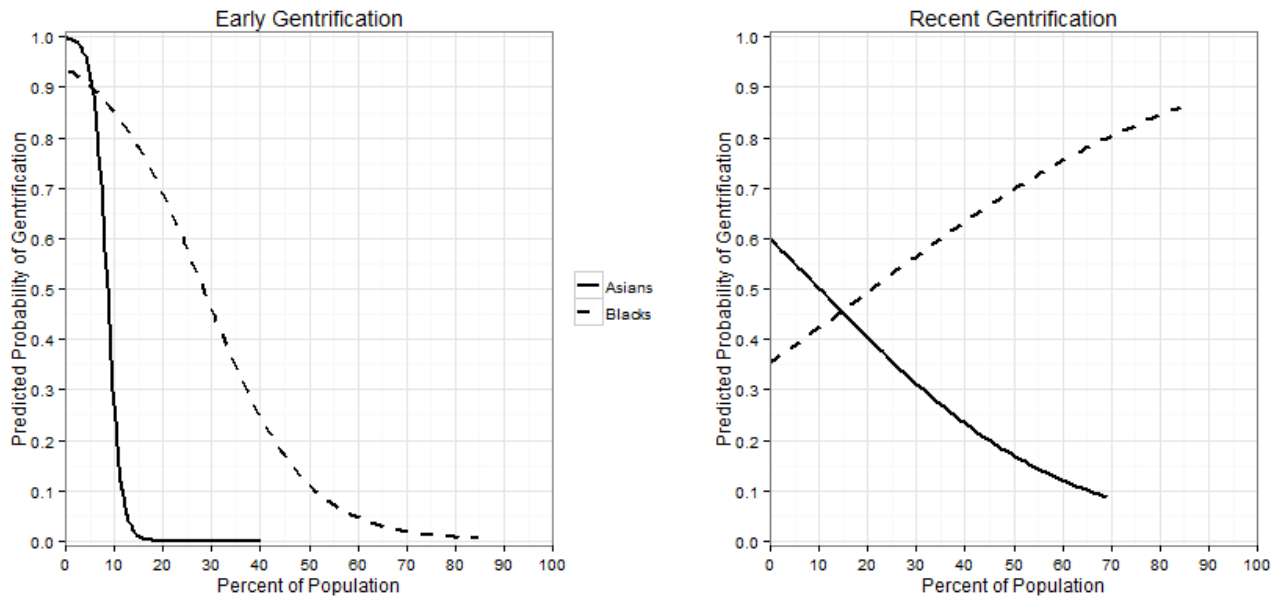
Explaining Heterogeneity in Gentrification across Race Groups and Over Time

The existing literature on neighborhood racial composition and the pace and location of gentrification finds that early gentrification did not take place in predominantly minority, particularly black or Hispanic neighborhoods, or predominantly white neighborhoods. In Seattle, where there are relatively low levels of segregation and few low-income, predominantly black or Hispanic neighborhoods, gentrification should be more likely to occur in heterogeneous neighborhoods, given gentrifiers' posited attraction for diversity. The literature also suggests that neighborhoods with more minorities should be more likely to gentrify in recent decades. Only a few scholars have theorized these differences across racial and ethnic groups or across time, but, as I discuss below, these theories do not explain the findings in Seattle.

Racial Stratification in Gentrification

A handful of studies, though in highly segregated cities, have provided evidence that runs counter to claims that gentrifiers are necessarily attracted to racially and ethnically diverse neighborhoods (Bader 2011; Berrey 2005; Hwang and Sampson 2014). Instead, this research suggests that gentrification does indeed follow similar racial hierarchical patterns that drive residential stratification beyond the context of gentrification. With few predominantly minority neighborhoods and

relatively small minority group shares in Seattle, neighborhoods in which whites are not the large majority were at the bottom of the racial hierarchy: neighborhoods with higher shares of any minority group were less likely to gentrify or gentrified at slower rates than those with less. While the results on early gentrification in Seattle support a racial hierarchical process, such a racial hierarchy does not hold in the recent wave of gentrification, where neighborhoods with higher shares of blacks are more likely to gentrify but neighborhoods with higher shares of Asians are unlikely to gentrify.

