

Gentrification, Displacement and the Role of Public Investment: A Literature Review

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Introduction

The United States' metropolitan areas' ever-changing economies, demographics, and morphologies have fostered opportunity for some and hardship for others. These differential experiences “land” in place, and specifically in neighborhoods. Generally, three dynamic processes can be identified as important determinants of neighborhood change: movement of people, public policies and investments, and flows of private capital. These influences are by no means mutually exclusive – in fact they are very much mutually dependent – and they each are mediated by conceptions of race, class, place, and scale. How scholars approach the study of neighborhood change and the relative emphasis that they place on these three influences shapes the questions asked and attendant interventions proposed.

These catalysts result in a range of transformations – physical, demographic, political, economic – along upward, downward, or flat trajectories. In urban studies and policy, scholars have devoted volumes to analyzing neighborhood decline and subsequent revitalization at the hands of government, market, and individual interventions. One particular category of neighborhood change is gentrification, definitions and impacts of which have been debated for at least fifty years. Central to these debates is confronting and documenting the differential impacts on incumbent and new residents, and questions of who bears the burden and who reaps the benefits of changes. Few studies have addressed the role of public investment, and more specifically transit investment, in gentrification. Moreover, little has been written about how transit investment may spur neighborhood disinvestment and decline. Yet, at a time when so many U.S. regions are considering how best to accommodate future growth via public investment, developing a better understanding of its relationship with neighborhood change is critical to crafting more effective public policy.

This literature review will document the vast bodies of scholarship that have sought to examine these issues.¹ First, we contextualize the concept and study of neighborhood change. Second, we delve into the literature on neighborhood decline and ascent (gentrification). The third section examines the role of public investment, specifically transit investment, on neighborhood change. Next, we examine the range of studies that have tried to define and measure one of gentrification's most pronounced negative impacts: displacement. After describing the evolution of urban simulation models and their ability to incorporate racial and income transition, we conclude with an examination of gentrification and displacement assessment tools.

Historical Perspectives on Neighborhoods and Change

Neighborhoods have been changing since the beginning of time; People move in and out, buildings are built and destroyed, infrastructure and amenities are added and removed,

¹ A separate, second literature review will focus more specifically on the anti-displacement policies that have evolved to stabilize neighborhoods.

properties are transferred, etc. Despite the constancy of change, our current paradigms for understanding and studying neighborhoods and change stem from the early 20th century when urban America experienced dramatic change due to rapid industrialization, extensive flows of immigrants from Europe, and mass migration of African Americans from the rural south. In this time of great transition, emergent social problems, and heightened middle class anxiety about the ills of urban society, new ideas emerged to understand urban growth, neighborhood change, and attendant tensions.

We review these ideas here because they continue to be prominent in today's scholarship and understandings about neighborhoods and change. Three key issues that emerged include: 1) the primacy of neighborhood as the unit of analysis in studying the city; 2) specific concepts of the substantive nature of neighborhoods, including: concepts of a social ecology, cycles of equilibrium to disequilibrium, ideas of social disorganization, and assimilation; and 3) attention to race and ethnicity and their links to persistent neighborhood poverty.

While today the notion of the "neighborhood" is one that practitioners, scholars, and laypersons alike take for granted, its definitions vary and not all privilege its role in social processes. The neighborhood has come to be understood as the physical building block of the city for both "social and political organization" (Sampson 2011, 53), and thus conflates physical with non-physical attributes. Early scholars hypothesized that cities' physical elements like size and density, as well as their heterogeneous demographics, impacted the mechanisms and processes of neighborhood change (Park 1936; Park 1925; Wirth 1938). Theorists suggested that there were natural areas in the city for specific types of land uses and people, such as the concentric zone model with a central business district at the center, transitional zones of light industrial and offices next, followed by worker housing, and finally newer housing for the middle class in the outer ring (Burgess 1925).

These ideas about neighborhoods and urban morphology presented a deterministic model, in which neighborhoods were considered a closed ecosystem and neighborhood change followed a natural tendency towards social equilibrium. New residents – distinguished by ethnicity and class – would enter the ecosystem and disrupt the equilibrium. Competition for space followed, and neighborhood succession occurred when less dominant populations were forced to relocate. The dominant groups that stayed established a new equilibrium. In these conceptualizations of neighborhood change, competition for space drove locational decisions of different groups in a natural and inevitable way. Observed deviant behavior was thought to be a natural reaction to urbanization; new arrivals to the city fostered social disorganization, which would return to equilibrium once the immigrants assimilated (Park 1936; Park 1925; Wirth 1938).

This "ecological" model also naturalized segregation. New arrivals to the city – specifically the "poor, the vicious, the criminal" – would separate themselves from the "dominant moral order" (Park 1925, 43) into segregated neighborhoods to live amongst those with a similar moral code of conduct. Like disorganization, this "voluntary segregation would eventually break down as acculturation brought assimilation" (Hall 2002, 372). These concepts set the foundation for subsequent study and policy premised on notions of marginality in which

immigrants, African Americans and low-income people operate with logics distinct from mainstream, middle-class society, and on assimilation as a key mechanism to mitigate social disorganization.

Although early researchers were most concerned with immigrant influx and increasing white ethnic diversity, others – notably black sociologists – observed that neighborhoods with burgeoning African American populations seemed to experience neighborhood succession differently than the model of naturalized assimilation would predict. Unlike immigrant in-movers to Chicago, the African American population was involuntarily contained in specific neighborhoods (DuBois 2003).

These approaches to neighborhoods and neighborhood change have been widely adopted in today's policy and research agendas, perhaps understandably, since about half of all U.S. metropolitan areas conform to the concentric zone model (Dwyer 2010). Yet, these early ideas have their weaknesses. The deterministic and ecological theories naturalize the transition process and leave very little room for politics. The conflation of geographic units (neighborhoods) with social and political units masks other processes in cities. Public institutions also remain notably absent in these early theories and these approaches lose sight of larger city and regional forces that influence neighborhood level change. Subsequent research has improved upon these weaknesses by de-naturalizing market phenomena, incorporating the role of public sector actors and public policy, and by embedding neighborhood in other macro- and meso-scale processes (Goetz 2013; Jargowsky 1997).

Finding: Influential early models of neighborhood change present processes of succession and segregation as inevitable, underemphasizing the role of the state.

Trends in Mobility and Neighborhood Segregation

Despite the emphasis of urban models on change, what is perhaps most startling about this literature is how slow neighborhoods are to change. Analysis of change over time suggests that neighborhoods are surprisingly stable (Wei and Knox 2014). Over individual decades, the change that researchers are discussing amounts to a few percentage points; neighborhood transformation takes decades to complete. And in fact, overall, Americans have become significantly more rooted over time; just 12% of U.S. residents moved in 2008, the lowest rate since 1948 and probably long before (C. S. Fischer 2010). Sociologist Claude Fischer credits growing security, as well as technology, for the shift, but adds: "Americans as a whole are moving less and less. But where the remaining movers—both those forced by poverty and those liberated by affluence—are moving is reinforcing the economic and, increasingly, the cultural separations among us" (Fischer 2013). Yet, for many at the lower end of the economic spectrum, stability means imprisonment: even though many families have left, researchers estimate that some 70% of families in today's impoverished neighborhoods were living there in the 1970s as well (Sharkey 2012).

Questions of urban morphology and neighborhood change have continued to capture academic and popular imagination because of the perceived and real impacts of

neighborhoods on residents. Scholars writing on the “geographies of opportunity” (Briggs 2005) argue that the spatial relationships between high quality housing, jobs, and schools structure social mobility. Patterns of urban development in the United States have resulted in uneven geographies of opportunity, in which low-income and families of color experience limited access to affordable housing, high quality schools, and good-paying jobs. A range of studies have found that living in poor neighborhoods negatively impacts residents, particularly young people, who are more likely than their counterparts in wealthier neighborhoods to participate in and be victims of criminal activity, experience teen pregnancy, drop out of high school, and perform poorly in school among a multitude of other negative outcomes (Crane 1991; Ellen and Turner 1997; Galster 2010; P. A. Jargowsky 1997; Jencks et al. 1990; Ludwig et al. 2001; Sampson, Morenoff, and Gannon-Rowley 2002; Sharkey 2013). However, geographic proximity does not affect opportunity in the same way for all variables; living next door to a toxic waste site may impact life chances more than living next to a major employer (Chapple 2014).

Economic Segregation

Economic segregation has increased steadily since the 1970s, with a brief respite in the 1990s, and is related closely to racial segregation (i.e., income segregation is growing more rapidly among black families than white) (Fischer et al. 2004; Fry and Taylor 2015; P. Jargowsky 2001; Lichter, Parisi, and Taquino 2012; Reardon and Bischoff 2011; Watson 2009; Yang and Jargowsky 2006). Increases are particularly pronounced in more affluent neighborhoods: between 1980 and 2010, the share of upper-income households living in majority upper-income tracts doubled from 9 to 18 percent, compared to an increase from 23 to 25 percent in segregation of lower-income households living in majority lower-income tracts (Fry and Taylor 2012).

The sorting of the rich and poor is even more pronounced between jurisdictions than between neighborhoods in the same city (Reardon and Bischoff 2011). Over time, the poor are increasingly concentrated in high-poverty places, while the non-poor shift to non-poor cities (Lichter, Parisi, and Taquino 2012). Upper-income households in metropolitan areas like Houston or Dallas are much more likely to segregate themselves than those in denser older regions like Boston or Philadelphia or even Chicago (Fry and Taylor 2012). This suggests that segregation is related to metropolitan structure and suburbanization. The concentric zone model is particularly strongly associated with the segregation of the affluent (Dwyer 2010). In other words, in metropolitan areas where the affluent are most separated from the poor, they are living on land further from the center.

Metropolitan areas that conform to the concentric zone model (for example, places like Chicago, Los Angeles, and Philadelphia) tend to be larger and more densely populated metros, often with a higher degree of both affluence and inequality, a larger African-American population, and a greater share of population in the suburbs. In the remaining metropolitan areas, there is greater integration between the affluent and the poor (Dwyer 2010). In these places, such as Seattle, Charleston, and Boulder, the rich concentrate in the urban core, allowing more opportunity for interaction with the poor. Growing racial/ethnic

diversity may be reshaping some of these areas, with suburban immigrant enclaves creating a more fragmented, checkerboard patterns of segregation (Coulton et al. 1996).

Public choice theorists, most prominently Charles Tiebout (1956), have long understood economic segregation to result from the preference of consumers for distinct baskets of public goods (e.g., schools, parks, etc.); local jurisdictions provide these services at different levels, attracting residents of similar economic means (Peterson 1981). However, the causality here is unclear: government policies shape free markets and preferences, as well as respond to them. Thus, transportation policies favoring the automobile, discrimination and redlining in early federal home ownership policies, mortgage interest tax deductions for home owners, and other urban policies have actively shaped or reinforced patterns of racial and economic segregation, while severely constraining choices for disadvantaged groups (Dreier, Mollenkopf, and Swanstrom 2004).

But we also now understand that neighborhood income segregation within metropolitan areas is influenced mostly by income inequality, in particular, higher compensation in the top quintile and the lack of jobs for the bottom quintile (Reardon and Bischoff 2011; Watson 2009). Income inequality leads to income segregation because higher incomes, supported by housing policy, allow certain households to sort themselves according to their preferences – and control local political processes that continue exclusion (Reardon and Bischoff 2011). Other explanatory factors include disinvestment in urban areas, suburban investment and land use patterns, and the practices generally of government and the underwriting industry (Hirsch 1983; Levy, McDade, and Dumlao Bertumen 2011). But were income inequality to stop rising, the number of segregated neighborhoods would decline (Reardon and Bischoff 2011, Watson 2009).

Finding: Neighborhoods change slowly, but over time are becoming more segregated by income, due in part to macro-level increases in income inequality.

Racial Transition and Succession

In the U.S., income segregation is highly correlated with racial/ethnic segregation, which has a long history. As many scholars have documented, African American segregation peaked in 1960 and 1970, and has declined since then (Logan 2013; Vigdor 2013). The growth of Asian and Hispanic populations in the last several decades has led to more diverse, multi-ethnic neighborhoods. Ellen and coauthors (2012) find both the increase of previously White neighborhoods that became integrated through the growth of non-white populations, as well as a smaller but accelerating number of previously non-White neighborhoods that became integrated through the growth of White populations. It is important to note two countervailing trends, however. First, while the number of integrated neighborhoods increased from 1990 to 2010, the large majority of non-integrated neighborhoods remained so over each decade. Furthermore, African American - White segregation has persisted in major metropolitan areas, especially in the Northeast and Midwest and a large share of minorities still live in neighborhoods with virtually no White residents (Logan 2013). Second, a significant number of integrated neighborhoods reverted to non-integration during each decade, though the stability of integration increased after 2000. These findings of increasing integration over time, persistence of

non-integration in a majority of neighborhoods, and instability of some integrated neighborhoods are corroborated by a number of other researchers (Farrell and Lee 2011; Quercia and Galster 2000; Chipman et al. 2012; Sampson and Sharkey 2008; Logan and Zhang 2010).

Looking at the neighborhood and metropolitan correlates of these demographic shifts, Ellen et al. (2012) find a number of interesting patterns. Focusing on a case pertinent to the study of gentrification – the integration of African American neighborhoods by White in-movers – the authors find that neighborhoods that become integrated actually start off with lower income and rates of homeownership and higher rates of poverty than those that remain non-integrated. Additionally, these neighborhoods are more likely to be located in central cities of metropolitan areas with growing populations. Looking at rates of transition to integration by racial and ethnic category, the researchers contradict previous work (Logan and Zhang 2010; Reibel and Regelson 2011; Lee and Wood 1991) by finding multi-racial/ethnic neighborhoods to integrate with White in-movers at a relatively infrequent rate. This contradiction may be explained, however, by the lack of nuance employed by the various authors in categorizing race and ethnicities, as various subgroups can display markedly different residential movement patterns (Charles 2003).

Several main theories have been put forward to account for both the persistence and change of neighborhood racial compositions over time. With respect to the integration of formerly White neighborhoods, a primary mechanism described by Charles (2003) is that of “spatial assimilation,” which argues that as the gap between socioeconomic status of racial and ethnic groups narrows, so too does their spatial segregation. While this mechanism may help explain the integration of Hispanic and Asian households into previously White neighborhoods, it does not help explain the plight of African American households (Charles 2003). For these groups, a theory of “place stratification” is a better fit, incorporating discriminating institutions that limit residential movement of African Americans into White neighborhoods, such as biased residential preferences among non-Hispanic Whites and discrimination in the real estate market (Charles 2003; Krysan et al. 2009; Turner et al. 2013).

The converse neighborhood process, transition from integration back to segregation, have been explained by economists through theories of neighborhood “tipping,” which hold that as the neighborhood proportion of non-white racial and ethnic groups increase past a certain threshold, a rapid out-migration of other (White) groups will ensue (Schelling 1971; Charles 2000; Bruch and Mare 2006). The precise threshold at which neighborhoods “tip” varies according to a number of metropolitan-level attributes, and researchers have found that places with small non-white populations, high levels of discrimination, large homicide rates, and a history of racial riots tip at lower thresholds than other places (Quercia and Galster 2000; Card, Mas, and Rothstein 2008).

A number of other macro-level and institutional influences have been attached to racial transition. For instance, rates of macro-level population movement are seen to have a substantial impact on neighborhood racial compositions, with the movements of the Great Migration out of the South and into metropolitan areas of the Northeast, Midwest, and West

leading to greater degrees of black segregation in urban neighborhoods (Ottensmann, Good, and Gleeson 1990) and more recent movements of immigrants into neighborhoods leading to greater rates of outmigration among native-born residents (Crowder, Hall, and Tolnay 2011).

Finally, a number of studies have gone beyond place-level analyses of neighborhood racial change to examine the determinants of individual household movements. For instance, (Hipp 2012) has found a strong correlation between the race of the prior resident of a housing unit and the race of the in-moving resident, a phenomenon that he attributes to a signaling mechanism for neighborhood belonging. (Sampson 2012) similarly finds that Hispanic and Black residents overwhelmingly move to predominantly Hispanic and Black neighborhoods of Chicago, respectively. Additionally, he finds strong effects of spatial proximity on selection of destination neighborhoods, as well as strong associations with similarities in income, perceptions of physical disorder, and social network connectedness between origin and destination neighborhoods. These findings may help explain results from other researchers that have found limited impact of housing policies and programs such as inclusionary zoning and housing choice vouchers to reduce neighborhood racial segregation (Glaeser 2003; Kontokosta 2013; Chaskin 2013). The literature on gentrification, discussed below, revisits this question of how in-migration patterns reshape neighborhoods.

Finding: Racial segregation persists due to patterns of in-migration, “tipping points,” and other processes; however, racial integration is increasing, particularly in growing cities.

Dimensions of Neighborhoods and Change

In general, studies of neighborhood change began with preoccupations about decline and have evolved into concerns about the impacts of neighborhood ascent, variously defined. Public investment – and disinvestment – has played a role in both types of change.

Neighborhood Decline

The story of neighborhood decline in the United States is oft-told. While early researchers naturalized processes of neighborhood transition and decline, the drivers of decline are anything but natural and stem from a confluence of factors including: federal policy and investments, changes in the economy, demographic and migration shifts, and discriminatory actions. Neighborhood conditions and patterns of physical (dis)investment have been conflated with challenges of poverty (Katz 2012). Given this conflation, our review examines not only research concerned with physical change but also studies that investigate demographic and social dynamics that accompany neighborhood level transitions.

Between the 1920s and 1950s, the African American population in northern cities swelled due to the mechanization of agricultural production in the south and Jim Crow laws, even as deindustrialization started to take hold and jobs began moving out of central cities

(Sugrue 2005). Simultaneously Federal programs, (e.g., the Federal Highway Program and Home Ownership Loan Corporation) provided quick access and large subsidies for home ownership in the suburbs. The confluence of government subsidy and investment in infrastructure and regulation with private lending practices led to subsidies for racial segregation, with restrictive covenants and lending practices governed by racially discriminatory stipulations (K. Jackson 1987).

