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Transit-Oriented Development and Commercial Gentrification: Exploring the Linkages

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TRANSIT ORIENTED DEVELOPMENT & COMMERCIAL GENTRIFICATION: *EXPLORING THE LINKAGES*

FINAL REPORT

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The Center for Community Innovation at UC Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

The Center for Neighborhood Knowledge at UCLA conducts basic and applied research on the socioeconomic formation and internal dynamics of neighborhoods, and how these collective spatial units are positioned and embedded in the Southern California region.

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EXECUTIVE SUMMARY

As central cities in California continue their renaissance, commercial gentrification is often identified by residents as a concern. For many, commercial gentrification means the intrusion of new businesses that force out a favorite food shop or a longstanding retail store because of higher rents. For others, it means an influx of hip cafés, trendy retail boutiques, and gourmet fast food restaurants - places that change the fabric of their familiar neighborhood, for better or for worse. For many merchants, commercial gentrification can have implications for economic survival, as increased rents may lead to displacement and business closures.

This report was born out of these concerns, which we uncovered when interviewing community stakeholders as part of our earlier research on residential gentrification in Los Angeles and the Bay Area (See Chapple, Loukaitou-Sideris, Waddell, Chatman, & Ong, 2017). Over the course of this past work, interviews with community members and planners revealed rapidly-changing storefronts to be a recurring concern. As we looked deeper into this phenomenon, we found that potential relationships between commercial gentrification and transit-oriented development (TOD), transit ridership, and traffic safety were relatively unexplored.

This report focuses on the San Francisco Bay and Los Angeles regions and addresses gaps in our understanding of the relationship between commercial gentrification and TOD, rail transit ridership, and traffic safety.

The primary elements of this report are:

- A literature review of research on commercial gentrification.
- The development of a quantitative metric that defines commercial gentrification based on four objective parameters.
- Statistical analyses that explore associations between commercial gentrification and rail transit stations, changes in transit ridership, and traffic safety.
- Qualitative examinations of four case study neighborhoods: two in Los Angeles and two in the Bay Area.

Using these methods, we produced the following research findings:

- Commercially gentrified stations are generally characterized by an influx of eateries, cafés, and bars.
- Proximity to a transit station is likely not associated with commercial gentrification. More important factors that may relate to commercial gentrification are the demographic characteristics of a neighborhood, particularly the percent of non-Hispanic black, foreign-born, and renter residents, as well as overall population density. In some contexts, residential gentrification may lead to commercial gentrification.

Executive Summary

- Commercial gentrification may contribute to increases in total, cyclist-involved, and pedestrian-involved average annual crashes around rail transit stations. It is unclear if this is directly due to the phenomenon of commercial gentrification or if it is related to an increase in traffic that occurs in commercially gentrified areas.

- Commercial gentrification does not appear to have a significant effect on rail transit ridership. Residential gentrification in Los Angeles, on the other hand, may lead to reduced rates of transit ridership in the decade after the residential gentrification occurs.

- Merchants generally indicated that rising rent costs were the most prominent aspect of neighborhood change putting pressure on their businesses' bottom line.

Following these conclusions, we recommend the following as prudent municipal, state, and regional policies to mitigate traffic crash impacts and empower transit-oriented development:

- While our quantitative research does not find a significant relationship between a neighborhood's proximity to transit and commercial gentrification, this may not represent a universal truth, and this issue certainly requires further probing. Policymakers should not simply assume that transit neighborhoods are not susceptible to commercial gentrification.

- The relationship between residential and commercial gentrification also needs further exploration. The results of this study are rather mixed, and it is not clear when and where one type of gentrification follows the other, or which comes first. We suspect that there may not be a universal pattern, and this relationship may change from one neighborhood to the other.

- Our findings indicate that commercial gentrification is context-specific. Policymakers, therefore, should not only rely on aggregate data but also seek to identify what is happening on the ground in specific commercial transit neighborhoods. Commercial neighborhood stakeholders, such as merchants, property owners, and realtors can provide good information about gentrification trends, business closures, relocations, rent increases, etc.