Scholars have described two forces that are responsible for the shift over time from gentrification avoiding minority neighborhoods to targeting them: 1) the increased role of the state, particularly with regard to public housing policy (e.g., Goetz 2011; Hyra 2012); and, 2) the role of middle-class minorities (e.g., Bostic and Martin 2003; Pattillo 2007). Although these arguments have applied to predominantly black neighborhoods, Asians in Seattle comprise a substantial share of the public housing population, and the public housing population is racially mixed. Thus, shifts in public housing policy that promote development would affect both groups and thus cannot explain the divergent results for blacks and Asians. Further, models examining block groups where public housing was redeveloped barely reduces the positive coefficient for the share of blacks associated with the likelihood of gentrification. Indeed, none of the block groups that were over 50 percent black that gentrified contained public housing. Therefore, public housing policy cannot explain the divergent results between blacks and Asians.

If a racial order that distinguishes among groups emerges, as it does in the recent wave of gentrification, previous research on residential stratification suggests that neighborhoods with greater shares of Asians should be more likely to gentrify than those with greater shares of blacks (Charles 2003). However, the opposite pattern occurs in Seattle. Given Asians' relatively long history and relatively lower socioeconomic status in Seattle relative to other major cities, it is possible that Asians experience greater discrimination relative to blacks when it comes to race-based residential preferences by others. Qualitative accounts, however, suggest that negative prejudices were historically evenly distributed between blacks and Asians in Seattle (Chin 2001; Taylor 1994).

Although I cannot directly assess this hypothesis with available data, I examine if neighborhood perceptions are associated with group population shares. I use two different measures of neighborhood perceptions—disorder and danger—constructed from surveys conducted of Seattle residents in 1990

and 2003.[23] These survey questions do not directly assess race-based residential preferences, but they provide a measure of how neighborhood perceptions are associated with racial and ethnic compositions. Among gentrifiable tracts and block groups, the 1990 measures are positively correlated with the share of blacks but not the share of Asians, and the 2003 measures are positively correlated with the shares of all minority groups, with no discernible differences between groups. If anything, neighborhood perceptions are generally more negative for areas with greater shares of blacks compared to those with greater shares of Asians.

Transit development—another state-driven policy—may also be responsible for the observed shift. While transportation access has been an important factor attracting gentrification in other cities, Seattle implemented its public transportation system in 2003. I test if the square root of the distance from a tract or block group to the nearest stop along the light rail line that is either completed, under construction, or planned explains the findings in models examining the location of recent gentrification, but the main results for Asians and blacks remain.

Alternatively, black middle-class residents may be driving gentrification in neighborhoods with higher shares of blacks, while neighborhoods with greater shares of Asians remain isolated from its co-ethnic middle-class residents. For block groups that were gentrifiable in 1990 or 2000, household incomes were indeed higher on average for blacks. Including group poverty rates in the models reduces the Asian coefficient and increases the black coefficient in predicting recent gentrification, but the substantive results remain similar. It is also possible that the relative differences within these groups across the city may matter instead. The sample of neighborhoods included in each analysis contains areas with relatively less owner-occupied housing by Asians compared to the remainder of Seattle but relatively more owner-occupied housing by blacks. Thus, more advantaged blacks may be concentrated in gentrifiable neighborhoods while more advantaged Asians are concentrated in non-gentrifiable neighborhoods. However, both the black and Asian median household incomes and poverty rates in gentrifiable neighborhoods are much lower and higher, respectively, than in non-gentrifiable tracts and

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[23] The 1990 measures come from Miethe's survey of 5,302 Seattle residents across 100 of Seattle's 123 populated census tracts and the 2003 measures come from the Seattle Neighborhood and Crime Survey of 3,365 residents across all Seattle tracts. I use scaled measures, aggregated using empirical Bayes estimates, of neighborhood perceptions of danger (based on fear of walking alone at night and a safety rating of the neighborhood for the 1990 survey and concerns with safety, worries of attack, and a safety rating for the 2003 survey) and neighborhood disorder (based on if teens hanging out, vandalism, and abandoned and run-down housing for the 1990 survey and teens hanging out, litter, graffiti, abandoned and run-down housing, and neighbors causing trouble for the 2003 survey were problems).

block groups. Overall, the literature on residential stratification and gentrification cannot explain the results in Seattle.