The demographic shifts enabled by these public policies and private actions left cities with a severely depleted tax base to support the more disadvantaged communities who did not have options to leave the city (Frieden and Sagalyn 1989). Ostensibly to address the persistent poverty in cities, urban renewal sought to revive downtown business districts and provide adequate housing for all. However, the divergent interests of stakeholders including developers, mayors, and affordable housing advocates resulted in a diluted policy that prioritized downtown redevelopment at the expense of primarily low income communities and particularly African American communities, leading many to refer to urban renewal as “Negro Removal.” Meanwhile, public housing development served as a tool to physically and socially buffer central business districts from neighborhoods of poverty, which were predominantly African American (Halpern 1995; Hirsch 1983). These efforts emphasize the approach of “solving” social, economic, and political problems with spatial and physical solutions. In essence, this period conflated urban policy with anti-poverty policy, due in part to the real policy challenges of addressing structural poverty (O’Connor 2002).

By the late 1980s, inner city poverty and metropolitan inequality were cemented. Wilson (1987), drawing on some of the earlier notions of neighborhood succession, argued that the key mechanisms driving inner city poverty were structural economic shifts; shifting migration flows; changes in the age structure; and the out-migration of middle class blacks as a result of Civil Rights gains. These shifts resulted in “concentration effects,” leaving residents even more isolated from mainstream institutions, labor market, and politics, which manifested spatially in the creation of the black ghetto neighborhood. Beyond Wilson’s focus on class, Massey and Denton (1993) argued that neighborhood decline is caused by systems of discrimination pervasive in the housing market, and that “racial segregation...and the black ghetto – are the key structural factors responsible for the perpetuation of black poverty” (Massey and Denton 1993, 9). They suggest a “culture of segregation” forms from geographic isolation, resulting in limited political power, less resilience to respond to economic shifts, and little or no access to job opportunities and mainstream institutions.

Sociologist Loic Waquant offers another way of understanding the relationship between race, poverty, and space, extending Massey and Denton’s focus on residential segregation. For Waquant (1997), racial enclosure is a critical component to understand urban decline. Analyses and proposed interventions only focused on poverty will never mitigate and deconstruct the ghetto, since it is, in fact, the racial and ethnic enclosure and control that creates poverty, not the other way around. He argues that the shift to class-based segregation at the expense of an analysis of race is a “tactical” choice by scholars given the politics of influencing policy: “[scholars] have diligently effaced from their analytical

framework the one causal nexus that the American state stubbornly refuses to acknowledge, confront, and mitigate when dealing with disparity and destitution: race” (1998, 149).

Complicating the issue of segregation for policymakers is the need to distinguish between the ghetto and the enclave (Marcuse 1997). In contrast, to the ghetto, where society segregates residents involuntarily in a process of exclusion, the enclave is a spatial cluster where residents choose to congregate in order to achieve economic goals (such as Chinatown) or social cohesion (such as Hasidic Williamsburg, Brooklyn). The urban enclave may strengthen social groups or subcultures and more effectively provide the resources to prosper than an integrated neighborhood does (Fischer 1984).

More recently, scholars using quantitative methods have broadened analyses from the neighborhood level to metropolitan, county, and state geographies (Fischer et al. 2004; Massey, Rothwell, and Domina 2009; Reardon et al. 2008). Jargowsky’s (1997) empirical work links ghetto poverty with metropolitan economies and finds that changes in economic opportunity at the metropolitan level impact the levels of inner city poverty. Further, Jargowsky’s work raises questions about the concept of neighborhood as a self-contained ecosystem, highlighting neighborhoods’ interdependency on each other and on broader metropolitan economies and infrastructures. Neighborhood decline and disinvestment may reflect regional economic distress, but may also be related to the shift of investment elsewhere in the metropolitan area.

Finding: Neighborhood decline results from the interaction of demographic shifts, public policy, and entrenched segregation, and is shaped by metropolitan context.

Neighborhood Ascent and Gentrification

Following decades of public and private initiatives to regenerate the inner city, scholars are increasingly paying attention to the causes and consequences of the upward trajectories of neighborhoods, also known as neighborhood ascent or upgrading. Much like decline, neighborhoods exhibit a variety of trajectories of ascent, which depend greatly by their starting points. Owens (2012), for instance, identified nine different types of neighborhoods that are all experiencing some form of upgrading in the United States: minority urban neighborhoods, affluent neighborhoods, diverse urban neighborhoods, no population neighborhoods, new white suburbs, upper middle-class white suburbs, booming suburbs, and Hispanic enclave neighborhoods. While different actors and catalysts may be at play in these different types of neighborhood ascent, Owens does not suggest any causality, and does not investigate the role of investment or public policies on these trajectories. In this section we provide an overview of the literature on gentrification, the most commonly studied form of neighborhood ascent involving the racial and economic transformation of low income neighborhoods.

The first documented use of the term “gentrification” (Glass 1964) describes the influx of a “gentry” in lower income neighborhoods in London during the 1950s and 60s.² Today, gentrification is generally defined as simultaneously a spatial and social practice that results in “the transformation of a working-class or vacant area of the central city into middle-class residential or commercial use” (Loretta Lees, Slater, and Wyly 2008, xv).³ Often, gentrification has been understood as a tool of revitalization for declining urban neighborhoods, defined primarily by its physical deterioration. However, revitalization, as first noted by Clay (1979) can take two forms: incumbent upgrading and gentrification. Incumbent upgrading, whereupon existing residents improve the conditions of their neighborhood, is catalyzed by the cost of housing, the rise of neighborhood consciousness, demographic pressure, and reduced pressures from migrants to the city. Gentrification, on the other hand, draws middle class residents to the city, attracted by job and recreational opportunities, low and appreciating housing prices, stabilization of negative social conditions (such as crime), and lifestyle or aesthetic considerations. Displacement is the negative outcome of gentrification, but not present in incumbent upgrading.

Gentrification literature conceptualizes neighborhoods as terrain not of isolated pockets of decline and abandonment, but rather as sites of exploration, potential investment, and emergent identity construction that are manifestations of larger city, metropolitan, and global forces. Gentrification does not rely on a singular cause. It may emerge when three conditions are present: the existence of a potential pool of gentrifiers, a supply of inner city housing, and a cultural preference for urban living (Hamnett 1991). It is arguably a “chaotic” process, that does not lend itself to binary or linear analysis (Beauregard 1986; Freeman 2006; L. Lees 1996). Early debates, however, relied strongly on binaries to identify the causes of gentrification. Scholars argued that either macro-forces of capital accumulation or micro-sociological processes of individual preferences drive gentrification processes. Today, the overarching debate has generally drawn a line between the flows of capital versus flows of people to neighborhoods. This dichotomous narrative has spawned many analyses focused on either production and supply-side or consumption, demand-side catalysts. Flows of capital focus on profit-seeking and the work of broader economic forces to make inner city areas profitable for in-movers. Flows of people refer to individual gentrifiers who enter inner city areas, drawn by cultural and aesthetic preferences.

From the production or supply side perspective, private capital investment, public policies, and public investments are the main mechanisms of gentrification. Smith (1979) argues that the return of capital from the suburbs to the city drives gentrification; the change in neighborhoods is the spatial manifestation of the restructuring of capital through shifting land values and housing development. Gentrification occurs in disinvested neighborhoods where there is the greatest “rent gap” between the cost of purchasing property and the price at which gentrifiers can rent or sell (1979). Smith (1979) sees individual gentrifiers as important, but places a greater emphasis on a broader nexus of actors – developers,

² While Glass offers the first use of the term, the phenomenon very well predates this naming. For example, Osman (2011) documents earlier instances of class-based movement into inner city areas in the United States; his history of “brownstoning” in Brooklyn dates gentrifying neighborhood change to the 1940s.

³ An early definition by London and Palen (1984) quoting the Urban Land Institute names gentrification as a “private-market non-subsidized housing renovation.”

builders, mortgage lenders, government agencies, real estate agents – that make up the full political economy of capital flows into urban areas. His focus actually obscures individual ascriptive characteristics (e.g., race) in favor of a more macro analysis of gentrification and urban land markets as a function of the capitalist economy.

Another “supply-side” actor is government – at the local, state, and federal levels – which through public subsidy and policy measures sets the conditions for and catalyzes gentrification processes. As mentioned previously, Smith (1979; 1996) sees government as part of a larger political economy that aims to accumulate capital through land use management and city development, echoing the idea of the city as a “growth machine” (Logan and Molotch 1987). Others (Freeman 2006; Wilson and Taub 2006; Pattillo 2008; powell and Spencer 2002) have clearly tied gentrification to historical patterns of residential segregation. Segregated neighborhoods experience the “double insult – a ‘one-two’ knock” (powell and Spencer 2002, 437) of neglect and white flight in the 1950s through 1970s and then the forces of displacement in the 1980s through today. These scholars highlight the role of policy in structuring the differential and inequitable spatial distributions of risks and resources by race and class across metropolitan areas. Gentrification represents merely the latest imprint of these efforts by the state. In subsequent sections we will review the literature on the specific role of government investment in infrastructure in housing prices and subsequent neighborhood change.

For those that explain gentrification as flows of people (rather than capital) two threads persist, both grounded in consumer-driven, demand-side principles. One thread focuses on aesthetic and lifestyle preferences of gentrifiers, who desire a gritty, authentically “urban” experience (Caulfield 1994; Ley 1994; Ley 1996; Zukin 1982) or who see themselves as agents to preserve some nostalgic, authentic character of a place (Brown-Saracino 2009). The second thread is embedded in neoclassical economics and links land values to housing location choice connected to shifts in the labor market (Hamnett 2003).

Ethnographic accounts have examined middle- and upper-class, primarily white, childless in-movers and their motivations to move to inner city neighborhoods. These studies have identified political persuasions and identity construction vis-à-vis their housing choices into declining neighborhoods as the primary catalysts (Brown-Saracino 2009; Caulfield 1994; Ley 1996; Ley 2003). Others also consider broader economic forces (Rose 1984; Zukin 1987), which point to the connections between the theories on macro- flows of capital described above and these more micro-sociological processes of individuals.

These earlier studies on in-movers have focused primarily in inter-racial/ethnic gentrification, with White in-movers and incumbent communities of color. More recently, scholars have examined cases of middle class black in-movers into predominantly low-income black neighborhoods (Boyd 2005; Freeman 2006; Hyra 2008; Moore 2009; Pattillo 2008; Taylor 2002). These studies tie neighborhood-specific processes to larger structural issues of residential segregation and exclusion, arguing that in some cases black in-movers feel more comfortable relocating to predominantly African American neighborhoods because of a history of housing discrimination in predominantly white neighborhoods and the suburbs (Freeman 2006; Moore 2009; Taylor 2002). African American in-movers also

become connected to a set of cultural practices and aesthetics that link to their racial identities (Freeman 2006). Further, black gentrifiers may see their relocation in inner cities as a project of “racial uplift” for their lower income black counterparts (Boyd 2005). Additional work has also shown substantial racial diversity specifically among higher-income gentrifying households (Bostic and Martin 2003).

Looking at neighborhood racial transition through the lens of gentrification, existing evidence is mixed. Research has found trends of greater White movement into poor, non-White neighborhoods (Crowder and South 2005; McKinnish, Walsh, and Kirk White 2010), resulting in shifting racial compositions in the face of gentrification. Other research, however, presents a picture of less sharp differences in race among households moving into and out of gentrifying and non-gentrifying neighborhoods (Ellen and O’Regan 2011). Finally, Hwang and Sampson (2014) recently found that Chicago neighborhoods with higher proportions of Black and Latino residents gentrified at a slower pace than predominantly White neighborhoods, indicating that gentrifiers have less of a taste for integrated neighborhoods than previously believed.

Finding: Gentrification results from both flows of capital and people. The extent to which gentrification is linked to racial transition differs across neighborhood contexts.

Cultural Strategies and Gentrification

An analysis of the built environment unveils a range of cultural strategies undertaken in many cities, from large- to micro-scale, that can be linked to processes of gentrification. In order to stand out and take part in inter-urban competition, cities make use of “starchitects,” innovative design, and “cultural” institutions/developments to give them a competitive edge (Zukin 1995). Flagship developments, including entertainment and business-oriented facilities such as festival marketplaces and entertainment districts (Boyer 1992; Hannigan 1998), sports arenas (Chapin 2004; Noll and Zimbalist 1997), convention centers (Sanders 2002), and office complexes (Fainstein 2011) play an influential and catalytic role in urban regeneration (Bianchini et al. 1992). Many cities have undertaken these types of development strategies as tools for city boosterism and economic revitalization.

These cultural strategies are considered essential in attracting the “creative class” (Florida 2002), as well as stimulating consumer spending. While certain theorists find that cities with a high level of these amenities have grown the fastest and see this as a positive development (Glaeser 2003); others argue that these strategies are predominantly aimed at elite and gentrifying areas or those aimed at attracting tourists and thus promote greater social stratification (Zukin 1995; N. Smith 1996).

Critics also argue that the cultural economy drives redevelopment strategies toward the production of commercialized urban spaces, which are in turn geared primarily toward entertainment and tourism (Zukin 1995; Zukin 2009). The consequences of these strategies can be increased property values, gentrification, displacement, and inauthentic

places.⁴ Additionally, Zukin believes that “culture is [...] a powerful means of controlling cities” (Zukin 1995: 1). Controlling cities in this sense refers to deciding who belongs and who doesn’t in specific areas of cities. Nevertheless, the aesthetic improvements, city marketing, and economic growth that are associated with cultural development strategies are often touted as the necessary benefits in successful redevelopment projects (Florida 2002; Landry 2008).

Noting the increasing emphasis on the economic benefits of cultural initiatives, scholars have also pointed to the ever-increasing creation of commodified public spaces (Smith 1996; Zukin 1995). Zukin sees the production of cultural spaces in cities as a result of an organized effort between real estate developers, public-private partnerships, and community organizations. Zukin is implying that “middle class tastes” for cultural offerings—artist galleries, ethnic restaurants and shops, historic preservation, and mixed-uses—are essentially part of scripted program designated to increase economic revenue for the city and create spaces for the middle class to spend their disposable income, perhaps leading to gentrification. The prevalence of ethnic retail has also been shown to catalyze gentrification in Los Angeles and Toronto, where ethnic commodification attracted larger city audiences and served to revalorize local real estate markets (Loukaitou-Sideris 2002; Hackworth and Rekers 2005). Even when the change is ostensibly organic, as in emergent arts districts, planners are often working in tandem with artists and others to create economic development (Chapple, Jackson, and Martin 2010).

Finding: Cultural strategies can transform places, creating new economic value but at the same time displacing existing meanings.

Commercial and Retail Gentrification

Changes in the commercial environment of gentrifying neighborhoods have been seen as both an instigator and consequence of residential demographic change (Chapple and Jacobus 2009). Researchers have shown that retail and commercial amenities signal to middle class residents that a low-income neighborhood is changing, consequently attracting new residents (Brown-Saracino 2004). On the other side, the shifting buying power and cultural preferences of new residents in gentrifying neighborhoods may influence the mix of retail in nearby commercial corridors (Chapple and Jacobus 2009). At first, residents may have a positive response if new retail and services provide desired goods that were previously not available (such as Starbucks, CVS, etc.) and if that provokes only minimal displacement of other retail (Sullivan and Shaw 2011; Freeman 2006). However, new commercial amenities in gentrifying neighborhoods also imply rising property values, as well as an influx of white and middle-class residents, creating conditions for direct displacement through competition or rising rent (Zukin 2009). This association seems appropriate as local amenities, such as retail businesses, have been found

⁴ Susan Fainstein (2001) questions whether “inauthentic” is an appropriate term to criticize new development; arguably, if it reflects underlying social forces, as for instance does Disneyland, then it is genuine.

to play an important role in household residential choice (Fischel 1985; Kolko, 2011).

Generally, commercial gentrification of urban areas involves complex issues of social class, cultural capital, and race (Zukin 2009: 48). Besides responding to a different consumer base, changes in the retail landscape reflect structural changes in the retail industry. Many scholars believe that commercial gentrification results in the disappearance of small, mom-and-pop stores and the arrival of national chains, such as CVS, Starbucks, Target (Loretta Lees 2003; Zukin et al. 2009; Fishman 2006; Bloom n.d.). Chains are usually interested in commercial districts at the mature end of any revitalization timeline: places with high foot traffic and strong demographics (Bloom, n.d.). Overall commercial rents increase because as local retail spending increases, more businesses compete to capture it (Kennedy and Leonard 2001a; Chapple and Jacobus 2009).

The increase in rents can push out local businesses that are not drawing the same traffic as the chain stores and not generating similarly high sales volume. These local businesses may have had higher multiplier effects on the area, due to reliance on local suppliers and the recirculation of business owner profits (Civic Economics 2012). However, chains can also create their own customer traffic and that additional traffic can have positive effects on nearby businesses: as more customers come into the commercial district, they encounter other businesses along the way (Bloom, n.d.). Moreover, they benefit consumers by offering goods and services at lower prices, likely offsetting any losses in the local multiplier. Others suggest that an influx of national chains can also indicate the changing corporate views of the commercial viability of the inner city (Porter 1995). Still, when Wal-Mart or other big box retailers come to town, there is net job and business loss, as well as decreases in retail wages (Dube, Lester, and Eidlin 2007; Ficano 2013; Haltiwanger, Jarmin, and Krizan 2010; Neumark, Zhang, and Ciccarella 2008).

Empirical studies on the nature of commercial change in gentrifying neighborhoods are mixed and scarce. Koebel (2002) measured the factors influencing changes in the number of neighborhood retail and service businesses in six cities, finding little relationship with neighborhood economic (e.g., median income) factors. Instead, he found that a substantial amount of the change in neighborhood commerce was related to property and location characteristics (such as redevelopment or revitalization projects). In contrast, Chapple and Jacobus (2009) found that overall retail establishment growth in the SF Bay Area was associated with neighborhoods becoming middle- or upper-income rather than those that became bipolar or gentrified. Meltzer and Schuetz (2011) analyzed changes among neighborhood businesses in New York City, finding that retail access improved rapidly in low home value neighborhoods that experienced upgrading or gentrification. The authors suggest that these results indicate that retail is quite sensitive to changes in neighborhood economic and demographic characteristics (Meltzer and Schuetz 2012). Finally, a study comparing retail change in California found that in gentrifying neighborhoods, new businesses grew more (in employment) than existing businesses in the 1990s, but not in the 2000s (Plowman 2014). This suggests the importance of extending the timeframe for the analysis of neighborhood change.

The relationship between TODs and retail gentrification is similarly under-studied.

Recently, Schuetz (2014) asked if new rail stations in California resulted in changes in retail employment, finding little support for such relationships. However, the absence of parking was found to be significantly associated with a decline in retail employment. Finally, in their analysis of the effects of TOD investments on small and ethnically owned businesses in LA County, Paul Ong and collaborators found that growth in Asian and small commercial establishments in TODs lagged behind the County average, despite the fact that real estate activity was higher in the TODs than for the county (Ong, Pech, and Ray 2014).