Diversification

Can insights from the literature on immigration and the diversification of cities and neighborhoods explain these counterintuitive findings? Although this literature led to competing hypotheses about whether gentrification would be more or less likely in neighborhoods with growing numbers of Asians and/or Hispanics, it is possible that the rapid growth of Asians to the city or to individual neighborhoods deterred gentrification. In a separate model, I include Asian and Hispanic population changes from 1980 to 1990 to test the hypothesis that these changes are negatively associated with the likelihood of recent gentrification. I find that changes from 1980 to 1990 for both the Asian and Hispanic populations are negatively associated with gentrification, and the negative effect of the share of Asians is no longer statistically significant. An increase in a neighborhood's Asian population by 10 people reduces the odds of gentrification by 5 percent, respectively, and an increase in the Hispanic population by 10 people reduces the odds of gentrification by 29 percent. Models including black population changes do not change the substantive results, and black population declines are also positively associated with the likelihood of gentrification.

Although Asians and Hispanics have become increasingly segregated as their populations have grown, the neighborhoods where gentrification is unlikely are not necessarily concentrated Asian, Hispanic, or immigrant enclaves either. Neighborhoods that out-groups perceive as enclaves may be less attractive to out-group individuals, and, therefore, they may be less likely to gentrify. The findings hold, however, when I exclude the 11 block groups that are over 50 percent Asian and when I exclude block groups that are part of the International District, which is about 50 percent Asian but is known for its distinctive cultural character associated with various Asian ethnic groups.

Block groups that did not gentrify, however, experienced greater increases in their foreign-born populations relative to gentrifying neighborhoods ($p<.05$) from 1990 to 2000. This suggests that these nongentrifying neighborhoods attracted immigrant residents while gentrifying neighborhoods attracted college-educated, higher-income residents. Although areas with higher shares of Asians tend to have residential characteristics that favor the likelihood of gentrification, such as older housing, low ownership rates, and high shares of multiunit housing, distinct housing markets may exist in areas with higher shares of Asians that work to provide housing for new immigrants, who are primarily Asian, rather than gentrifiers. Rather than selling properties to developers or rehabilitating properties to rent

at higher rates to middle- and upper-income gentrifiers, property owners in these neighborhoods may rely on the continued demand for low-cost housing by new immigrants without having to reinvest in the property. Further, survey data of Seattle residents from 2003 show that Asians, compared to respondents in all other race groups, have much stronger preferences for in-group neighbors relative to out-group neighbors.

Why would landlords choose to do this? These neighborhoods likely have high property ownership by Asians, given their greater presence and long history of property ownership in Seattle, which was enabled by mechanisms such as rotating credit associations (Light 1972; Taylor 1994). Preferences by ethnic landlords for in-group tenants and the use of co-ethnic networks and employers for housing information and resources, processes found in other studies (Ball and Yamamura 1960; Massey 1988; Wong 1998), may channel new immigrants to neighborhoods with greater shares of Asians. Further, Light, Bernard, and Kim (1999) find that these practices span beyond co-ethnic groups to immigrant groups, more broadly, particularly for ethnic groups with weaker entrepreneurial resources. Thus, the results support the thesis that neighborhoods with growing Asian and Hispanic populations are less likely to gentrify, as mechanisms associated with immigrant networks and capital make these neighborhoods increasingly segregated.

A New Framework for Gentrification: An Ecology of Low-Cost Neighborhoods

As these findings in Seattle demonstrate, the relationship between race and gentrification and its changes over time found in past research in highly segregated cities does not apply in Seattle. The findings in Seattle suggest that this relationship is dependent on broader racial and ethnic compositional characteristics of a city. This has important implications for understanding socioeconomic change and stability in neighborhoods in US cities, whose compositional characteristics have been changing rapidly due to the rise in immigration and the accompanying growth of Asians and Hispanics. Different groups entering cities with preexisting racial structures brings new sets of neighborhood choices. As cities become increasingly attractive places to live by middle- and upper middle-class residents, low-cost neighborhoods often face increased demand by these groups. I argue, however, that there are distinct processes that attract some groups seeking low-cost neighborhoods to certain areas relative to other groups, and that such processes facilitate or prohibit gentrification in some areas and not others. Below, I describe this framework in more detail.

Heterogeneity of Low-Cost Housing Seekers

Low-cost neighborhoods attract various groups of housing seekers: immigrant ethnic groups, other low- to moderate-income residents (including housing voucher holders and participants in other subsidized housing programs), and middle- and upper-class gentrifiers. Although low-cost housing may exist in high-cost neighborhoods, previous scholarship has shown that residents often search for housing by limiting their searches to neighborhoods and by further limiting their neighborhood choices to those that they consider and eliminate those that they choose to avoid (Bader and Krysan 2015).

Each group of housing seekers generally has distinct considerations concerning the neighborhoods in which they search. For example, new immigrants may prefer to be in neighborhoods with co-ethnics, while housing voucher holders may search in areas where they think the likelihood that landlords will accept their vouchers is higher (DeLuca et al. 2013). Further, they likely search for housing through distinct processes: whereas gentrifiers may go through real estate agents and brokers that generally serve middle- and higher-income residents, new immigrants may rely on information through co-ethnic networks or in-group real estate agents (Massey 1988; Wong 1998).

Differential Access to Housing

Although these groups may have distinct preferences and channels in their housing search, they also have distinct abilities to translate these preferences into actual neighborhood moves. Given that immigrant ethnic groups and other low- and moderate-income residents face greater financial constraints than gentrifiers in general, gentrifiers largely have the upper-hand in the residential selection process. Immigrant ethnic groups, however, also often possess distinct forms of economic and social capital relative to other non-immigrant groups, such as informal financial resources, that likely give them advantages in the housing market, especially relative to other lower-income residents (Light 1972).

Moreover, the ability of residents to enter low-cost neighborhoods is also dependent on the availability of points of entry into low-cost neighborhoods. In other words, a supply of housing in neighborhoods must be available in the housing search process in order for housing seekers to enter neighborhoods. In the early wave of gentrification, low-cost neighborhoods had experienced decades of depopulation as residents exited central cities for the suburbs. A plethora of vacant housing and vacant lots and aging populations generally provided points of entry to most low-cost neighborhoods in cities, with the exception of public housing (Clay 1979; Zukin 1987).

However, the influx of immigrants, which has grown steeper since the 1990s, and shifts in housing policy pose new dynamics on access to low-cost housing in various neighborhoods. The influx of immigrants to central city neighborhoods has provided a demographic renewal to many neighborhoods (Winnick 1990), reducing the supply of vacant housing in the neighborhoods to which they have entered. If immigrants ethnic groups use in-group channels in their housing searches, gentrifiers may never become aware of the share of available housing in low-cost neighborhoods where these groups tend to reside and control the housing market and where housing demand by co-ethnics is steady. Further, the demolition of public housing projects and the rebuilding of mixed-income housing developments have made the housing supply of neighborhoods that have historically housed large public housing developments available to higher-income residents. Thus, although this does not fully explain my findings in Seattle, other accounts of gentrification in predominantly black neighborhoods point to the importance of this shift in the housing supply in facilitating gentrification (Goetz 2011; Hyra 2012). At the same time, an increase in the market-rate housing supply by either building on available land or building higher-unit structures (e.g., luxury high-rise condominiums) can facilitate gentrification. However, the ability to do this can also be restricted by zoning and land use laws that some groups can effectively organize to protect while others cannot.

The Interdependence of Affordable Neighborhoods

The heteroegeneity of access to housing across affordable neighborhoods implies that the supply of housing in some affordable neighborhoods affects the demand in other affordable neighborhoods. For example, in Seattle, if mechanisms associated with co-ethnic or immigrant networks or effective political organizing restrict the housing market in neighborhoods with greater shares of Asians to other co-ethnics and immigrants, gentrifiers may have easier access to neighborhoods with greater shares of blacks. Despite the fact that these neighborhoods were historically less likely to gentrify compared to neighborhoods with fewer minorities, the city-wide increase in housing demand, accompanying Seattle's economic growth, places more pressures on affordable neighborhoods. However, within-neighborhood housing market dynamics can shift housing demand pressures into other affordable neighborhoods. Thus, although some neighborhoods may not necessarily facilitate gentrification, mechanisms in other neighborhoods that prohibit gentrification in other neighborhoods can allocate demand for affordable housing to other neighborhoods.