Finding: Commercial gentrification can also transform a neighborhood's meaning, but research is mixed on whether it is positive or negative for existing residents and businesses.

The Role of Public Investments in Neighborhood Ascent

The vast majority of gentrification literature has focused on private actors and capital. However, the public sector plays an important role in neighborhood transformation. While we have detailed the study of urban renewal and federal programs as part of the discourse on neighborhood decline, government has had a strong hand in neighborhood improvement as well, investing in physical infrastructure such as rail transit, schools, parks, and highways, as well as neighborhood-based organizations. These initiatives date from at least the 1950s urban renewal and public housing development to more recent interventions like the Empowerment Zones of the 1980s and 90s, HOPE VI in the 1990s and early 2000s, and today's Choice Neighborhoods and Promise Zones programs among many other programs.

As described above, in the 1980s persistent poverty in inner city urban areas, particularly among the African-American community, led to extensive scholarly inquiry, and Federal housing policy realigned to focus on the deconcentration of poverty through the development of mixed income housing and housing mobility programs (Goetz 2003). This shift in federal policy "to encourage deconcentration is based on the consensus among policy makers and scholars that high concentrations of very low income households in housing" is detrimental (Popkin et al. 2000, 928). Federal programs promoting mixed income housing development aimed to alleviate poverty, however have had mixed results (Joseph 2006).

Recently, critics of these programs have raised concerns that mixed-income development displace those living in poverty rather than supporting their social mobility by catalyzing other upgrades and development (Bridge et al. 2012). These critiques have placed government policy and programs at the center of longstanding debates about the catalysts and consequences of neighborhood ascent, suggesting that certain housing policies represent "state-sponsored gentrification" (Bridge, Butler, and Lees 2012).

In addition to Federal housing policy, numerous infrastructure and other federal, state and local government investments have the potential to significantly alter the physical and social makeup of low income neighborhoods.

Although few studies have looked at the impact of public investments on neighborhood demographic change, there is a significant body of literature on the impact of transit on property values, which is intimately tied to the social status of the people who live there. In the next section we review the relevant body of literature to begin to relate public investments in infrastructure to neighborhood demographic change, with a specific focus on transit.

Rail Transit

Transit and transit-oriented districts (TODs) are viewed as desirable amenities in urban neighborhoods due to their accessibility. Scholars have found that areas adjacent to transit stops often experience thriving commercial activity with the introduction of shops, restaurants and other businesses that attract commuters and non-commuters (Bluestone, Stevenson, and Williams 2008). However, disamenity effects also exist from being “too close” to transit, which can result in heightened noise, congestion, pollution, and traffic (Cervero 2006; Kilpatrick et al. 2007).

In a review of existing research on the topic, (Giuliano and Agarwal 2010) state that, “the literature does not establish unambiguously whether or not rail transit investments get capitalized in property values.” They attribute inconsistent findings in part to differences in research methods and in the local conditions in which transit investments are made. They note that transit systems have an appreciable impact on accessibility only where road networks are insufficient for handling travel demands (i.e., where congestion is severe). Other researchers, however, argue that the accessibility benefits of living near transit outweigh the potential nuisance effects, and that proximity to public transit often leads to higher home values and rents (Wardrip 2011).

Most empirical studies on the impact of transportation investments focus on changes in property values rather than land use, household, or racial transition (Landis et al. 1995). suggest this may be due to the fact that property value data is more widely available than data such as land use. In general, the literature agrees that transport investments (new stations, TODs) have economic benefits primarily if they improve access significantly. Households with easy access to public transit are able to spend less on transportation and can thus afford to spend more on housing (Kilpatrick et al. 2007). Economic theory suggests that the value of decreased travel time should be reflected in home prices, as reviewed in Hess and Almeida (2007). Benefits tend to be the highest near, but not too near, network access points such as rail stations or freeway ramps.

Several recent literature reviews have summarized research related to the home price premiums, which come with proximity to transit. These premiums vary significantly. (Cervero and Duncan 2004) found that the premium for home prices ranged from 6 percent to 45 percent (2004). Another literature review set the range between 3 percent and 40 percent (Diaz 1999). A third review, involving heavy and light rail systems only, found a maximum premium of 32 percent, although some studies found no effect, while others found negative effects (Hess and Almeida 2007). Summarizing the available

research is difficult, because as (Duncan 2008, p.121) argues, generalization is problematic owing to different methodologies and contexts. He concludes: “The most that one might safely generalize from the body of literature is that properties near stations sell at small to modest premiums (somewhere between 0% and 10%).”

There are two common methods to study the effect of transit proximity on housing costs. One is to compare residential prices near transit with similar homes farther away, using a hedonic price model to separate out the effects of housing characteristics from the impact of location.⁵ The other method, “Pre/Post studies,” examine prices in an area before and after the initiation of transit, represent another, albeit less utilized, method to examine the effect of transit on housing costs.

In hedonic price models, the independent variable for modeling the price effects of transit is most often the distance from the nearest transit station (Chatman, Tulach, and Kim 2012; Duncan 2008; Cervero and Duncan 2002a), measured along streets or in terms of distance rings. Two earlier studies from Toronto, have utilized weighted travel-time-based measures as an alternative to distance travelled (Bajic 1983; Dewees 1976). Hedonic price models may also use monetary savings⁶ as an independent variable, inquiring how travelers respond when faced with a tradeoff between time and money, for example when offered the option to pay extra for a faster trip (Nelson 1992; Lewis-Workman and Brod 1997; H. Chen, Rufolo, and Dueker 1998; Gatzlaff and Smith 1993; Wardman 2004). “Pre/Post” studies, although less commonly used because it requires access to longitudinal data (Chatman et al. 2012), is considered “more optimal” because it is easier to establish causal links (Duncan 2010: 5). A summary of the literature using hedonic price models and “Pre/Post” studies is included in the Appendix.

Overall, the impact of transit on home values can vary depending on a number of mediating factors. Wardrip (2011) outlines several reasons, which include: housing tenure and type, the extent and reliability of the transit system, the strength of the housing market, the nature of the surrounding development, and so on. In an area with a strong housing market and a reliable transit system, the price premium may be much higher than the average. Additionally, effects may vary for different stations within a single market. For instance, averages can hide a lot of variation, and transit stations may have little or no impact on housing prices in some neighborhoods but a significant impact in others (Wardrip 2011). Some studies have also found that transit expansion plans may drive increases in property values before anything is built (Knaap, Ding, and Hopkins 2001). Finally, research suggests that heavy rail systems have a greater impact on property values than light rail systems. This is likely due to heavy rail’s greater frequency, speed, and scope of service as compared

⁵ The basic premise of the hedonic pricing method is that the price of a marketed good is related to its characteristics. In the case of housing, this relates to square footage, number of rooms, amenities, etc. (http://www.ecosystemvaluation.org/hedonic_pricing.htm).

⁶ Total travel time costs are the product of the amount of time (minutes or hours) multiplied by unit costs (measured as cents per minute or dollars per hour). Generally, travel time unit costs are calculated relative to average wages (Litman, 2011: 4). Personal travel time unit costs are usually estimated at 25-50% of prevailing wage rates, with variations due to factors such as age, income, or length of commute (Waters 1992; Litman 2007).

to most light rail networks, as reviewed by (Brinckerhoff 2001; Lewis-Workman and Brod 1997; Landis et al. 1995).

Rail impacts on Commercial Land Values

Most studies have focused on the impact of transit investment on residential properties. However, a few studies have examined the relationship between transit and commercial property values. A study of Northern California's Santa Clara County's light-rail system found that properties within a half-mile of stations resulted in rent premiums, and those that were a quarter to a half-mile away were worth even more (Weinberger 2001). In another study of Santa Clara, (Cervero and Duncan 2002b) found that the commercial property land values were higher for commuter rail access than for light rail access, which is the opposite result observed for apartments in the same city (Cervero and Duncan 2002c). In a meta-analysis of existing studies, Debrezion, Pels, and Rietveld (2007) found that commercial properties within ¼-mile range from the station were 12.2% more expensive than residential properties. Further away from the station, residential properties received a higher premium than commercial properties.

Finding: New fixed-rail transit has a generally positive effect on both residential and commercial property values, but its impact varies substantially according to context.

Bus and Bus Rapid Transit

Several scholars have described Bus Rapid Transit (BRT) as an attractive modal transit option (R. B. Diaz and Schneck 2000; Levinson et al. 2002; Polzin and Baltes 2002; Vuchic 2002). The attributes favoring BRT are its lower capital cost relative to other modes (such as fixed rail) (US GAO 2001) as well as its implementation and operational flexibility (Jarzab, Lightbody, and Maeda 2002).

There is limited evidence about the relationship between land values and BRT (Rodriguez and Targa 2004; Johnson 2003). Similarly, traditional bus service is rarely considered when discussing the impact of transit on housing costs. In their review of the literature, Hess and Almeida (2007, p. 1043) explain that "...property values near bus routes have only modest gains, if any, from transit proximity, because most bus routes lack the permanence of fixed infrastructure."

Much attention and research has been focused on Bogota, Colombia's BRT TransMilenio. What makes TransMilenio an interesting case study is that affordable transport was coupled with affordable housing initiatives. This has been made possible with an innovative land-banking/poverty-alleviation program, called Metrovivienda, which was introduced in 1999 (Cervero 2005). Under this program, the city acquires land and provides public utilities, roads, and open space. Afterwards property is sold to developers with the stipulation that average prices be kept under a certain price and affordable to families with incomes of US\$200 per month. An important aspect of the Metrovivienda program is the acquisition of land well in advance of the arrival of the BRT services. This has enabled the organization to acquire land before prices become inflated by the arrival of

the BRT. This is important because as a recent study found, those residing close to TransMilenio stations pay higher monthly rents: on average, housing prices fell between 6.8 and 9.3 percent for every five minutes' increase in walking time to a station (Cervero 2005). Thus, acquiring land in advance has kept prices affordable for low-income households. However, more recent work has shown that by failing to leverage development around BRT stations, the TransMilenio system has created regional mobility at the expense of accessibility for the poor (Cervero 2013).

In North America, the relationship between accessibility to BRT and land values is only examined by a handful of studies focusing on bus priority treatments (high-occupancy-vehicle (HOV)-bus lanes) and transit ways. In an early study, (Knight and Trygg 1977) examined HOV-bus lanes in Washington, DC, California, Seattle, and Florida. They relied on previously published reports, interviews, aerial photographs, and other secondary sources available at the time to conclude that exclusive bus lanes incorporated into highways appear to have no impact on either residential or commercial development. A later study by Mullins, Washington, and Stokes (1990) found that the BRT in Ottawa, Canada, appeared to have some effect on land development in areas surrounding stations. A review of studies from Houston, Texas, Pittsburgh, Pennsylvania, and San Francisco, California conducted by Rodriguez and Targa (2004), revealed that bus transit had no impact on either residential or commercial development. A hedonic analysis applied to Los Angeles's BRT, one year after its initiation, did not detect any evidence of benefits to nearby multi-family parcels (Cervero and Duncan 2002a). Recent work by a UCLA student, however, found that Los Angeles' Orange Line (BRT) had an effect on the neighborhood real estate market. In between 2000 and 2012, areas near the Orange Line (BRT) fixed-guideway saw median rent increase by 25% compared to 15% in the control area, renter occupied units increased by 9% compared to 0% in the control area, and home value increase by 47% compared to 34% in the control area (Brown 2014). No significant differences in median income or household vehicle ownership were found, however other demographic characteristics (growth, education, and race) were found to significantly change.

Rodriquez and Targa (2004) suggest that these mixed results could be partially explained by the BRT's lack of fixed guideways, as well as the cross-sectional research design and the newness of the service. Indeed, a study of a 25-year old bus rapid transit (BRT) system in Pittsburgh found a significant price premium for homes selling near the BRT line (Perk and Catala 2009). The implication is that where a BRT system can bring lasting improvements in accessibility on par with a fixed rail transit system, housing markets may respond accordingly.

Finding: Preliminary evidence suggests that BRT has limited or no effects on local property values.

Transit-induced Gentrification

Although the vast majority of the literature has focused on the impacts of transit investments and planning on real estate value, a number of scholars are beginning to investigate the relationship between transit investments and the demographic shifts

common in gentrifying neighborhoods as well (Lin 2002; Chapple 2009; Kahn 2007; Pollack, Bluestone, and Billingham 2010; Dominie 2012; see the Appendix for a summary of L.A. specific TOD studies and policy reports). Studies have also found that the real estate premiums associated with rail investment can alter the demographic composition of the surrounding neighborhood (R. Diaz 1999; Cervero and Duncan 2004; Lin 2002).

There are several factors that scholars cite as the likely cause of gentrification near transit. The demand side argument claims that transit is likely to spur gentrification when the new transit modes (rail, bus, etc.) provide a viable alternative to the car thereby attracting higher income households. The reduction in transportation costs for residents is also thought to increase land values, attracting higher value uses and income residents (TCRP 2004).

The supply-side argument claims that transit is likely to cause gentrification when it counters pre-existing patterns of disinvestment. Thus, gentrification around transit investments is likely to occur when there is a credible commitment to large scale investment: reinvestment in a disinvested neighborhood is likely when it appears that an actor (a state agency, financial institution or large land-owner) demonstrates a commitment to refurbish the physical environment at a scale capable of influencing the area's land or housing market (Knaap, Ding, and Hopkins 2001; N. Smith 1979). Large transit investments appear to have been used successfully and intentionally to demonstrate this type of commitment (Pollack, Bluestone, and Billingham 2010).

Pollack and coauthors (2010) affirm that transit can be a catalyst for neighborhood renewal, and that such improvements to neighborhood accessibility could potentially 'price out' current residents because of rising property values. Despite the connections between improved accessibility, higher property values, and gentrification, only a few studies address these issues explicitly and few look at issues of income and race (Lin 2002; Kahn 2007; Pollack et al. 2010; Dominie 2012). Thus, while Lin (2002) and Kahn (2007) develop models to explain the relationship between neighborhood gentrification and transit they do not take into account race and ethnicity.

Other Public Investments

Government investment in a wide range of neighborhood infrastructure and services can also have significant impacts on property values and neighborhood change. In this section we outline the literature on the impact of schools, parks and open spaces, and highways on housing prices.

Schools

The quality of public schools is widely believed to be a key determinant of housing prices (Max 2004). A number of studies employ hedonic regression models to examine this relationship. In 1969, Oates documented a positive relationship between school expenditures and housing values in 53 northern New Jersey municipalities. Following Oates' work, a number of researchers have estimated similar relationships. Most of these

studies have produced similar findings. For instance Dubin and Goodman (1982) estimated the impact of school performance and crime measures on housing prices in Baltimore, finding a significant relationship between real estate value and school characteristics such as the pupil-to-staff ratio, average teacher experience, percent of staff with graduate degree, and third and fifth grade test scores. In Minnesota, Reback (2005) identified the capitalization effects of a school choice program, finding that the adoption of inter-district open enrollment policy weakened the link between local school quality and property values.

Parks and Open Spaces

Extensive research has tried to value urban parks, forests, and open space through analysis of property data and stated preferences. The majority of these studies use hedonic analysis of property sales data, finding that home values increase with proximity to a park (Bolitzer and Netusil 2000; Acharya and Bennett 2001; Lutzenhiser and Netusil 2001; Troy and Grove 2008; V. K. Smith, Poulos, and Kim 2002) looked specifically at the price effects of urban greenways, or linear areas of open space along rivers, streams, or abandoned railroad corridors in Austin, TX, finding such adjacency resulted in significant increases in property values. Studies often distinguish broadly between protected open space, such as public parks and land under conservation easement, and developable open space, such as privately owned agricultural land (Irwin and Bockstael 2001; Irwin 2002; Geoghegan 2002; Bucholtz, Geoghegan, and Lynch 2003). This difference is relevant because studies have found that preserved open space surrounding a home increases home value, while developable open space has a lesser, insignificant, or negative effect on home value (Anderson and West 2006). Finally, in a study of Baltimore, Troy and Grove (2008) found that crime is a critical factor conditioning how residents perceive parks and how this is reflected in the housing market.

Highways

Studies of the impact of highways on nearby land and housing values date to the beginnings of the Interstate Highway Program (Adkins 1959; Mohring 1961). Huang (1994) reviewed the hedonic price literature, finding that studies from the 1950s and 1960s usually revealed large land price increases near major highway projects. Later studies, from the 1970s and the 1980s, typically showed smaller and often statistically insignificant land price effects from highway projects. Both Giuliano (1989) and Huang (1994) argued that this happens because as the highway system was developed in many urban areas, the value of access to any particular highway was reduced because accessibility was then generally good throughout the network. Huang (1994) also noted that for residential properties, noise and other disamenities reduce the value of locating close to a highway. Finally, using access rather than distance, Voith (1993) found that highway access (measured by travel time by highway to downtown) influenced housing prices in the Philadelphia area and that the magnitude of that effect increased during the 1980s.

Finding: Proximity to high quality schools and parks, as well as access to highways, increases home values.

Understanding Negative Impacts of Gentrification: Displacement

Gentrification scholarship has used primarily qualitative research methods to uncover the causes and reveal the motivations of individual actors in neighborhoods. Unlike scholarly discourse on decline and revitalization in the 1950s and 1960s, the gentrification debates since the 1970s have largely neglected the public sector. Attention is shifting today, however, as increasingly, particular kinds of federal investments – specifically in mixed income housing – have raised questions about state-sponsored/catalyzed gentrification. The primary concern of gentrification is one of its negative outcomes: displacement⁷. Given today's landscape of public investment, advocates and scholars are increasingly concerned that public investments may create a situation in which incumbent residents have fewer options than they did before and are forced out or can't move in.

To fully understand this concern, we now turn to review the literature on displacement. This literature has dominated much discussion by gentrification scholars since the early 1990s, and represents a departure from the methods employed until then. As we will describe, scholars became increasingly concerned with measuring, assessing the extent, and predicting displacement as a result of first public and then private revitalization efforts.

Consistently activists, residents and social justice actors identify displacement as the biggest impact of concern resulting from neighborhood revitalization and gentrification. Anxieties about residential, retail and job displacement reflect the lived experience of neighborhood change and the social memory of displacements past. Yet social science research attempting to quantify the scale and nature of residential displacement has come up short. Why the discrepancy?