Further, how tight or loose the housing demand is for affordable neighborhoods across the city also conditions the degree to which these intra-neighborhood housing market dynamics matter. The

looser city-wide housing demand during the 1970s and 1980s in Seattle may help explain why gentrification primarily took place in neighborhoods with the fewest minorities in the early wave of gentrification, while the tightened housing market in recent decades combined with the rapid rise of Asians can explain why gentrification primarily took place in neighborhoods with greater shares of blacks.

Conclusion

Counter to past research on gentrification and counter to expectations for gentrification in cities with low segregation levels, the results in Seattle exhibit a racial hierarchy in how gentrification unfolds that does not reflect the racial order found in highly segregated contexts. While insights from the literature on immigration shed light on the findings, I proposed a new framework to explain them that considers gentrifying neighborhoods as part of an ecology of low-cost neighborhoods with distinct but interdependent housing markets. This framework can help explain the factors that shape the relationship between neighborhood racial and ethnic composition and gentrification.

Specifically, I demonstrated that neighborhoods in Seattle with even small shares of minorities, who are comprised primarily of blacks and Asians, were very unlikely to gentrify during the 1970s and 1980s. In others words, gentrification favored areas that were overwhelmingly white and not diverse. In recent decades, however, neighborhoods with higher shares of blacks were more likely to gentrify, while neighborhoods with higher shares of Asians were least likely to gentrify. These latter neighborhoods had high levels of Asian, Hispanic, and immigrant growth. I argued that these counterintuitive findings suggest mechanisms associated with immigration and multiethnic neighborhoods that have not been considered in the literature on gentrification and uneven patterns of development by race. These mechanisms may include how landlords matter as both gatekeepers to housing and mediators of market forces, which have generally been understudied in sociological literature despite the importance of their role (Desmond 2012; Gilderbloom 1989; Rosen 2014); immigrant entrepreneurship, which has not been considered in relation to gentrification (Waldinger 1989; except see Godfrey 1988); and political organizing and efficacy in prohibiting high-cost development (Winnick 1990). Further research should examine the role of these actors in gentrification and, more generally, neighborhood change, particularly as immigrants play increasingly important roles in shaping housing dynamics (Vigdor 2014).

Previous literature on gentrification has generally neglected mechanisms associated with immigration and diversification. However, the findings in Seattle highlight how this factor cannot be ignored. In this article, I presented a framework that considers gentrification in a broader context of

affordable housing markets and conditional on the racial or ethnic composition of areas and their associated mechanisms. By thinking of the affordable housing market as an ecology of low-cost neighborhoods with distinct mechanisms operating that prohibit or facilitate gentrification, we can better explain the distinct findings between racial and ethnic groups in recent decades and within racial and ethnic groups across time in Seattle compared to previous research in highly segregated cities with many minority neighborhoods.

Although this analysis is limited to one city with both low segregation levels and few predominantly minority neighborhoods, this framework sets forth testable propositions that future research should apply to other cities, like those in the Sunbelt and new immigrant destinations, which have distinct underlying racial structures and immigrant histories for which other patterns may emerge. Specifically, this framework suggests that in cities with steady flows of immigrant groups and tightening housing demand, neighborhoods with greater shares of immigrant and ethnic groups that carry distinct forms of social and economic capital over other lower-income residents in the housing market, the less likely these neighborhoods will gentrify. Further, neighborhoods with greater shares of lower-income residents that are not in these groups will be more likely to gentrify. In cities with low immigration flows or loose housing markets, gentrification will follow a racial order found in patterns of residential stratification more broadly. Multicity, multi-level analyses of city- and metropolitan-level segregation, minority group size, and immigration effects on neighborhood-level changes would provide fruitful tests of this framework and would shed light on the increasingly dynamic and complex processes of residential selection and gentrification that come with the growth of multiethnic cities and neighborhoods.