In this section we review the body of research on residential displacement related to gentrification, neighborhood investment and revitalization. By tracing attempts to define and measure displacement, we highlight significant methodological limitations including data availability and narrow definitions of displacement and explore specific interpretations of the significance of displacement, which potentially mask the impacts on communities.

Defining Residential Displacement

The Federal Urban Renewal program, local redevelopment efforts, and interstate highway construction of the 1950s and 60s forcibly displaced communities of color and low income communities in urban neighborhoods en masse. Following these policy efforts, urban activists were particularly sensitive to the risks of displacement and the role of government in facilitating displacement. However, the nature of this displacement in the 1970s was no longer solely driven by forced removal by public action. Instead, a growing “back to the city” trend perceived to be largely driven by private actions and individual preferences,

⁷ Other negative consequences of gentrification that are not reviewed here include a sense of loss of place and belonging, erosion of social networks, community resources and political power, among others.

albeit with significant yet perhaps more subtle influences from the public sector⁸, began to dominate the public concerns with neighborhood change and residential displacement (Clay 1979).

In 1978 the U.S. Department of Housing and Urban Development (HUD) sponsored the first of a series of reports on revitalization and displacement called “Urban Displacement: A Reconnaissance” (Grier and Grier 1978). In this report, authors Eunice and George Grier listed twenty-five factors that might lead to the involuntary movement of people from their place of residence (Figure 1). These factors imply a diverse set of actors: natural disasters; building-owners who initiate condominium conversion or rent increases; local government conducting proactive code enforcement and planning decisions; federal government initiating large-scale urban renewal; and banks engaging in redlining practices, to name a few.

Figure 1 “Some Conditions Resulting in Displacement in Urban Neighborhoods”

Source: (Grier and Grier 1978, p.2)

- | | |
|---|---|
| • Abandonment | • Military base expansion |
| • Accidental fire | • Natural disaster |
| • Airport construction or expansion | • Partition sales |
| • Arson | • Planning and zoning decisions |
| • Code enforcement (incl. overcrowding) | • Public building construction |
| • Conversion of rental apartments to condominiums | • Redlining |
| • Demolition to make way for new housing | • Rehabilitation (private market) |
| • Demolition for safety/health reasons | • Rehabilitation (publicly aided) |
| • Foreclosure | • Renovation of public housing |
| • Highway or transit constructions/ expansion | • Rising market prices and rents |
| • Historic area designation | • School construction |
| • Institutional expansion (universities/hospitals, etc) | • Urban renewal |
| | • Withdrawal of private services from neighborhood or structure |

In an effort to provide a definition of displacement that encompasses these various drivers, Grier and Grier proposed the following definition, which has been adopted by numerous researchers and agencies in subsequent decades:

“Displacement occurs when any household is forced to move from its residence by conditions which affect the dwelling or immediate surroundings, and which:

- 1) are beyond the household’s reasonable ability to control or prevent;

⁸ Although large scale urban renewal has dominated the social imaginary about the ways in which the public sector can influence neighborhood change and displacement, myriad public interventions can influence the composition of neighborhoods from tax abatement programs to zoning decisions and pro-active code enforcement.

- 2) occur despite the household's having met all previously-imposed conditions of occupancy; and
- 3) make continued occupancy by that household impossible, hazardous or unaffordable." (Grier and Grier, 1978, p. 8)

Although they use the term "forced" in their definition of displacement, Grier and Grier do not equate "forced" with involuntary. In fact, they describe the fact that many who are displaced are subject to a variety of actions or inactions that can be frank or subtle, therefore concluding:

"For most residents to move under such conditions is about as 'voluntary' as is swerving one's car to avoid an accident. By the time the landlord issues notices of eviction, or the code inspector posts the structure as uninhabitable, few occupants may be left. Therefore we cannot define displacement simply in terms of legal or administrative actions – or even draw a clear-cut line between 'voluntary' and 'involuntary' movement." (p.3)

Newman and Owen (1982) extend the false distinction between voluntary and involuntary moves to moves driven by economic reasons when stating that "low-income households who experience extremely large rent increases may technically 'choose' to move, but the likelihood that they had any real alternative is very small" (p.137).

In an effort to categorize the causes of displacement, Grier and Grier distinguish between disinvestment displacement, reinvestment displacement and displacement caused by enhanced housing market competition, despite their obvious inter-connections. Disinvestment-related displacement described the conditions under which the value of a property does not justify investing in its maintenance, thereby resulting in decay and abandonment. Reinvestment related displacement refers to the case where investments in a neighborhood results in increased rent to a point where it's profitable to sell or raise the rent and tenants are forced to leave. The authors are careful to note that "unrelated as they seem, these two conditions of displacement may be successive stages in the cycle of neighborhood change" (p.3). Finally, enhanced housing market competition referred to broad shifts in the national and regional housing market, which they argue have an even larger impact than disinvestment or reinvestment forces, although again acknowledging the relationship between the three. As an example they discuss the needs of the then young baby boom generation that were not being met by housing production of mostly single family suburban homes, thus resulting in pressures on the pre-existing urban housing stock.

The distinctions in these three types of displacement pressures resurfaced 8 years later when Peter Marcuse analyzed displacement in New York City (Marcuse 1986). Marcuse argued that when looking at the relationship between gentrification and displacement one must first consider the disinvestment of urban neighborhoods and subsequent displacement, which makes land ripe for investment with gentrification of "vacant" land. From this perspective gentrification can happen long after abandonment-induced displacement. Therefore, he argues, most gentrification induced displacement studies

significantly underestimated the magnitude of the problem and therefore “chains” of displacement must be considered. He further distinguishes between displacement caused by physical reasons (e.g., water is turned off, evictions, rehab, etc.) and economic causes (e.g., rising rent). In addition, Marcuse introduces the concept of exclusionary displacement, modifying Grier and Grier’s definition of displacement to define exclusionary displacement as:

“Exclusionary displacement from gentrification occurs when any household is not permitted to move into a dwelling, by a change in conditions, which affect that dwelling or its immediate surroundings, which:

- a) is beyond the household’s reasonable ability to control or prevent;
- b) occur despite the household’s being able to meet all previously-imposed conditions of occupancy;
- c) differs significantly and in a spatially concentrated fashion from changes in the housing market as a whole; and
- d) makes occupancy by that household impossible, hazardous or unaffordable.” (p. 156)

Although Marcuse’s four categories of displacement (e.g., direct/physical, direct/economic, chains of displacement and exclusionary) provide the most comprehensive definition available, he warns that to sum across the categories would lead to an over-estimate of displacement as there is considerable overlap between them; yet to exclude any source could produce an underestimate.

Despite these early attempts to define displacement and the fact that most authors have formally adopted one or the other definition, in operationalizing the term for the means of study, most researchers have narrowly defined displacement as evictions or unaffordable price increases. This narrow focus stems from two factors. Researchers have access to limited data and are challenged to impute the motivation behind household moves. Tracking which exits from a neighborhood are displacement motivated is difficult; measuring displacement is akin to “measuring the invisible” as the population under question has moved away from the place of study (Atkinson 2000). Perhaps because of this, definitions and operationalization of displacement is often driven by the data available. Furthermore, scholars often define displacement based on the scope and sponsor of their research agenda. For instance, many of the early HUD-funded studies on displacement were specifically concerned with the role of HUD programs in residential displacement and therefore narrowly defined it as displacement resulting from public action (US HUD 1979). Another study (Schill, Nathan, and Persaud 1983) that focused on revitalization-induced displacement defined displacement as that occurring as a result of “neighborhood reinvestment or upgrading” (p.47).

For the purposes of this literature we do not adopt a singular definition of displacement. In our effort to review and evaluate the disparate literature on residential displacement, however, we adopt the framework of Marcuse (1986) and Grier and Grier to classify the types of displacement studies analyzed. As each of the studies reviewed below utilizes slightly different definitions of displacement in their analysis, we make a point to highlight their operating definitions in addition to the methods and results of their study.

Finding: Displacement takes many different forms—direct and indirect, physical or economic, and exclusionary—and may result from either investment or disinvestment.

Measuring Residential Displacement

Researchers have varied in their approaches to studying gentrification/revitalization-induced displacement. Studies use qualitative and quantitative methods to answer a variety of questions ranging from the nature of displacement (e.g., how many and who gets displaced, where do they move to, who is most vulnerable, etc.) to the causes (e.g., changes in rent, condo conversion, disinvestment, etc.) and consequences of displacement (e.g., neighborhood destabilization, re-segregation, crowding, rent-burden, satisfaction with new neighborhoods, etc.). For most of the studies reviewed, a number of questions are addressed in each, making it challenging to categorize studies by the questions they seek to answer. Instead, we review the studies on residential displacement chronologically; because of shifts in understanding and interests, data availability, and statistical methods, the timing of the study largely coincides with methodological approaches.

Following, we review specific studies and then compare across studies to identify common methodological challenges, persistent gaps in inquiry and promising indicators to include in our research. We proceed by summarizing relevant studies on displacement along the following dimensions: a) the context in which the studies were undertaken and the resultant questions that preoccupied them, b) the research approach, c) the source and type of data used, d) their working definition of displacement and gentrification/revitalization, e) their results, and f) the strengths and shortcomings of the study.

As mentioned above, quantitative studies on displacement found their origins in the late 1970s as urban America was witnessing a wave of downtown reinvestment following the urban crises. Because of the newness of the phenomenon, many early studies on displacement were concerned with quantifying its magnitude to determine if it was a “significant” phenomenon. In the late 1970s, for instance, HUD was actively considering the adoption of policies to address displacement associated with HUD’s programs. In the 1979 “Displacement Report” they reviewed a series of case studies and national datasets to evaluate the nature and magnitude of the “displacement problem.” Although citing Grier and Grier’s definition of displacement, the report mostly focused on displacement occurring as a result of eminent domain related to federal, state or local government activity. Emphasis was placed on the results from the nationally representative American Housing Survey from which the report estimated that nationally, independent of neighborhood or city of residence and independent of the vulnerability of the household (i.e., income or race) over half a million households were displaced each year. When evaluated in light of the fact that 20% of all U.S. households move each year and in conjunction with data on the scale of urban revitalization the HUD report concluded that “the population and economic trends represented by ‘revitalization’ in urban areas are far too small to slow significantly or to reverse the movement to the suburbs and the loss of economic activity by central cities” (US HUD 1979, p.iii). These conclusions were reached despite citing evidence from case studies in revitalizing neighborhoods in Seattle and

Washington D.C. which showed that nearly 20% of people moving out of revitalizing neighborhoods were displaced. This early study and its ambiguous criteria against which it evaluated the “significance” of the displacement phenomenon would prove to be a common theme in future studies that have displayed a lack of transparency and little consistency in how to assess significance.

One of the outcomes of HUD’s initiative, however, was to invest in a series of research studies to better understand and quantify the magnitude and impacts of neighborhood revitalization and displacement. Two HUD-funded studies stand out for their methodological rigor. These studies identified and surveyed displaced households from revitalizing neighborhoods to find out their reasons for moving out. The first, a study of “Market Generated Displacement” (NIAS 1981), was concerned with the rapid revitalization of San Francisco’s Hayes Valley neighborhood and the potential impacts on pre-existing residents. The researchers conducted a survey of previous residents that left the neighborhood, new residents that moved into the neighborhood and continuing residents. They found that from 1975-1979, one out of four of the out- and intra-neighborhood movers from their sample were displaced, which they defined as any non-voluntary reason for moving except lifecycle factors (i.e., divorce, unemployment). They also found that displacees of Hayes Valley were more likely to be black households, less well educated, poor, renters, elderly and living alone in comparison to in-movers and stayers. Displacees moved out for a variety of reasons including investment related causes (i.e., rising rent, evictions, condo-conversions), but also disinvestment-related reasons (i.e., crime, poor housing quality, etc.), calling into question both the nature and timing of neighborhood revitalization, disinvestment, and displacement, making it hard to identify a linear relationship or before and after period. They did not, however, explicitly link information on the public or private revitalization investments in the neighborhood with displacement and their study lacked any comparison to non-revitalizing neighborhoods, thereby limiting their ability to contextualize their results on the displacement impacts of revitalization.

Asking similar questions about the impacts of revitalization on residential displacement, in 1983 Michael Schill and coauthors from Princeton University published a study on displacement trends in 9 revitalizing neighborhoods of five cities⁹ (Schill, Nathan, and Persaud 1983). They surveyed and interviewed out-movers from these neighborhoods to better understand the frequency and effects of neighborhood reinvestment. From this sample, they found that 23% of out-movers in 1978-80 were displaced, which they defined as the following reasons for moving out their neighborhood: 1) the rent was increased too much, 2) they were evicted or 3) the house they were renting was sold. Using statistical regression, Schill and coauthors found that crowding, frequency of previous moves, unemployment and marital status predicted displacement. Although they conclude that the “advantages of neighborhood reinvestment outweighed its disadvantages,” (p.7) their research also suffered from data limitations given the potential under-sampling of the most vulnerable and more transient households, since they were less likely to be detected by the door-to-door canvass used to construct the list of out-movers, as well as the absence of

⁹ Boston, Cincinnati, Richmond, VA, Seattle and Denver

control neighborhoods. Furthermore, these authors look only at a 2-year timeframe and do not define the stage of revitalization each of the neighborhoods were experiencing, thereby potentially missing what Marcuse would describe as chains of displacement in addition to ignoring exclusionary displacement effects of revitalization.

In one of the first studies to try to estimate the national displacement rate associated with urban revitalization, Newman and Owens (1982) used longitudinal data from the Panel Study on Income Dynamics to estimate the scale, nature and impacts of displacement. They considered people who moved out of their previous residence because of the conditions of the house/neighborhood, public action, and eviction by the landlord because of sale or reoccupation to be displaced. Newman and Owens found that average annual rate of displacement between 1970 and 1977 was roughly 1 percent, however when calculated as a fraction of all families who moved, the proportion was 5 percent and of urban families 8.2 percent. Using this dataset the authors were able to follow people over time, yet they lacked information on neighborhood conditions, thereby limiting their ability to make inferences about revitalization-induced displacement.

Research on gentrification and displacement waned in the late 1980s and early 1990s. However, in many respects the economic boom of the 1990s reinvigorated both the revitalization of downtown areas and the study of gentrification-induced displacement. Although sharing in some of the questions and methodologies of the previous literature, the new wave of displacement studies capitalized on larger, more detailed datasets, allowing for the introduction of control neighborhoods and the use of more advanced statistical techniques in an attempt tease out the independent effects of gentrification on residential displacement. Many of these studies also pay much closer attention to the impacts on disadvantaged households rather than studying displacement of the general population.

In one of the first attempts to use more detailed, disaggregate data to understand the displacement impacts of gentrification, Rowland Atkinson (2000) combined cross-sectional and disaggregate longitudinal census data for London. To proxy gentrification, he used increases in the number of professionals and managers in the neighborhood whereas he approximated displacement by decreases in the number of residents from the following vulnerable groups: working class, unskilled labor, renters, unemployed, people of color, elderly and single parent households. From this analysis he found a clear link between the rise in gentrification and displacement of vulnerable groups. Atkinson was one of the first to focus on specific vulnerable populations in his operationalized definition of displacement. Yet he cautioned that the study at the large ward and district scale with “noisy” data does little to provide a deeper understanding about the impacts of displacement, for which he suggests more qualitative research.

In response to the growing negative perception about the impacts of gentrification, in 2001 Jacob Vigdor asked if low-status households were more likely to exit housing units in gentrifying zones relative to other parts of the Boston metropolitan area. He analyzed aggregate census data and the American Housing Survey data by running a regression of

residential stability on location in a gentrified zone, which had populations of roughly 100-200,000 people. Although he did not limit his analysis to this, he generally defined preference-driven gentrification as increased educational attainment and income-driven gentrification as increased owner-occupied housing values. In addition, he did not specify what constitutes displacement, but rather proxied it as any exit from a neighborhood that falls within a general “gentrifying region.” Vigdor found that housing turnover was greater in gentrifying zones; however, educational attainment, which he used as an indicator of poverty, appeared to predict housing stability rather than turnover when interacted with location in a gentrified zone. Furthermore, he found that a poor household was more likely to exit poverty than to be replaced by a non-poor household. Vigdor’s study emphasized the difficulties in characterizing the counterfactual: what would have happened to low income residents if gentrification had not occurred? He chose to compare the moves of low-status households in gentrifying zones to non-gentrifying zones, however the large zones could significantly smooth over neighborhood variability, thereby limiting his ability to answer the question he asked.

Lance Freeman and Frank Braconi (2004) hailed the potential benefits of affluent households moving back to central cities and sought to help governments evaluate the potential negative consequences of policies to promote gentrification. Applying similar methodologies as Vigdor for New York City, with the distinct advantage of having a higher spatial resolution and disaggregate data available from the New York City Housing and Vacancy Survey (NYCHVS), the authors compared the exit rates of poor households in gentrifying sub-boroughs (roughly 47,000 households) to the exit rates of the poor in low-income neighborhoods that did not gentrify. They classified a sub-borough as gentrifying based on higher rates of growth in white populations, monthly rent, educational attainment and median income in contrast to other NYC neighborhoods. They did not, however, include an operational definition of displacement beyond neighborhood exits.

Controlling for life-cycle variables (i.e., age, marital status, children) and housing unit characteristics (e.g., rent, tenure, overcrowding, etc.) in their regression, they found that poor households residing in gentrifying neighborhoods were less likely to move than poor households residing elsewhere. They do note, however, people moving into gentrifying neighborhoods were of a higher socio-economic status than those leaving. Despite these indications of exclusionary displacement, however, Freeman and Braconi state “a neighborhood could go from a 30% poverty population to 12% in as few as 10 years without any displacement whatsoever, providing that all vacated units are rented by non-poor households” (p.50). The authors also note that their findings could be due to the large spatial area and that the lower rates of residential mobility could be due to a lack of affordable housing in familiar nearby locations. In their later study, Newman and Wyly (2006) critiqued Freeman and Braconi’s findings, pointing to the “chain of displacement” arguments that the “gentrified” neighborhoods had already seen the displacement of poor households in decades earlier. Furthermore, they argue, the non-gentrifying poor neighborhood control groups included residents of some of the poorest areas of the city with respective high turnover rates, creating an artificially high standard to use as a control.