Such mechanisms in shaping patterns of gentrification also have important implications for neighborhood inequality, particularly for African-Americans. In Seattle, neighborhoods with higher shares of blacks were more likely to gentrify in recent decades, and these neighborhoods experienced large declines in their black populations over the last two decades. If distinct housing markets exist that preserve affordable housing for incoming immigrants and co-ethnics, then affordable housing will decline disproportionately for minority populations that do not have similar capital as within co-ethnic communities, placing greater pressures for displacement on these groups.

Both the measures and analyses are not without limitations. While the measures that rely on visible characteristics of gentrification are more reliable than census-based measures at detecting gentrification, they are limited to census tracts as the unit of analysis. Seattle's relatively small number of tracts, as well as the small number of gentrifiable tracts, limits the analyses to early gentrification and

its expansion to very small sample sizes. Although I employed statistical practices to deal with the limited sample sizes and made efforts to carefully describe the distinct characteristics of the samples, the coefficient estimates in the analyses of early gentrification and its trajectories are imprecise. Another limitation of small sample sizes is that I am only able to use a limited set of control variables simultaneously. I selected and constructed variables based on theoretically relevant factors and examined individual factors separately, but it is possible that particular features that comprise the principal components may explain gentrification better if I had considered them separately.

In addition, although the measures that rely on visible indicators are more reliable than census-based measures at detecting gentrification, they also place greater emphasis on the physical features of neighborhood reinvestment and renewal. While this approach provides measures that correlate well with socioeconomic characteristics associated with the process, it does not necessarily capture cultural activities, population changes, and local discourse that are also part of gentrification. Moreover, these gentrification measures only capture one point in time, thus limiting causal inference. As Google continues to collect images, researchers will be able to use similar survey instruments to assess changes over time. Lastly, although the technology makes systematic social observation of streets much easier than before, data collection and coding are still time consuming and costly. Developments in automated visual coding methods and expanded efforts to collect information on neighborhood characteristics across cities would advance measurements of gentrification, as well as neighborhood change.

Despite limitations, the results from this study offer insights for debates surrounding gentrification and racial and ethnic inequality. As gentrification has become a highly contentious topic in public discourse, empirical research still lags behind in explaining both its causes and consequences, particularly when it comes to racial and ethnic change. Understanding the uneven patterns of development and its mechanisms are necessary for abating the negative consequences that come with gentrification and fostering solutions that combat the persistence of neighborhood inequality by race.

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Appendix

Table A1. Factor Loadings and Correlations for Principal Components

| | Early Gentrification (Gentrification Field Surveys, 1998) | | | | Gentrification Trajectories (Gentrification Stage Score, 2011) | | | | Recent Gentrification (Census-Based Gentrification, 1990-2013) | | | |
| | First PC (1980 tracts) | | Second PC (1980 tracts) | | First PC (1990 tracts) | | Second PC (1990 tracts) | | First PC (1990 block groups) | | Second PC (1990 block groups) | |
	Factor Loadings	Correlation	Factor Loadings	Correlation	Factor Loadings	Correlation	Factor Loadings	Correlation	Factor Loadings	Correlation	Factor Loadings	Correlation
% vacant units	-0.02	0.44	-0.04	-0.34	0.02	0.44	-0.04	-0.38	0.02	0.39	-0.03	-0.29
% homeownership	0.32	-0.81	0.50	0.57	-0.30	-0.78	0.46	0.60	-0.32	-0.75	0.46	0.62
Median home value (logged)	0.00	-0.02	0.00	0.43	0.00	0.25	0.01	0.44	0.00	0.20	0.00	0.43
Median gross rent (logged)	0.00	-0.53	0.01	0.53	0.00	-0.48	0.01	0.56	0.00	-0.41	0.00	0.39
% multiunit structures	-0.38	0.84	-0.52	-0.52	0.38	0.82	-0.49	-0.53	0.42	0.80	-0.52	-0.57
% units built over 30 years ago	-0.11	0.40	0.22	0.36	-0.01	-0.06	0.31	0.64	-0.04	-0.11	0.41	0.74
% new resident in last 10 years	-0.14	0.74	-0.24	-0.57	0.14	0.74	-0.21	-0.55	0.17	0.69	-0.24	-0.56
Distance (in feet) (sq. rt.)	0.84	-0.97	-0.43	-0.23	-0.85	-0.97	-0.41	-0.23	-0.83	-0.94	-0.48	-0.32
% college-educated	-0.05	0.23	0.32	0.66	0.07	0.25	0.36	0.69	0.08	0.30	0.25	0.52
% below poverty	-0.10	0.64	-0.15	-0.45	0.10	0.55	-0.18	-0.50	0.00	-0.01	-0.04	-0.30
Median household income (logged)	0.00	-0.62	0.01	0.59	0.00	-0.60	0.01	0.65	0.00	-0.53	0.01	0.58
Income per capita (logged)	0.00	-0.13	0.01	0.47	0.00	-0.01	0.01	0.58	0.00	-0.01	0.00	0.43
% professional/managerial	-0.01	0.09	0.24	0.70	0.01	0.06	0.29	0.75	--	--	--	--