Building off this analysis with a nationally representative sample, in his 2005 analysis of data from the Panel Study on Income Dynamics, Freeman compared displacement in poor gentrifying census tracts to poor census tracts that did not gentrify. He defined gentrifying census tracts as those disinvested, low income central city tracts that experienced increased investment and educational attainment. Freeman considered displacement motivated moves as those where residents wanted to consume less space, pay less rent, were evicted, got divorced, joined the armed forces, or other involuntary reasons. Freeman found that rental inflation was a significant predictor of mobility and displacement was higher in gentrifying as opposed to non-gentrifying tracts. He also found that for in-movers the poverty rates declined and educational levels increased more sharply in gentrifying than in non-gentrifying neighborhoods. Freeman also found that moves originating in gentrifying neighborhoods were more likely to end outside of the neighborhood when compared to the counterfactual non-gentrifying neighborhoods. He defined this pattern, however, as succession (or reverse filtering), rather than exclusionary displacement. Despite his significant findings, Freeman concluded that the overall rate of displacement was very small, since the probability of a household in a gentrifying neighborhood being displaced was “only” 1.3% (Freeman 2005). Given the fact that this data is nationally, not locally representative, the results likely mask a great deal of heterogeneity between metropolitan areas and even within Census tracts.

In response to the media’s interpretation of the previous studies that gentrification benefits all, Newman and Wyly (2006) reanalyzed the NYCHVS data, adding a qualitative component to their research. Given the limitations from the dataset, they were only able to look at the sub-borough in their quantitative analysis. Narrowing their analysis of displacement to households that moved for reasons of housing expense, landlord harassment, and displacement by private action (condo conversion, etc.), they found between 6-10% of all moves in New York City from 1989 to 2002 were due to displacement. They argued that this could be a significant under-estimate, however, due to the inability of the NYCHVS data to capture “doubling up” or staying with relatives, which they found from their qualitative analysis to be an important coping strategy. For the qualitative component of their study, the authors interviewed 33 key informants to assess the catalysts for physical, demographic, political and economic change. Their interviews revealed tremendous displacement pressures resulting in crowding, homelessness or people moving out of the neighborhood or even city. None of these dynamics, the authors note, were captured in the NYCHVS. Despite the significance of their modeled results, the authors emphasize the low predictive power of the model, which they attribute to deficiencies in the dataset. Furthermore, and similar to the limitations of previous studies, their spatial unit of the sub-borough was too large to fully understand neighborhood dynamics.

In a more recent analysis, McKinnish et al. (2010) analyzed the confidential national Census Long Form data from 1990 and 2000 to understand who moves into and out of gentrifying neighborhoods, which they defined as low-income tracts in 1990 where the average household income increase by over \$10,000. They did not explicitly define displacement, although they do look at exit rates of specific vulnerable population groups. The authors found that migrants into gentrifying tracts were more likely to be higher income, college

educated, younger, white and black and less likely to be Hispanic, have children and be immigrants when compared to non-gentrifying low-income tracts. McKinnish and coauthors also found that 33% of the income gains in gentrifying neighborhoods was due to the in-migration of middle-income black households. They found little difference between the in-migration rates of non-college educated black households between gentrifying and non-gentrifying neighborhoods, leading them to conclude that exclusionary displacement was not occurring. They also found “modestly” high exit of low-education and retention of high-education households in gentrifying neighborhoods. Although this study improved upon previous studies with its access to household-level data, it suffered from methodological limitations of the Census sample size (one in six) that could differ from the census tract populations, the narrow definition of gentrification (including an influx of higher-income residents but not capital, i.e., higher property values), the possibility that neighborhood change may occur at a smaller geography than the census tract, and the masking of geographical variability (e.g., differences between strong versus weak market cities).

Wyly and coauthors (2010) updated their 2006 study using more recent NYCHVS data (2002-2008), asking if recent changes in housing assistance and rent regulations altered the choices available to displaced renters. Using slightly modified methods, the authors compared the number of people moving out of a neighborhood to the number of people moving into a neighborhood as a means of analyzing displacement pressures, maintaining their definitions of gentrification and displacement from their previous study. The authors found that annualized displacement rates ranged from a minimum of about 10,000- 20,000 households per year, however they emphasized the considerable uncertainty in these estimates. When comparing their results to local eviction data, the authors estimate that the NYCHVS misses twelve out of thirteen displacements. Wyly and coauthors also ran a regression model finding that poor households with high rent burden were nearly twice as likely to have been displaced in comparison to other groups. While their statistical analysis did not find any significant relationship between household composition (i.e., race) and displacement the authors note that “the interwoven relations of urban life should not be obscured by the illusory cleanliness of a multivariate test...Insignificant estimates do not mean that race, gender, or family structure are irrelevant just that they are inextricably bound up with other circumstances” (p.2615). Furthermore, they explained that household composition is determined partly by how people and families cope with high housing costs and displacement; that is, the variable is endogenous. Despite certain innovations, this study suffered from some of the same methodological limitations as their previous study, namely those relating to the geographic resolution of their dataset.

Finally, Ellen and O’Regan (2011) used a nationwide data from the American Housing Survey to compare characteristics of households that moved into or out of gentrifying neighborhoods to better understand how and why neighborhoods experience income gains. The longitudinal nature of this dataset, which follows housing units over time, allowed for the researchers to identify the characteristics of households that moved both out of and in to gentrifying neighborhood, which they defined as neighborhoods experiencing a 5% gain in income relative to the metropolitan area. For displacement rates they calculated 2-year exit rates and modeled them as a function of neighborhood income

gains controlling for a series of household lifecycle characteristics. They found that neighborhood income gains did not predict household exit rates, even among vulnerable groups. Age, renter and minority status did predict exit rates for the overall sample, including gentrifying and non-gentrifying tracts. As opposed to other authors (e.g., Newman et al.), Ellen and O'Regan make no mention of the low predictive power of their models (R^2 of 0.122). Instead they take their results to indicate that there is “no evidence that original residents – even renters and poor households – exited these communities at elevated rates” (p.94). The authors suggested that selective entry and exit among homeowners were key drivers of neighborhood change. To some, however, such selective entry would be an indicator of displacement. The most significant shortcomings of this study were the narrow definitions of gentrification (not including private investment), the lack of information about reasons for moving, as well as the masking of geographic variability.

Although varied in their approaches, questions and results, one consistent finding across these studies is that in-movers to gentrifying neighborhoods are wealthier, whiter and of higher educational attainment and out-movers are more likely to be renters, poorer and people of color. The research also consistently shows that rent appreciation predicts displacement. A number of the above studies also found that government intervention on the housing market through rent stabilization and public housing programs are protective factors limiting the displacement effects of gentrification. However, the studies are not consistent in their finding that gentrification induces displacement. Why the discrepancy? One possible explanation for the unexpected residential stability is that in neighborhoods that are gaining new amenities (along with new residents), the normal neighborhood transition process slows; residents try harder to stay in the neighborhood, even if it means paying more rent in exchange (Chapple 2014). Yet, these higher rent burdens are unlikely to be sustainable over the long term, resulting in displacement in a longer term framework than is typically measured. In the following section we review some of the methodological limitations discussed above as a means to consolidate and advance future research directions.

Finding: Despite severe data and analytic challenges in measuring the extent of displacement, most studies agree that gentrification at a minimum leads to exclusionary displacement and may push out some renters as well.

Challenges to Understanding Displacement

Most studies reviewed here suffer from significant data limitations and consequently limited advances in understanding what drives displacement and how to predict it. In this section we review the most common methodological limitations contributing the conflicting and ambiguous understanding about the relationship between revitalization/gentrification and residential displacement. Among other limitations, we review the following four below: 1) inconsistent definitions and operationalization of the terms gentrification and displacement, 2) differences in the definitions of a comparison group and controls to calculate and compare displacement rates, 3) the time-scale of analysis that may not capture the full processes of neighborhood change, 4) ambiguous criteria against which to determine the significance and meaning of research results.

Together, these challenges limit the ability of researchers to adequately capture the full magnitude and impact of gentrification and displacement.

Each of the above reviewed studies defined and operationalized the concepts of gentrification and displacement in slightly different ways, not only making it difficult to compare across studies, but also significantly impacting the results achieved. For some, displacement only encompasses evictions whereas others include such concepts as exclusionary displacement and even chains of displacement (i.e., Millard et al. not reviewed here). The vast majority of studies narrowly define displacement under what Marcuse would classify as physical or economic displacement, but ignore or dismiss exclusionary displacement as simply succession and replacement. This limitation results not only from data and methodological limitations, but also normative understandings of what constitutes forced displacement. Where one study may claim to find evidence of displacement (at least of the exclusionary kind) because in-movers are becoming whiter and more affluent, other authors may define such phenomena as merely succession or replacement. How we define the phenomenon matters for how we interpret the results. Furthermore, the definition and operationalization of gentrification is highly varied and very few authors attempted to systematically capture the many dimensions of gentrification. In almost all of these studies (with the exception of Freeman) gentrification is proxied for by income change rather than private or public investment. However, an influx of capital into a neighborhood might have much stronger impacts on resident stability than simply higher-income households moving next door. Furthermore, the link between what predicts gentrification and subsequently displacement has not been made. It is important to not only understand if gentrification predicts displacement, but what dimensions of gentrification and what factors spurring gentrification also cause displacement.

Another key limitation is a consistent and clear identification of a comparison group. While some argue we should be comparing displacement from poor gentrifying neighborhoods to non-gentrifying poor neighborhoods (i.e., Freeman 2005 and Vigdor 2001), others believe we should be comparing to city-wide averages or more stable neighborhoods in general (i.e., Newman and Wyly 2006). Furthermore, some studies calculate displacement as a percentage of all movers or as a percentage of all households, either city-wide or by neighborhood. These comparison groups are important because they not only provide a context against which to evaluate results, but also reveal belief systems about our normative understandings of how neighborhoods should function. More and more, researchers are becoming more transparent about the reference population and control groups, which is a trend that needs to continue.

Further obscuring the relationship between gentrification and displacement are the issues of timing. Neighborhood change is a long process, and many of the studies examined above only look at relatively short time periods. In its early phases, gentrification may not result in displacement, but over time, in the absence of protections, tenants may be forced to move. As a result, the principal barrier to studying the relationship is the lack of appropriate panel data to determine the extent of mobility and displacement. Furthermore, if one is to consider the full chains of displacement, as suggested by Marcuse, it would be

important to extend our analysis to the period prior to gentrification to carefully consider disinvestment-related displacement as part of the gentrification-displacement phenomenon.

Finally, the review of this literature highlights the lack of any consistent measure or criteria against which to interpret study results. Whereas some studies highlight the low predictive power and limited interpretability of their modeling results (i.e., Wyly et al. 2010) others barely even report on the statistical significance of their results or even when statistically significant (i.e., Vigdor 2001), minimize the relevance of findings based on the statistical magnitude of the effect. These inconsistencies are not unique to studies of gentrification and displacement, but rather social scientific inquiry in general. This likely highlights the underlying belief systems of ultimately subjective nature of social science research. For instance, some authors interpret their statistically significant results of the higher rates of displacement in gentrifying neighborhoods to be too small to be of concern (Freeman 2005). But for other researchers, such results are of concern because they significantly impact real people in real neighborhoods. Whether the impact is large or small is a relative interpretation that lies in the eyes of the beholder. This limitation, which mirrors the differences in the definition of the reference population and control groups, should be carefully examined, made transparent, and its implications should be discussed in any study that has the potential to impact real lives.

Much of the methodological limitations discussed above are ultimately data-driven. Where more detailed disaggregate data exist, it lacks information about households' reasons for moving (i.e., PSID or the Census long form) and does not have sufficient spatial resolution or coverage to contribute to local knowledge (i.e., National Household Survey). Where local data is available, it may not contain information about where displaced households are displaced from (i.e., NYHVS). Without panel data, it is not possible to understand the nature of turnover in a neighborhood (i.e., whether neighborhood household income changes are occurring to existing residents or newcomers). But even when datasets such as the American Housing Survey (the confidential panel version) or the Panel Study of Income Dynamics allow tracking of individual households, their responses to questions about reasons for moving are not precise enough to measure displacement (e.g., there is no answer option for "the landlord raised the rent"). For this reason it is important to not only compare and combine data sets as much as possible but to carefully understand and explore the implications of the data limitations as much as possible.

Finding: Previous studies have failed to build a cumulative understanding of displacement because they have utilized different definitions, compared different populations, and adopted a relatively short timeframe; there is not even agreement on what constitutes a significant effect.

Indicators for Analyzing Residential Displacement

As is evidenced from the above review, researchers have used myriad indicators and sources of data for characterizing residential displacement, each with its own set of advantages and disadvantages. In this section we summarize the types of indicators and data used to analyze such indicators, highlighting the typical sources of such data. It is

important to note that this table summarizes quantitative data sources only. As discussed above, data on many of the drivers and impacts of gentrification and displacement are not regularly gathered or are hard to quantify. It is therefore important to consider qualitative sources of information to better understand the drivers and impacts of neighborhood change.

Table 1 Indicators and Data Sources for Analyzing Gentrification and Displacement

Indicator Type	Indicators	Data sources
Change in property values and rents	Sales value, property value	County tax assessor's office, Department of finance, data aggregator
	Rent	Data aggregators, apartment operating licenses, craigslist
	Changes in availability of restricted affordable housing	HUD, housing departments
Investment in the neighborhood	Building permits, housing starts, renovation permits, absentee ownership	Jurisdiction's building or planning departments
	Mortgage lending and characteristics	HMDA and assessor data
	Sales (volume and price	County assessor's office, data aggregators
	Condo conversions	Assessor office, housing department, department of public works
	Change in community and business orgs (#, membership, nature of activities, etc.)	Chamber of commerce, NETS, neighborhood or local business associations, etc.
	Public investments (transit, streets, parks, etc.)	Public works departments, transit agencies, parks and rec, etc.
Disinvestment	Building conditions, tenant complaints, vacancies, fires, building condemnation,	Surveys, Census, maps, building departments, utility shut-offs, fire department
	School quality, crime, employment rates, neighborhood opportunity	Department of Education, Police Departments/crime maps, Census, Bureau of Labor Statistics
	Neighborhood quality	Local Surveys
Change in tenure and demographic changes	Tenure type, change in tenancy	Building department, assessor's office, census
	Evictions	Rent board, superior court
	Foreclosure	HUD, proprietary data sources
	Demographics data on in- vs. out-movers (race, ethnicity, age, income, employment, educational achievement, marital status, etc.)	Census, voter registration, real estate directories, surveys, American Housing Survey, DMV
Investment potential	Neighborhood and building characteristics (e.g., age and square footage, improvement-to-land ratio)	Tax assessor, Census, Deeds, etc.
	Neighborhood perceptions	Surveys of residents, realtors, lenders, neighborhood businesses, Newspapers, TV, blogs, etc.
Reasons that people move in/out of 'hood	Reason for move	Surveys of in- and out- movers, HCD housing discrimination complaints

		database.
Coping strategies / displacement impacts	Crowding/doubling up	Census, utility bills, building footprint
	Increased travel distance and time	Census

Implications for Strong versus Weak Markets

The intensity of gentrification, as well as how it is experienced by local residents, will differ according to market context. Where economic growth is above average and demand for land is strong, new private and public investment can accelerate neighborhood change and push up property values. This process likely transforms neighborhood meanings and crowds out existing residents. Where the economy is more tepid, the new investment will also transform neighborhoods, but may not have the same displacement effects. The Center for Transit-Oriented Development (2013) has illustrated this market variation: new fixed rail investments have transformed some neighborhoods while leaving others essentially unchanged.

Yet, the existing literature on gentrification and displacement fails to acknowledge these market differences. Many studies examine strong market cities such as New York, San Francisco, and London, with findings that may not be at all applicable to weaker market regions or even neighboring cities. Although these case studies provide some of the most methodologically rigorous analyses of neighborhood change processes, they do not provide systematic comparisons across market types. Where studies do look across market types, they typically try to predict change across many different metropolitan areas without controlling for local economies. As a result, these more systematic models likely have poor predictive value for individual metros. This in turn raises questions of the utility of these analyses for local policymakers.

Finding: Existing studies rarely account or proxy for regional market strength, which undermines their relevance to particular contexts.

Urban Simulation Models and Neighborhood Change

In recent years, a number of computational models have sought to simulate aspects of neighborhood change associated with gentrification. The models discussed here fall into two broad categories: those that address the phenomenon of gentrification explicitly, and those that focus primarily on processes of residential choice and residential segregation, patterned after Schelling's early model of neighborhood "tipping" along racial lines (Schelling 1971). Roughly following the same division, the simulation models in the literature can also be grouped according to their structure. Models focusing on representing the movement of individuals and households into spatial patterns of settlement tend to be specified through "agent-based models," also referred to in the literature as "multi-agent systems," while models that focus on capturing inter-related patterns of change among spatially fixed entities (such as housing units or entire neighborhoods) tend to be specified through cellular automata (Torrens and Nara 2007). Additionally, a number of hybrid model specifications contain both spatially fixed automata

and spatially mobile agents (Torrens and Nara 2007; Diappi and Bolchi 2013). The integrated land use and transportation models utilized by metropolitan planning organizations (e.g., UrbanSim and PECAS) simulate the individual decisions and interactions of agents (e.g., households, businesses), fixed physical characteristics of urban environments (e.g., buildings and transit) as well as larger structural constraints (e.g., land use regulations) (Johnston and McCoy 2006).

Despite their compatibility with the study of residential spatial dynamics, relatively few simulation models have been specified to focus explicitly on gentrification. One explanation for this paucity is the difficulty of adequately incorporating the breadth of social theory needed to account for the range of gentrifying mechanisms (Torrens and Nara 2007). Here we analyze four studies that attempt to simulate neighborhood economic and racial change. In developing the first widely published work on gentrification-based computational models, O'Sullivan (2002) relies heavily on Smith's rent gap theory for specifying the structure of his cellular automata model of gentrification in a region of East London. Specifically, O'Sullivan sets out to model the role of neighborhood status in determining the "gap" in a given parcel's potential and capitalized rents and the gap's impact on states of "for sale," "owner-occupied," "for rent," and "rented" (O'Sullivan 2002; p. 260). In assessing the performance of the model, O'Sullivan suggests to nest the neighborhood within a broader urban structure, allowing neighborhood status to better reflect position within a wider city hierarchy.

Diappi and Bolchi (2013) model gentrification in Milan through a specification of "active agents," including real estate investors, housing owners and housing tenants; and "passive agents," which they specify as individual buildings. Within this general structure, investor agents choose to develop housing based on city-wide assessments of rent gaps, housing owner agents make housing upkeep decisions based on localized market conditions, and tenant agents sort themselves into different housing units based on housing conditions, rents, and their (heterogeneous income-based) ability to pay. Additionally, potential rents are shaped by local amenities and proximity to the city center. Finally, the amount of capital that investor agents have to spend is shaped by exogenous business cycles (Diappi and Bolchi 2013; pp. 89-90).

Similarly, Torrens and Nara, in a simulation of gentrifying change in Salt Lake City, specify properties and aggregations of properties as "fixed automata" and residential households as "mobile automata," which they liken to agents. Torrens and Nara reference the importance of capital-driven supply-based approaches to modeling gentrification and include demand-based drivers of gentrification. Within this general framework, they generate nested patterns of behavior between household agents, large neighborhood markets that they chose to either enter or stay in, and specific housing properties within the market of choice. A number of variables drive the dynamics of these moves including spatial amenities and economic prosperity at the market level; price, housing quality, and spatial amenities at the property level; and economic status, amenity preferences, and moving thresholds at the household level. Notably, ethnicity (Latino or non-Latino) is also included as a state variable for both households and properties.

Finally, Jackson and coauthors (2008) utilize an agent-based model to study gentrifying patterns in Boston. While the structure of their model is similar to those of Diappi and Bolchi (2013) and Torrens and Nara (2007), they operationalize gentrifying change as being driven by demand-side consumer decisions, rather than by supply-side development decisions, justifying this approach by pointing to the absence of an observed relationship between large-scale neighborhood investment projects and changes in nearby rents in Boston between 2003 and 2007. The residential dynamics simulated by Jackson et al. are driven by the interactions of four classes of agents: professionals, students, non-professionals, and elderly, each of whom are motivated by varying abilities to pay and preferences for neighborhood composition and amenity access.

The above four models, while exemplars of computational modeling approaches to gentrification, all suffer from a related set of limitations. First, each of the above models is constrained in its ability to theoretically ground mechanisms of neighborhood change. While the work of O'Sullivan (2002) and Diappi and Bolchi (2013) is well-grounded in Smith's rent gap theory, it does not incorporate competing theories of the drivers of gentrification, notably those focusing on the housing demand of gentrifying populations and their particular set of locational preferences. Similarly, all four models are limited by a lack of important empirical detail, both in their specifications of agent attributes (such as agent incomes and baseline parcel rents), as well as in their specification of neighborhood choice and parcel change mechanisms. An important example of the latter drawback is in the incorporation (or lack thereof) of race and ethnicity in the models. Despite empirical work demonstrating the importance of race above and beyond income in shaping housing decisions (see Charles 2003; Pais, South, and Crowder 2012) the majority of the models covered here do not include any measure of race or ethnicity.

Looking beyond models that explicitly simulate gentrification, a number of computational models examine processes of neighborhood segregation. The seminal model on which much of this work draws upon was specified by Schelling (1971) in an attempt to account for the dynamics of residential segregation between whites and blacks. In his model of residential movement on a simple grid, Schelling demonstrates that when whites and blacks are ascribed thresholds of same-race neighborhood preference, they can generate very sharp patterns of segregation, even when their preference thresholds are relatively innocuous.

More recent efforts have extended on this model in a number of ways (summarized by Huang et al. 2013). For instance, various extensions have modified the structure of neighborhood composition preferences and attached them to empirical estimates of residential preference (Bruch and Mare 2006; Xie and Zhou 2012), situated models in realistic and empirically grounded urban environments (Crooks 2010; Yin 2009), gone beyond binary racial distinctions to include interactions among a greater diversity of agents (Ellis et al. 2012; Clark and Fossett 2008), and incorporated competing sets of non-racial preferences (K. Chen et al. 2005). The range of residential choice mechanisms explored in these model extensions hold the potential to help refine and improve the incorporation of race in simulations of gentrification.

Finally, researchers are beginning to use integrated land use and transportation models to simulate neighborhood composition and gentrification. Using the Simple Integrated Land-Use Orchestrator (SILO) model, Dawkins and Moeckel (2014) analyzed the impact of an inclusionary housing program and more compact development for Washington, D.C. on neighborhood gentrification. The SILO model accounts for household relocation constraints, housing costs, transportation costs, and travel times, but not race and ethnicity. No simulation model to date has been used to explicitly study residential displacement.

Finding: Urban simulation models are guided by consumer decision-making, rather than the development decisions – flows of people rather than capital – and have neglected the role of race; thus they may not capture complex gentrification dynamics.

Moving from Research to Praxis: Prediction and Mitigation

A number of researchers have developed models and analyses to aid activists and governments to better understand, predict and plan for neighborhood change. One of the earlier iterations of work predicting gentrification is a presentation by researchers from the Urban Institute (Austin Turner and Snow 2001). Analyzing data for the DC area, they identified the following five leading indicators as predictive of future gentrification (defined as sales prices that are above the D.C. average) as low priced areas that are: 1) adjacent to higher-priced areas, 2) have good metro access, 3) contain historic architecture, 4) have large housing units, and 5) experience over 50% appreciation in sales prices between 1994 and 2000. Census tracts were scored for each indicator and then ranked according to the sum of indicators with a maximum value of 5. This ranking system is one of the first recorded attempts to create a policy-relevant tool to analyze and predict gentrification, however the presentation did not include their methodology nor an evaluation of the results.

In a 2001 discussion paper prepared for the Brookings Institution and PolicyLink, Kennedy and Leonard conducted a literature review, case studies and stakeholder interviews to determine the predictors, impacts and responses to neighborhood gentrification (Kennedy and Leonard 2001b). From this research they identified the following factors to be predictive of gentrification:

- | | |
|---|---|
| a) high rate of renters, | h) large rent gap, |
| b) ease of access to job centers, | i) urban amenities, |
| c) high and increasing levels of metropolitan congestion, | j) targeted public sector policies (e.g., tax incentives, public housing revitalization, construction of transit facilities, disposition of city owned properties, code enforcement, etc.), |
| d) high architectural value, | k) growing preference for urban amenities. |
| e) comparatively low housing values, | |
| f) high job growth, | |
| g) constrained housing supply, | |

In addition, they characterized the following factors as indicative that the process of gentrification was already underway: a) shift in tenure, b) increase in down payment and

decrease in FHA financing, c) influx of households interested in urban living, and d) increase in high income serving amenities such as music clubs, coffee shops, galleries, etc.

In 2009, sponsored by the Association of Bay Area Governments, Karen Chapple at the Center for Community Innovation (CCI) at UC Berkeley conducted an analysis of neighborhood change in the San Francisco Bay Area from 1990 to 2000 and used the results of this analysis to predict neighborhood susceptibility to gentrification (Chapple 2009). Chapple adopted Freeman's (2005) definition of gentrifying neighborhoods as low-income census tracts in central city locations in 1990 that by 2000 experienced housing appreciation and increased educational attainment above the 9-county regional average. The author then constructed a multivariate statistical model that had gentrification as the dependent variable, and a set of 19 socio-economic, locational and built environment factors for 1990 as independent variables¹⁰. Based on the outcome of the regression, Chapple determined the direction, significance and rank of the variables. The author assigned a value of 1 if census tracts scored above the regional average for each of the 19 predictive variables and summed across the variables. With a maximum score of 19, tracts were determined highly susceptible if they scored 16 or higher and of moderate susceptibility with scores between 13 and 15. No analysis or prediction of displacement or exit rates was included in this study as neighborhood gentrification and change was the object of analysis.

The Dukakis Center for Urban and Regional Policy (2010) conducted an analysis transit oriented development and its association with neighborhood gentrification and displacement (Pollack, Bluestone, and Billingham 2010). Analyzing 42 neighborhoods (block groups within ½ mile of a transit station) near rail stations in 12 metro areas across the United States, they studied changes between 1990 and 2000 for neighborhood socio-economic and housing characteristics (e.g., # units, racial composition, household income, auto ownership, etc. and compared it to the metropolitan area to determine if patterns in transit oriented neighborhoods differed significantly (i.e., over 20%) from non-transit oriented neighborhoods. They found that rail-served neighborhoods were more likely to experience higher rates growth in population, production of housing units, household incomes, housing costs, in-migration, and car ownership when compared to the averages for the respective metropolitan areas. To discern whether gentrification occurred more often in neighborhoods with initially high proportions of renters rather than homeowners, they looked for a correlation between the rate of homeownership in 1990 (before the transit station opened) on the one hand and both the percentage change in the non-Hispanic white population between 1990 and 2000 and the percentage change in median household income between 1990 and 2000 on the other. In both cases they found that a higher initial proportion of renters was correlated with a larger change in racial and ethnic composition and larger increases in median household income.

¹⁰ % of workers taking transit, density of youth facilities, density of public space, density of small parks, % non-family households, % of dwelling units in buildings with 5+ units, % of dwelling units in buildings with 3-4 units, % renter-occupied, Public housing units, income diversity, % of renters paying > 0.35 of income, distance to San Jose, % of dwelling units with three or more cars available, density of recreational facilities, % married couples with children, % non-Hispanic white, median gross rent, % of owners paying > 0.35 of income, Distance to San Francisco

Applying the same methodology he used to study gentrification and displacement in London, in 2011 Atkinson and coauthors characterized household vulnerability to displacement from neighborhoods that gentrified between 2001 and 2006 in the Melbourne and Sydney greater metropolitan areas. A vulnerability score (from 1-13) was measured based on tenure, number of employed persons per household, and occupation, ranking owner-purchaser, two income, professional households at the least vulnerable end of the scale (1) and working age private rents not in the labor force at the most vulnerable (13). Displacement rates were calculated by dividing the number of out-migrants with vulnerability characteristics by the number of households with these characteristics exposed to the likelihood of moving in 2001. Gentrified neighborhoods were defined by projecting the population for various sub-groups (e.g., low-income) and comparing projected to actual populations. Neighborhoods that had higher than projected numbers of high income, occupied and professional populations were designated gentrified.

Building off the same methodology as Chapple (2009), LISC researchers constructed a model predicting gentrification in neighborhoods of Houston (Winston and Walker 2012). They created a narrower definition of gentrifying neighborhoods by restricting the label to those that experience increases in a neighborhood's median incomes, median housing values, and educational attainment that are at least 10 percent higher than for all Houston neighborhoods. They began with the same list of independent variables (excluding the locational and income diversity ones), and added several others such as percent poverty, vacancy rates as well as dis-amenity variables such as industrial land uses for 1990. In addition, they included in the regression changes in the variables between 1990 and 2000. From this original list of 32 only seven variables¹¹ were significantly associated with gentrification rates and were included in the susceptibility model. Rather than scoring tracts like CCI, the LISC researchers used the regression coefficients and continuous independent variables in predicting the rate of gentrification, resulting in higher predictive accuracy. Validating their model using 2007 (2005-2009) ACS data, they found 86% accuracy for highly susceptible tracts (i.e. those that the model predicted were 75% likely to gentrify) and 60% accuracy for moderate susceptibility (i.e., between 50% and 75% likelihood).

A recent study in Portland by Lisa Bates (2013) set out to predict market changes based on a small set of indicators (vulnerability to displacement, demographic changes, and housing market conditions). She defined tracts as vulnerable to displacement in 2010 when they had higher-than-average populations of renters, communities of color, lack college degrees, and had lower incomes. For housing market conditions Bates defines neighborhood market typologies as 1) adjacent tracts (low/moderate 2010 value, low-moderate appreciation, touch boundary of high value/appreciation tract), accelerating tracts (low/moderate in 2010 with high appreciation rates), and appreciated tracts (low or moderate 1990 values, high 2010 value, high 1990-2010 appreciation). Combining this

¹¹ % of non-family households 1990, % of dwelling units in buildings with 5+ units 1990, % of dwelling units with three or more cars available 1990, number of youth facilities, Δ in % of married couples with children 1990 – 2000, Δ in % of non-family households 1990 – 2000, Δ in % of renter-occupied units 1990 – 2000

information with demographic shifts for vulnerability factors (see above) between 2000 and 2010, the identified the following neighborhood typologies:

1. Susceptible tracts: are near high-value and/or high-appreciation tracts, but still have low or moderate home values and appreciation rates. They have vulnerable populations and are not yet experiencing demographic change indicative of gentrification.
2. Early: Type 1 tracts experienced high appreciation rates over the last decade, but still have low or moderate home values. Their populations are vulnerable but no gentrification-related demographic change has occurred.
3. Early: Type 2 tracts are near high-value and/or high-appreciation tracts but still have low or moderate home values and appreciation rates. They have vulnerable populations and have experienced demographic change indicative of gentrification.
4. Dynamic tracts experienced high appreciation rates over the last decade but still have low or moderate home values. They exhibit demographic change indicative of displacement but still have vulnerable populations.
5. Late tracts had low or moderate median home values in 1990, but experienced high appreciation over the last two decades and are now high-value tracts. They have experienced gentrification-related demographic change, but still have populations that are vulnerable.
6. Continued loss tracts are also high-value areas that experienced high appreciation over the last two decades starting from low or moderate 1990 values. They no longer have above-average levels of vulnerable populations, but exhibited high levels of demographic change over the previous period, and remaining vulnerable households may be in a precarious situation.

Bates then uses these typologies to recommend how to tailor policy approaches to the specific characteristics and needs of neighborhoods.

Finally, the Puget Sound Regional Council together with the Center for Transit Oriented Development created a typology of neighborhoods as part of their “Growing Transit Communities” Strategy (PSRC 2013). They constructed a “people profile” and “place profile” matrix and aligned policy responses according to neighborhood typology. The people profile consisted of a social infrastructure/access to opportunity axis comprised of a composite indicator of education, economic health, housing and neighborhood quality, mobility and transportation, and health and environment. The other axis - change/displacement - measured risk of displacement due to recent neighborhood change, current community risk factors, and current and future market pressure. Data used to quantify these factors relate to income, education, race and ethnicity, household type, housing tenure, and residential market strength measured at the block group level and were categorized into low, potential and immediate risk. Low risk communities tend to be moderate to higher income communities and/or communities with lower market pressures. Immediate risk communities tend to have indications that displacement of lower income populations has begun, higher current market strength, and/or high number of community risk factors. Potential risk communities are those that have a weak market strength and therefore do not face imminent displacement risk; however they also exhibit

numerous community risk factors that suggest needs for community stabilization efforts to avoid future displacement risk should market forces change.

The place profile also consisted of two dimensions: the degree to which a transit community's physical form and activity support a dense and walkable transit community (the physical form + activity/transit orientation axis) and the likelihood that the community will change due to real estate market strength (the change / market strength axis). The physical form+activity/transit orientation axis measures the degree to which a community's place characteristics are transit-oriented—with a form and activity level that support a dense and walkable community served by high-capacity transit. The composite index includes five sub-measures: pedestrian infrastructure, transit performance, physical form, population and proximity a mix of uses. The change / market strength axis measures the strength of the residential TOD market, which was intended to evaluate the potential demand for residential transit-oriented development, includes measures related to the real estate market, employment patterns, density, and household income and size. Combining the people and place typologies, they identify 8 general typologies, for each of which they identified implementation and policy approaches.

Finding: Many different descriptive toolkits offer typologies of neighborhood change, but few have analyzed the causality behind it, limiting the usefulness of such tools to predict and mitigate change.

Conclusions

Scholarly interest in the relationship between investment and displacement dates back to the 1970s, in the aftermath of displacement related to urban renewal. More recently, a new wave of scholarship examines gentrification, primarily in strong market cities, and its relationship to public investment, particularly in transit. The results of these studies are mixed, due in part to methodological shortcomings. However, the following findings emerge across the literature:

- Influential early models of neighborhood change present processes of succession and segregation as inevitable, underemphasizing the role of the state.
- Neighborhoods change slowly, but over time are becoming more segregated by income, due in part to macro-level increases in income inequality.
- Racial segregation harms life chances and persists due to patterns of in-migration, “tipping points,” and other processes; however, racial integration is increasing, particularly in growing cities.
- Neighborhood decline results from the interaction of demographic shifts, public policy, and entrenched segregation, and is shaped by metropolitan context.

- Gentrification results from both flows of capital and people. The extent to which gentrification is linked to racial transition differs across neighborhood contexts.
- Cultural strategies can transform places, creating new economic value but at the same time displacing existing meanings.
- Commercial gentrification can also transform a neighborhood's meaning, but research is mixed on whether it is positive or negative for existing residents and businesses.
- New fixed-rail transit has a generally positive effect on both residential and commercial property values, but its impact varies substantially according to context.
- Preliminary evidence suggests that BRT has limited or no effects on local property values.
- Proximity to high quality schools and parks, as well as access to highways, increases home values.
- Displacement takes many different forms—direct and indirect, physical or economic, and exclusionary—and may result from either investment or disinvestment.
- Despite severe data and analytic challenges in measuring the extent of displacement, most studies agree that gentrification at a minimum leads to exclusionary displacement and may push out some renters as well.
- Previous studies have failed to build a cumulative understanding of displacement because they have utilized different definitions, compared different populations, and adopted a relatively short timeframe; there is not even agreement on what constitutes a significant effect.
- Existing studies rarely account or proxy for regional market strength, which undermines their relevance to particular contexts.
- Urban simulation models are guided by consumer decision-making, rather than the development decisions – flows of people rather than capital – and have neglected the role of race; thus they may not capture complex gentrification dynamics.
- Many different descriptive toolkits offer typologies of neighborhood change, but few have analyzed the causality behind it, limiting the usefulness of such tools to predict and mitigate change.

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Appendix 1 Summary of Racial Transition and Succession Studies

Authors	Scale	Units of Analysis	Study Methods	Conclusions
Bostic and Martin (2003)	Nationwide (50 largest metros)	Census tract	The authors use census data from 1970 through 1990 to identify "gentrifiable" and gentrifying tracts. They then model different levels of black homeownership in these tracts over time.	Middle class black homeowners are found to be drivers of gentrification in the 1970s, though this finding loses significance in the 1980s.
Card et al. (2008)	Nationwide	Census tract	The authors use census data from 1970, 1980, 1990, and 2000 to estimate the existence of "tipping points" in neighborhood racial composition, beyond which changes in composition change more rapidly.	The authors find evidence of neighborhood tipping phenomena, with tipping points generally occurring when neighborhoods reach between 5% and 20% non-white. The specific point at which tipping occurs depends significantly on a variety of metro-level variables, including rates of violent crime, past incidences of riots, and measured racial animus.
Charles (2000)	Los Angeles	Individual survey respondents (N = 4,025)	Charles asks respondents of different races and ethnicities (white, black, Latino, Asian) whether they would prefer neighborhoods of various racial and ethnic compositions. The results are then regressed on a number of individual and neighborhood attributes.	Charles finds strong preference for same-race neighborhoods, with this preference particularly strong for white households. Additional modeling shows this preference to decline with graduate education and with younger respondent ages, and to increase with greater levels of racial stereotyping.
Charles (2003)	Literature Review	Mostly census tract and individual household	Charles reviews extant literature on various aspects of residential segregation, including the prevalence of segregation among different population groups, theories and empirics of neighborhood attainment, and patterns of individual neighborhood preference.	Looking specifically at neighborhood attainment, Charles differentiates between "spatial assimilation", which holds that different population groups integrate spatially in accordance with their SES attainment, and "place stratification", which holds that structural factors maintain patterns of spatial segregation, SES notwithstanding. While Charles finds much disagreement within the literature, there appears to be greater evidence for "place stratification" holding among black households.
Chipman, Wright, Ellis, and Holloway (2012)	Chicago	Census tract	Chicago neighborhoods are classified cross-sectionally according to race/ethnicity composition and tracked in their transitions from 1990 to 2010. The authors focus specifically on integrating descriptive results into an interactive mapping tool.	As with other studies the authors noted processes of diversification outside of Chicago's urban core, though they also noted a subset of "low-density, black-dominated tracts, whose numbers and locations barely changed during the past 20 years."