Note: Data for percent professional and managerial are not available for 1990 block groups harmonized to 2010 census boundaries.

Table A2. Regression Coefficients and Standard Errors Predicting Early Gentrification, Gentrification Trajectories, and Recent Gentrification on Racial and Ethnic Composition using Census-Based Tract-Level Gentrification Measures

	Early Gentrification (Census-Based Gentrification, 1970-1990)		Gentrification Trajectories (Census-Based Gentrification, 1990-2010)		Recent Gentrification (Census-Based Gentrification, 1970-1990)	
	(1)	(2)	(3)	(4)	(1)	(2)
	% Minority Groups	Diversity	% Minority Groups	Diversity	% Minority Groups	Diversity
% black	-0.039*		-0.124*		-0.034	
	(0.021)		(0.057)		(0.028)	
% Asian	-0.122*		-0.405†		-0.023	
	(0.058)		(0.216)		(0.029)	
% Hispanic	-0.117		-0.456		0.156	
	(0.209)		(0.561)		0.156	
Diversity indicator (<75% non-Hispanic white)		-1.610†		-2.029		0.866
		(0.906)		(2.735)		(0.696)
First PC (residential opportunity)	0.006	0.007	-0.091*	-0.126**	0.002	0.001
	(0.008)	(0.007)	(0.033)	(0.028)	(0.007)	(0.007)
Second PC (socioeconomic status)	-0.045*	0.027	0.247**	0.282**	0.016	0.019
	(0.025)	(0.020)	(0.048)	(0.050)	(0.021)	(0.020)
Crime rate (logged)	0.212	-0.328	2.554†	3.037*	0.860	1.056*
	(0.802)	(0.693)	(1.449)	(1.466)	(0.613)	(0.608)
Prior Gentrification			0.539	3.812	0.818	0.970
			(2.753)	(2.620)	(1.142)	(1.096)
AIC	-4.2	-2.1	279.9	284.3	-0.2	-2.9
N	40		42		54	
Model	Penalized logistic regression		Least squares regression		Penalized logistic regression	

Note: **$p<.01$; *$p<.05$; †$p<.10$ (two-tailed test). Early and recent gentrification is a binary measure calculated using the same methods used to calculate recent gentrification in the block group-level models. Gentrification trajectories are continuous measures based on the average of the higher value of the inverse rankings of a tract's rent and value and the higher value of the inverse rankings of a tract's income and education levels based on 2009-2013 ACS data.

Table A3. Correlations between Block Group Census-Based Gentrification Measure for 1990-2013 and Various Indicators

	1990	2013
% white	0.01	0.24**
% black	0.17**	-0.13*
% Hispanic	-0.08	-0.15*
% Asian	-0.20**	-0.18**
% college-educated	-0.01	0.40**
% below poverty	-0.05	-0.17**
% professional/managerial	--	0.32**
Median household income (logged)	-0.08	0.42**
Income per capita (logged)	0.06	0.38**
Median home value (logged)	-0.08	0.31**
Median gross rent (logged)	-0.08	0.33**
Coffee shops (per 100 residents)	--	0.11†
Building permits (per sq. km.)	--	0.13*

Note: **$p<.01$; *$p<.05$; †$p<.10$ (two-tailed test). Correlations with coffee shops exclude one outlier.