Authors	Scale	Units of Analysis	Study Methods	Conclusions
Crowder and South (2005)	Nationwide	Family	Using Panel Study of Income Dynamics longitudinal data from 1970 through 1997, the authors model the likelihood of black and white households transitioning between poor and non-poor tracts.	Across all years of the study, black-headed households are less likely than white-headed households to move from poor to non-poor tracts and more likely to move from non-poor to poor, after controlling for a number of factors. The racial discrepancy in both of these migration rates declined over time, however.
Crowder et al. (2011)	Nationwide	Family	The authors use Panel Study of Income Dynamics (PSID) data to follow panels individual households from 1968 through 2005. They model the likelihood of moving in terms of the immigrant presence in a given neighborhood.	The authors find that both native-born white and native-born black families are more likely to move out of neighborhoods with greater immigrant populations, with this result holding after controlling for a number of neighborhood and individual household variables.
Ellen, Horn, and O'Regan (2012)	Nationwide	Census tract	Census data from 1970 through 2010 is used to classify neighborhoods by race/ethnicity composition and to track the transitions between classifications.	There has been a steady increase in integrated neighborhoods, though a majority of non-integrated neighborhoods have remained so, and a substantial number of integrated neighborhoods have reverted to non-integrated status. Correlates of greater rates of integration include location in a central city and metropolitan growth.
Farrell and Lee (2011)	Nationwide (100 largest metros)	Census tract	Census data are used to categorize neighborhoods by race and ethnicity composition in 1990 and 2000, with transitions between classifications tracked.	Splitting neighborhoods cross-sectionally into those that are "dominant", "shared", "two-group", and "multi-group", the authors then look across time to classify neighborhoods as bifurcating, fragmenting, integrating, or "other". The authors find general trends toward diversification across metro areas, though they did note a subset of tracts experiencing a reduction of diversity through white out-migration.
Freeman and Rohe (2005)	Nationwide	Census tract	The authors identify tracts that received assisted housing (including public housing and housing units constructed under Section 236, Section 8, or the LIHTC program) between 1980 and 1990. The authors then use propensity score matching to test whether these tracts underwent greater racial transition than did comparable tracts that did not receive assisted housing units.	The authors find little evidence that the presence of assisted housing led to a greater outflow of white residents.

Authors	Scale	Units of Analysis	Study Methods	Conclusions
Glaeser (2003)	New York, New Jersey, California	Tenant, city	Glaeser examines the characteristics of tenants in rent-controlled units vs. non-rent-controlled units in New York City, as well examining aggregate statistics for California and New Jersey municipalities with and without rent control.	Rent control tenants in New York City are lower income, and older than tenants overall. They are also more likely to be white, casting doubt on rent control's ability to effect racial integration in the city. Looking at cities in California and New Jersey, Glaeser finds that cities with rent control in California saw less of an increase in rents and incomes than cities without, while the opposite was true for cities in New Jersey. Glaeser takes this as evidence that rent control might marginally increase economic integration in California, while it might be exasperating the concentration of poverty in New Jersey. The paper has little concrete to say with respect to racial segregation.
Hipp (2011)	Multiple cities for which violent crime data is available	Housing unit	The author uses American Housing Survey data from 1976 through 1999 to estimate probabilities of neighborhood out-migration and in-migration relative to crime rates.	Hipp finds that disparate levels of in- and out-migration by race contribute to different exposures to neighborhood crime by race and ethnicity. Controlling for a variety of individual and neighborhood characteristics, white households are more likely to exit neighborhoods with high and rising crime rates, while black and Latino households are more likely to enter into such neighborhoods.
Hipp (2012)	Nationwide	Housing unit	The author uses American Housing Survey data from 1985 to 1993 to predict the race of in-movers to a longitudinally tracked housing unit, based on racial characteristics of the surrounding census tract, an 11-household "micro-neighborhood", and of the prior occupants of the unit.	Same-race proportions at the micro-neighborhood level are better predictors of racial occupancy than are the comparable proportions at the tract level. Accounting for these neighborhood compositions, the race of the prior householder is still strongly predictive of the race of the new occupant. One explanation put forward for this phenomenon is a signaling mechanism, where new residents gain assurance that they belong in a given setting.
Krysan et al. (2009)	Metro Chicago and Detroit	Individual survey respondent (N = ~1,500)	Respondents of different races are shown videos of neighborhoods that vary by class signifiers and racial composition. The respondents were then asked to rate the desirability of the neighborhood.	Controlling for class, white respondents rate neighborhoods with black population and mixed population representation and less desirable than those with white population representation. Conversely, black respondents rated white neighborhoods as less desirable than black neighborhoods, but rated black neighborhoods as less desirable (though not statistically

Authors	Scale	Units of Analysis	Study Methods	Conclusions
				significantly) than mixed neighborhoods.
Lee and Wood (1991)	Nation-wide (58 central cities)	Census tracts	The authors used census data for 58 out of 60 central cities with populations greater than 250,000 in 1970 or 1980 to assess the trajectories of racially mixed neighborhoods during this time period.	The authors find significant variation in tract trajectories based on regional, city, and neighborhood factors. Framing transitions in terms of "succession", "stability", and "displacement", the authors find, for instance, that tracts across different regions that experience either displacement or stability tend to have greater initial population percentages of Hispanic and foreign born residents.
Logan and Zhang (2010)	Nationwide	Census tract	The authors track neighborhood race and ethnicity compositions from 1980 through 2000, looking to examine the role that "global neighborhoods" of high Asian and Hispanic residence play in integrating previously white neighborhoods.	While finding evidence for global neighborhoods, the authors also find that broad patterns of residential settlement are largely maintained through the avoidance by whites of "all-minority" areas, as well as of the out-migration of whites from more diverse neighborhoods.
McKinnish, Walsh, and White (2010)	Nationwide	Census tract	For both 1990 and 2000, the authors use confidential Census data to model household movements into and out of gentrifying neighborhoods (defined by baseline income and income change).	The authors find that largely middle-class black families carry out the income gentrification of low-income black neighborhoods. Conversely, gentrifying neighborhoods with low black populations see an increased outflow of high school-educated black households, though also with a substantial inflow of this same population group.
Ottensmann (1990)	South Bend, IN	Tract	The authors specify and run a set of simulation models to test the increase in neighborhood concentration of black residents between 1980 and 1990. The authors compare the concentration of black residents with and without the presence of black in-migration to the study metro.	The authors find that the in-migration of black residents is a major driver of greater black-white segregation.
Quercia and Galster (2000)	Literature Review	Primarily census tracts and block groups	The authors assess literature on neighborhood threshold effects, assessing theorized mechanisms for such thresholds, the neighborhood attributes on which such thresholds are conceptualized, the analytic methods by which thresholds are identified, and the actual empirical assessment of thresholds.	The authors find the "extant empirical literature" to be "sketchy", though they do see evidence for thresholds or "tipping points" along related socioeconomic measures, whereby neighborhoods have downward trajectories reinforced.

Authors	Scale	Units of Analysis	Study Methods	Conclusions
Reibel and Regelson (2011)	Nationwide (50 largest metros)	Census tract	The authors use a cluster analysis applied to neighborhoods based on their patterns of racial change between 1990 and 2000. They then analyze the distribution of these clusters, including specifying a model to account for the probability of a tract falling in a given cluster.	The authors find substantial regional variation in the prevalence of different transition types. Modeling this, they find that racially stable neighborhoods are more probable in the Northeast and South, transition from white to Hispanic less probably in the South and transition from white to black more probable in the south. They also find differences in transition probabilities based on racial/ethnic composition of metros (e.g. more "moderate integration" in metros with higher Asian population percentages) as well as locational characteristics of individual tracts (e.g. less integration in central cities).
Rosenblatt and Deluca (2012)	Baltimore	Family	The authors conduct interviews with families who have participated in Moving to Opportunity in Baltimore, seeking to understand why a large proportion of such participants moved back to high-poverty neighborhoods after program enrollment.	The authors note reports of families seeking to live in larger housing units in order to accommodate larger family sizes. These units were seen to be more affordable in high-poverty neighborhoods. Moreover, the interviewed families were able to move into such neighborhoods because of copying mechanisms developed during prior stays in distressed neighborhoods.
Sampson (2012)	Chicago	Family	Sampson uses longitudinal family survey data, as well as detailed information on the characteristics of neighborhoods, to model the neighborhood attainment of moving families.	A number of neighborhoods and household factors beyond mere race, income, and proximity are significantly predictive of where moving families end up. Specifically, similarities in perceived neighborhood disorder and closeness of elite and non-elite social network ties between origin and destination neighborhoods are associated with neighborhood destinations.
Sampson and Sharkey (2008)	Chicago	Family	The authors use longitudinal survey data to tract movement of families originating in Chicago, analyzing these movements in terms of detailed survey responses given by the families and characteristics of the neighborhoods of origin and destination.	The authors find movement between neighborhoods to be heavily patterned by race and class, with aggregate flows of family movements serving to reinforce existing patterns of racial and economic segregation.

Appendix 2 Summary of the Impact of Rail Transit Facilities on Residential and Commercial Property Values

<i>Authors</i>	<i>Rail Mode</i>	<i>Location (Transit Facility)</i>	<i>Methodology Used</i>	<i>Extent of Property Value Impact</i>	<i>Major Conclusions</i>
Ahlfedt (2013)	Light Rail (Jubilee Line & Docklands Light Railway)	London	Pre/Post Study	The study showed that for the average household a doubling of access to employment centers results in a utility effect that is equivalent to an increase in monthly income of £383 (in 2001 prices).	The model provides a better overview of potential funding possibilities for projects, particularly regarding contributions made by landlords levied on the predicted property price impact.
Armstrong (1995)	Commuter Rail (MBTA Fitchburg line)	Boston	Hedonic Price Models	Homes located in census tracts with rail stations had 6.7 per cent higher selling prices.	Proximity to the line (within 400 feet) coincided with a 20 per cent decrease in value, suggesting disamenity effects caused by frequent freight trains.
Armstrong and Rodriguez (2006)	Commuter rail	Four municipalities with commuter rail service, and three without commuter rail service.	Hedonic Price Models	Study finds a 10 per cent premium near stations.	There is a penalty between \$73 and \$290 per 100 feet closer to the right-of-way.
Bowes and Ihlanfeldt (2001)	Rapid Rail (MARTA)	Atlanta	Hedonic Price Models	Properties within a quarter of a mile from a station are found to sell for 19% less than properties beyond three miles from a station. And houses beyond three miles from a station sell on average for 4.7% more if the nearest station has a parking lot.	The positive effect of access to stations was generally greater than the negative effects of crime or the positive effects of retail, although within a quarter-mile radius some stations appeared to have net neutral or negative impacts.
Cervero (1996)	Heavy Rail	San Francisco Bay Area (Bay Area Rapid Transit)		+10-15% in rent for rental units within 1/4 mile of BART	Units within a quarter-mile of the Pleasant Hill Bart station rented for around \$34 more per month than comparable unit farther away.
Cervero and Duncan (2002)	Light and Commuter Rail	Santa Clara County	Hedonic Price Models	Large apartments within a quarter mile of station premiums as high as 45 percent, while land near commuter rail had a premium of about 20 per cent.	Apartments near light rail stops were more valuable than comparison properties.
Chatman et al. (2012)	Light, Interurban Rail	Southern New Jersey	Hedonic Price Models	Neutral to slightly negative.	The net impact of the line on the owned housing market is neutral to

<i>Authors</i>	<i>Rail Mode</i>	<i>Location (Transit Facility)</i>	<i>Methodology Used</i>	<i>Extent of Property Value Impact</i>	<i>Major Conclusions</i>
	(River Line)				slightly negative. While lower-income census tracts and smaller houses seem to appreciate near the station.
Chen et al. (1998)	Light Rail	Portland	Hedonic Price Models	Property premium was estimated at about 10.5 per cent.	The value of accessibility to the station generally exceeded the nuisance of the line.
Duncan (2008)	Light Rail	San Diego	Hedonic Price Models	17 per cent premiums for condominiums and 6 per cent premiums for single-family homes within a quarter-mile of light rail stations.	Past research has shown that property near rail stations have a premium (between 0% and 10%) in many U.S. cities. However, most of these studies focus on single-family homes. This paper indicates that condominiums receive capitalization benefits in excess of 10%, and the benefits received by single-family properties fall within the more typical range (<10%).
Gatzlaff and Smith (1993)	Heavy Rail	Dade County, Florida (Miami Metrorail)	Pre/Post Study	At most a 5% higher rate of appreciation in real estate sales value compared to the rest of the City of Miami.	Residential values were only weakly impacted by the announcement of the new rail system. Higher priced neighborhoods have experienced greater increases in property values near Metrorail stations while declining ones have not
Gibbons and Machin (2005)	London Underground and Docklands Light Railway (late 1990s)	South East London	Hedonic Valuation Models	House prices rose by 9.3 percent more in places with transit than without.	The study suggests that households significantly value rail access and that these valuations are sizable as compared to the valuations of other local amenities and services.
Goetz et al. (2010)	Light Rail (Hiawatha Line)	Minneapolis	Pre/Post Study	Single-family homes within ½ - mile of a station sold for \$5,229 more after 2004 than homes farther from the station. The premium for multi-family properties was \$15,755 after the line opened.	This study demonstrates that completion of the Hiawatha Line has generated value and investment activity in the Minneapolis housing market.
Hess and Almeida (2007)	Light Rail	Buffalo, New York	Hedonic Price Models	A premium of between 2 and 5 per cent of value was found.	There is a lower effect for properties in economically declining areas and higher effects in more prosperous areas.

<i>Authors</i>	<i>Rail Mode</i>	<i>Location (Transit Facility)</i>	<i>Methodology Used</i>	<i>Extent of Property Value Impact</i>	<i>Major Conclusions</i>
Immergluck (2009)	Light Rail (Beltline)	Atlanta	Pre/Post Study	Single-family homes within one-quarter mile of the planned loop sold at a 15 to 30 percent premium compared to similar properties located more than two miles away.	The study found large increases in premiums for homes near the lower-income, southern parts of the Beltline TIF district between 2003 and 2005, which corresponded to initial media coverage of the planning process. The findings suggest that planning for the Beltline induced substantial speculation and gentrification.
Kahn (2007)	Light Rail	14 cities	Pre/Post Study	Neighborhoods close to new “walk-and-ride” stations saw home values increase more than 5 percent over 10 years, but home values near new “park-and-ride” stations fell by about 2 percent.	This article uses a 14-city census tract-level panel data set covering 1970 to 2000 to document significant heterogeneity in the effects of rail transit expansions across the 14 cities. Communities receiving increased access to new “walk-and-ride” stations experience greater gentrification than communities that are now close to new “park-and-ride” stations.
Knapp et al. (2001)	Light Rail	Portland	Pre/Post Study	Vacant parcels within one-half mile of the planned line sold at a 31 percent premium in the two years after plans were announced. The premiums for parcels within one mile were 10 percent.	The study find that plans for light rail investments have positive effects on land values in proposed station areas.
McDonald and Osuji (1995)	Southwest Side Rapid Transit Line	Chicago	Pre/Post Study	An increase of 17 per cent in value for properties within a half-mile of stations by examining comparative parcel sales from 1980 to 1990.	Alternatively, the increase was 1.9% (or \$126.75 per lot) per mile of distance to downtown Chicago for those sites within one-half mile of the stations.
McMillan and McDonald (2004)	Rapid Transit Line (Downtown Chicago to Midway Airport)	Chicago	Pre/Post Study	Single-family homes near transit began selling for 4.2 percent more than homes one mile away in the 1980s. The premium increased to as much as 19.4 percent between 1991 and 1996 before correcting to just about	House prices were being effected by proximity to the stations in the late 1980s and early 1990s—after the plans for the line were well known. The difference between the increase in the value of homes within the sample

<i>Authors</i>	<i>Rail Mode</i>	<i>Location (Transit Facility)</i>	<i>Methodology Used</i>	<i>Extent of Property Value Impact</i>	<i>Major Conclusions</i>
				10 percent in later years.	area as compared with properties farther away from the new transit stations was approximately \$216 million between 1986 and 1999.
Nelson (1992)	Heavy Rail	Atlanta, Georgia (MARTA East Line)	Hedonic Price Models	+\$1,000 on home prices for each 100 feet a house is closer to a rail station in low-income transit adjacent census tracts; a slight negative effect in high income tracts (although this may be due to proximity to industrial uses or to low income neighborhoods).	For lower income neighborhoods, the benefit effects of accessibility more than offset any nuisance effects. Higher value homes may be more sensitive to nuisance effects than by improvements in accessibility.
Pollack et al. (2010)	Fixed Rail	42 stations	Pre/Post Study	In 29 of the 42 station areas, the median home value increased by at least 20% more than in the region as a whole. Station area median gross rents outpaced the region by a similar margin in about 40 percent of cases.	The study affirm that transit can be a catalyst for neighborhood renewal, and that such improvements to neighborhood accessibility could potentially 'price out' current residents because of rising property values.
Weinberger (2001)	Light Rail	Santa Clara County, California	Explanatory hedonic models. The study design attempts to reconcile both longitudinal and cross-sectional effects in a single model.	A commercial property within ~ ¼-mile of a transit station would lease in 1993 for 13.8% more than other properties leased in the County in that year, if it were leased in 1997 it would command a 14.6% premium but only 5.2% in 1998.	The basic results indicate that after controlling for factors such as length and type of lease, building improvements, regional and local economic cycles, and location, properties that lie within a ~ ¼ mile of a light rail station command a higher lease rate than other properties in the County.

Appendix 3: Summary of Studies on TOD and Gentrification

Authors	Location of Study	Time Period	Variables & Methods Used	Major Conclusions
Lin (2002)	Chicago	1975-1991 Study Periods: 1975-1980, 1980-1985 and 1985-1991.	Residential zoning densities; straight-line distances to the CBD, Lake Michigan and transit stations; annual changes in land values. Method: regression analysis	- Transit had influenced gentrification during two of the three periods studied, with large, negative and statistically significant coefficients relating changes in housing values to proximity to transit. - Weakness: Results are limited since gentrification is usually measured with a variety of indicators, yet Lin only took into account changes in land values
Kahn (2007)	14 cities	1970-2000	Property values; education level; proximity to walk-and-ride stations; proximity to park-and-ride stations; and proximity to any transit station interacted with the median household income. Methods: Three model structures for statistical analysis. Regression analysis to estimate the changes in housing prices at the four study periods: 1970, 1980, 1990 and 2000.	- The regression showed mixed results across the study sample - walk-and-ride stations having a positive effect on housing prices, and park-and-ride stations effecting housing prices negatively. - The results were inconclusive, and varied depending on the type of regression models used (OLS or IV), ultimately demonstrating that although gentrification did occur near some walk-and-ride stations, it did not appear near park-and-ride transit stations.
Pollack et al. (2010)	12 cities	1990-2000	Population; race; household income; gross rent; mobility status (whether residents have moved in the last 5 years); transit ridership; housing value; and number of cars per household. Variables were collected and analyzed at the census	- Population, housing units, income, rents and home prices all increased in new rail station areas. - Car ownership increased. - A significant percentage of station areas saw

Authors	Location of Study	Time Period	Variables & Methods Used	Major Conclusions
Dominie (2012)	Los Angeles	1990-2010	block group level. Method: Regression Analysis	transit use drop faster than the region.
			Two income variables (high- and low-income households); changes in race/ethnicity; occupation; and education. Method: Six Regression Models	• Areas around transit in Los Angeles County, for the most part, were more likely to gentrify, • Greater increases in car-owning residents than the surrounding counties, and experienced resultant losses in transit ridership.

Appendix 4 TOD impacts in Los Angeles

Here we provide a brief overview of recent studies conducted by UCLA students, as well as nonprofit and public agencies related to TOD development and its impacts in Los Angeles neighborhoods.

UCLA Student Research

A UCLA study entitled *TOD Impacts on Businesses in Four Asian American Neighborhoods* focused on Chinatown, Thai Town, Little Tokyo, and Koreatown. Overall, this study was the first to examine the impact of TODs on small and ethnic businesses, thus expanding the way researchers should examine the impacts of government infrastructure investments on neighborhood change. Despite data limitations, the available information indicated that many local and Asian businesses did not proportionately benefit from development. There was considerable heterogeneity among the four communities in terms of impacts. From 2001 to 2011, businesses in Chinatown grew at a much lower rate relative to businesses in LA County, and the growth rate of Asian businesses showed a more drastic decrease in the TOD study area compared to that of LA County as well (Fang and Le, 2014). Koreatown only slightly lags behind Los Angeles County for all business and small business growth, thus this neighborhood is still very competitive and has potential for future growth (Cha et al. 2014). In Little Tokyo, the data implies that the TOD study area and LA County's overall business sectors are dynamic, though the study area saw lower rates of business growth and lower turnover (Hom, Toscano, and Yang, 2014). Finally, in Thai Town, the data suggests that while the overall business sector and small business subsector in the TOD Study Area are flourishing, Asian businesses are growing at a dismal rate (Macedo and Nem, 2014). Thus, the results are consistent with community concerns about a relative slowing of growth in small and Asian businesses. The study suggests that greater attention by government is needed to maintain the cultural characteristics of neighborhood and to support small local and ethnic businesses (Ong, Pech, and Ray 2014).

A second UCLA project focused on the analysis of transit-oriented development and fair and affordable housing, examining four LA neighborhoods: Boyle Heights, Westwood, the neighborhood around Sunset/Vermont, and the neighborhood around USC. All these TOD areas had distinctive characteristics.

- In Boyle Heights, racial/ethnic groups within the TOD Service Area earn far less than their respective racial/ethnic group in L.A. County at large. This pattern indicates that economic conditions have been a major factor driving the racial/ethnic distribution in the TOD Service Area, rather than explicit racial/ethnic discriminatory forces. Boyle Heights and the TOD Service Area both have a substantially higher proportion of affordable rental units than L.A. County at large. In addition to this, the median income in both areas is far lower than the county median. Due to these combined factors, the availability of affordable units provides residents with a relatively stable supply of housing, in turn lowering the rent burden in the area (Beltran et al., 2011).
- Around USC, there does not appear to be significant discrimination in housing on the basis of race or ethnicity, as Hispanic and Black/African American households are overrepresented in the USC neighborhood. However, an overrepresentation of African

American and Hispanic households may be indicative of housing discrimination in other parts of the city or region. There is a strong supply of low-rent housing, yet a majority of households still pay more than 30 percent of income on housing costs (Lopez et al., 2011).

- In the Sunset/Vermont station area there was no significantly overrepresented or underrepresented racial ethnic group. Trends confirm that the area is actually moving towards representations more consistent with Los Angeles County. Sunset/Vermont does not appear to have a greater need for affordable housing than the County, as it has proportionately twice as many low rent units than the County. However, over 50% of renters in this neighborhood face rent burden.
- In Westwood, subtle housing discrimination practices seem to exist. The research found that Latinos/Hispanics and Blacks are underrepresented in the neighborhood. And the area has an inadequate supply of low-rent housing and a high housing burden among renters. Indeed, people who want to live and work here cannot afford to be here without paying more than 30% of their income on rent (Allen et al., 2011).

Non-Profit Studies

1. *Planning to Stay: A Community Created Master Plan for an Improved Transit Village in Westlake*. February 2010. Central City Neighborhood Partners.

This study focused on the Metro Red Line in Westlake Village in Los Angeles. This area is a low-income, immigrant community, predominantly composed of renters, near downtown Los Angeles. The proximity to downtown and good transit access has prompted significant development interest, which has caused hardship for many residents because of increasing rents. The report mentions the replacement of mom-and-pop businesses by chain and upscale establishments.

The report views resident participation as critical to prevent further displacement and maintain affordable housing:

Residents' leadership is especially critical in resolving the conundrum of improving the neighborhood without gentrifying it. The solution is likely a combination of aggressive affordable housing policy and strategic improvements crafted to improve the neighborhood more in the eyes of current residents, than in the view of new more affluent residents (2010:11)

The report asks the important question: "Are we planning a transit village, or does it already exist?" This area is already very transit-friendly, as it is within walking distance of the Metro, Rapid Bus and bus lines. It averages 33,594 residents per square mile, more than 4 times the city average. The commercial streets are aligned with neighborhood businesses, services and offices in multi-story mixed-use buildings with active street facades. The area already has four times more transit use than the City of Los Angeles and seven times more than Los Angeles County. Consequently, the goal of this study is not to plan a transit village, but rather to improve an existing one. Suggestions proposed include:

- A "Transit Investment Based Inclusionary Housing Zone" that would require 25% or greater affordable units in all new construction and major renovations within ½

mile of the Red Line station. If challenged in court, the authors of the report believe that this policy would be affirmed because the value of station-adjacent property is significantly increased by the enormous public investment in the station and line, thus creating a constitutional basis for requiring developers to provide affordable housing.

- Density bonus programs that provide an additional incentive to build more affordable units. Modeled after the City of West Hollywood's successful ordinance, the policy proposal offers progressively more density bonus as the developer provides more affordable housing, all the way up to a 100% bonus for 100% affordable housing.
- Implementation of inclusive policies that ensure housing development rather than decrease the stock of affordable housing. It is critical to do this first, so that if later steps attract developer attention, their new projects will be certain to include ample affordable housing.
- Improvement of the neighborhood landscape starting with enhancements that serve current population such as a new DASH route (local shuttles), widened sidewalks, etc.

2. *Hollywood: A Comeback Story and Lessons Learned*. Beth Steckler and Lisa Payne. February 24, 2012.

The introduction of the Metro Red Line subway and three stations along Hollywood Boulevard in the heart of the redevelopment project area has served as a catalyst for development. The Community Redevelopment Agency (CRA) adopted a "bookend strategy" that at first focused investment around the stations with the assumption that it would then be easier to attract development to the rest of the project area.

However, by 2009 the demographics of Hollywood's residents had changed: they owned more cars, composed smaller households, and had higher incomes than the previous area residents. Despite all the development, the study outlines that the number of people living in central Hollywood fell by about 10 percent, while population in the city grew by about 9 percent. Per capita income rose 34 percent in Hollywood, but only 2 percent citywide. And there was an increase in car ownership despite the easy availability of high-quality transit: The area witnessed a 32 percent decrease in car-free households, while households with one car increased by 15 percent. This information has implications for ridership on the transit system. All the numbers suggest that, despite the city's extraordinary efforts to keep housing affordable, Hollywood is gentrifying.

Focusing on the case study of the Hollywood area, the report suggests the following 11 recommendations for TODs around metro stations in Los Angeles:

- Be bold in addressing big problems
- Get city agencies working together with the community
- Engage communities of interest to help address problems
- Tackle crime and problem properties
- Deliver on the promise of good jobs for the community

- Capture some of the increased property value
- Devise strategies for making streets and sidewalks clean
- Minimize displacement
- Seize opportunities for moving mission forward
- Get the parking right
- Advocate for local, regional, statewide, and federal policies.

3. Creating Successful Transit-Oriented Districts in Los Angeles: A Citywide Toolkit for Achieving Regional Goals. Center for Transit-Oriented Development. February 2010.

The Center for Transit-Oriented Development (CTOD) set out to determine why good TOD is or is not occurring around stations, and to strategize about ways that station area performance could be improved. CTOD examined the current success of transit-oriented districts through a data-driven analysis and a discussion with focus groups from five transit corridors in the city. They created a variety of tools measuring current performance including a station typology, station area profiles, and a set of regional screen maps that analyze demographic and economic conditions throughout the City.

The CTOD also conducted a case study analysis of five corridors that have clusters of stations, including: the Gold Line from Little Tokyo to Indiana; the Red Line from Vermont/Wilshire to Vermont/Sunset; the Orange Line from Sepulveda to Warner Center; the Expo Line from USC to Crenshaw; and a key portion of the proposed downtown streetcar alignment. CTOD invited stakeholders from these corridors to talk about the opportunities and challenges of TODs. Participants included staff from several city departments and various agencies including CRA-LA, the Planning Department, and LA Metro, as well as community members and organizations, institutional property owners and major employers, and planners, developers, and activists.

This report emphasizes that transit investment and transit-oriented districts are keys to enhancing affordable living. A 2009 study by the American Public Transportation Association found that households that used transit saved an average of \$10,000 in Los Angeles (2010: 4). Additionally, there is growing support for TOD from business interests. The authors emphasize that achieving TOD success requires the involvement of many public and private organizations.

According to the report, the demand for transit-oriented living in the Los Angeles region is strong and growing; nearly two-thirds of this demand is likely to come from households earning less than the city's median income (2010: 7). Already, transit serves many of the city's existing lower-income neighborhoods, offering residents regional access but increasing their vulnerability to displacement over time. (2010: 8). Furthermore, 22.4 percent of jobs in Los Angeles County are connected to transit (2010: 8).

The report stresses that since contracts on over 20,000 units of affordable housing will expire by 2014, housing preservation will be a key component of station area planning. Another means of protecting affordability is to proactively implement development plans

for small parcel sizes near some transit stations. The chart below identifies different TOD strategies that relate to several topics (for example, Housing Affordability and Economic Development) that came about as a result of this project.

4. *Preservation in Transit-Oriented Districts: A Study on the Need, Priorities, and Tools in Protecting Assisted and Unassisted Housing in the City of Los Angeles*. May 2012. Prepared for the Los Angeles Housing Department. Prepared by: Reconnecting America.

For this study, four existing transit-oriented districts were selected as areas of focus for preservation activities over five years. The areas were chosen based on several factors:

- Median Household Income
- Percent of Renter-Occupied Households
- Potential Change in Market Strength Resulting from:
 - Proximity to Major Job Centers
 - Areas with Lower Transportation Costs
 - Rising Property Values
 - Transit Access to Downtown Los Angeles and Westwood Resulting from Measure R Investments
 - Historic Neighborhood Character (age of buildings)
- Vulnerability of Housing Stock:
 - Concentration of Income-Restricted, At-Risk Units
 - Concentration of Larger Buildings Subject to the Rent Stabilization Ordinance
 - Concentration of Smaller Buildings Subject to the Rent Stabilization Ordinance

The station area clusters chosen were along the Red Line, Purple Line, Venice Blvd. Central L.A. Rapid Bus corridor (North of I-10), and Expo Line. The areas chosen exhibited a high confluence of vulnerability factors.

The study suggests that if transit investments manage to reduce congestion to major transit-oriented job centers like Downtown Los Angeles or Westwood, then workers in these places must be able to reach them by transit. Thus, the report proposes a comprehensive TOD strategy that might include the following:

- Affordable housing preservation;
- Coordinated land use regulations that leverage new transit-oriented development (both market rate and affordable);
- Provision of other amenities such as parks, quality schools, fresh food, etc.;
- Making last mile connections and investing in supportive pedestrian, bicycle, parking improvements and land use planning efforts; and
- Coordinated workforce and economic development strategy that considers both business attraction and job training near transit.

Appendix 5 Summary of Simulation Models of Gentrification

Authors	Model Structure ¹²	Model Setting	Mechanisms	Findings
O'Sullivan (2002)	Cellular automata	London	This model is explicitly posed as a spatial instantiation of the "rent gap" theory of gentrification. Each iteration of the model consists of spatially linked properties (the "cells" of the model) passing among states of "not for sale," "for sale," "seeking tenants," and "rented." The rent gap is operationalized as the amount by which the "condition" value of a given property is less than the average condition of spatially linked properties. This gap helps determine the investment in upgrading a property, which in turn helps determine the property's state, as well as values for sale price, rent price, and "neighborhood status."	Posed as an exploratory analysis, model outcomes are shown for a sample run of 60 years, with the author tracking the proportion of properties in each of the four different states, as well as average values occupant income, physical condition of properties, and neighborhood status. The model is able to generate alternate periods of stability and instability in these measures, with neighborhood change dependent on the inclusion of a neighborhood status feedback mechanism.
Torrens and Nara (2007)	Cellular automata and agent-based hybrid	Salt Lake City	The interactive units in this model are of three types: spatially fixed markets and properties, and spatially mobile residents. Residents choose among markets (large aggregations of properties) and then choose among nested properties. The decision whether or not to move, and subsequently where to move, is based on the preferences and economic statuses of residents, as well as of properties of both broader markets and individual properties. Real estate prices are subsequently adjusted based on location-specific vacancy rates.	The authors track five primary market-level outcomes in their model: total household population, average property values, the average economic status of residents, residential turnover, and resident ethnic profile. These outcomes are presented for four different model runs: a status quo scenario; a demand-based gentrification scenario, in which additional high-income households are exogenously input to the model; a supply-based gentrification scenario, in which additional high-value properties are exogenously input; and a scenario combining demand and supply gentrifying pressures. The model, specified in an exploratory way, is able to produce varying gentrification dynamics under these different scenarios.

¹² Mode structure is split into three broad types. "Cellular automata" models consist of spatially fixed units. The characteristics of these units (or automata) evolve according to the attributes of other, neighboring automata. The potential states of the automata, their updating rules, and their geometries of influence are all potentially complex. "Agent-based" models, on the other hand, consist of spatially mobile agents situated within a fixed or evolving environment. The agents move according to decision procedures that can be based on both characteristics of the environment and of other agents. Characteristics of agents themselves may be static or may change over time, and their movement may alter relevant aspects of the environment. Finally, hybrid models contain elements of both cellular automata and agent-based models. These models contain spatially mobile agents, but they also contain spatially fixed cells that evolve according to the actions of mobile agents, as well as in response to the characteristics of other spatially fixed cells.

Authors	Model Structure ¹²	Model Setting	Mechanisms	Findings
Jackson, Forest, and Sengupta (2008)	Agent-based	Boston	Four distinct types of mobile agents -- professionals, students, non-professionals, and elderly -- interact with a simulated urban landscape, with movement decisions governed by neighborhood preferences and abilities to pay that vary between agent types. Additionally, rents charged for simulated housing units increase according to the presence of professionals, and students transition over time to either professionals or non-professionals.	Measured outcomes of the gentrification model include the proportion of residents by type in the modeled neighborhoods, as well as the average land rents in these areas. Geographic trends are analyzed in terms of their qualitative similarity to results predicted by theory, and multiple test parameters are tweaked to validate the model's conformity to theoretical expectations.
Eckerd and Reames (2012)	Cellular automata and agent-based hybrid	Abstract grid	The authors posit a model that incorporates both a real estate market that governs the price of simulated plots of land, as well as a preference mechanism the governs the location decisions of residential agents. While the specifics of both of these mechanisms are left vague, the authors specify that residential agents are to be heterogeneous with respect to both income and race, and that these two dimensions of "socioeconomic status" are to drive the gentrifying dynamics.	The work presented by the authors is meant only to lay out the foundation for a gentrification simulation. Thus, the authors have no concrete results. They do, however, explicitly describe the process by which model results are to be compared with empirical observations to validate the model's structure, behavior, and policy implications.
Diappi and Bolchi (2013)	Cellular automata and agent-based hybrid	Milan	This model consists of investors, small owners, and tenants as "active" agents, and buildings as "passive" or spatially fixed agents. Within the model, investors decide whether to generate new developments and owners decide on their level of property upkeep based on property- and neighborhood-level characteristics (with investor decisions framed around the familiar rent gap theory). These supply decisions are additionally influenced by two exogenous factors: macroeconomic cycles, and an "Alonso curve" rent gradient falling outward from the city center. Tenants make locational decisions within the resulting real estate market based on their individual preferences and abilities to pay.	The model is first validated by reproducing the observed spatial patterns of rent in Milan as they evolved from 1993 to 2003. The authors next use the model to predict future rent levels with and without a series of planned large-scale development projects. Finally, the authors use model results to posit rent gap dynamics as a potential explanation for cyclicity observed in aggregate rent levels.