- Commercial gentrification in a transit neighborhood is often accompanied by an increased incidence of crashes involving pedestrians and cyclists. This may well be because more pedestrians and cyclists are present in the neighborhood, increasing rates of exposure. Regardless of cause, the increased occurrence of crashes tells us that policymakers should focus resources towards traffic calming, safe streets infrastructure provision, and other proven traffic safety improvements.

II. INTRODUCTION & CONTEXT FOR RESEARCH

INTRODUCTION & CONTEXT FOR RESEARCH

As communities across California invest in transit-oriented development (TOD), they are becoming increasingly cognizant of potential gentrification impacts. These impacts could jeopardize local economic development, traffic safety, and greenhouse gas (GHG) reduction goals. Ongoing research on TOD-related residential displacement has unearthed growing concerns about commercial gentrification. Although researchers have begun to establish the complicated relationship between residential and commercial change, surprisingly little is known about transit access and commercial gentrification. Nevertheless, the growing concern over residential displacement, especially as it relates to TOD investment, is motivating new research initiatives (Chapple et al., 2017) and advocacy campaigns (Public Advocates, 2014).

The primary concerns regarding TOD's potential displacement effects are both social and environmental; in addition to the societal and economic costs that displacement incurs, TOD-catalyzed gentrification and displacement may be resulting in more overall vehicle miles traveled (VMT) and greater GHG emissions (California Housing Partnership Corporation, 2014; Chapple et al., 2017). Commercial districts play a key role in the attainment of walkability and livability goals of TODs, as well as in California's quest to reduce VMT and GHGs, given that nearly three-quarters of all auto trips are for non-work purposes (Santos, McGuckin, Nakamoto, Gray, & Liss, 2011). The composition of these commercial districts is likely related to changes in nearby residential areas, either stimulating or responding to residential demographic shifts (Chapple & Jacobus, 2009). Details of these associations, particularly in the context of TOD, are under-researched.

In theory, investments in TOD are expected to reduce transportation costs for residents, thereby increasing land values and producing higher value land uses (Cervero, Murphy, Ferrell, Goguts, & Tsai, 2004). Furthermore, the increased pedestrian traffic generated by transit riders and other developments surrounding the station is thought to increase the number of customers, sales, and employees in TOD commercial districts, leading to economic development (Litman, 2017). That being said, research is emerging that highlights the links between residential gentrification and the decline in some areas of small, ethnically-owned businesses, calling into question the market such development seeks to serve and who benefits from the economic development (Meltzer & Schuetz, 2012; Ong, Pech, & Ray, 2014). Additionally, the rising land values and subsequent higher rents associated with TOD could drive out locally-serving businesses, resulting in an increase in retail stores that do not meet the budgets and/or cultural preferences of existing residents, such as boutiques (Cranor et al., 2015).

This research uses Los Angeles and the San Francisco Bay Area to examine the relationship between commercial gentrification and fixed rail transit, transit ridership, and traffic crashes. The first section of this report is a literature review of existing research efforts to characterize and model the relationship between transit access, commercial gentrification, and displacement. Although the vast majority of the literature has focused on the impacts of transit investments and planning on real estate value, scholars are beginning to investigate the relationship between transit investments and the demographic shifts common in gentrifying neighborhoods (Chapple

& Jacobus, 2009; Dominie, 2012; Kahn, 2007; Jane Lin, 2002; Pollack, Stephanie, Bluestone, & Billingham, 2010). Studies have found that real estate premiums associated with rail investment can alter the demographic composition of surrounding neighborhoods (Cervero & Duncan, 2004; Diaz, 1999; Jane Lin, 2002).

Next, using a longitudinal database of business establishments, we develop a quantitative definition of commercial gentrification for Los Angeles and the Bay Area. We then use this definition and employ regression analyses to explore commercial gentrification's relationships with transit access, changes in transit ridership, and traffic crashes. We ground-truth our quantitative findings to deepen our understanding of these relationships through interviews and field observations in two case studies in each study region. Finally, taking into account the regression analyses and the case studies, we provide policy implications and recommendations for future research.

This report builds off unique datasets we have constructed with support from a California Air Resources Board-funded project on the relationship between rail transit neighborhoods and residential displacement in Los Angeles and the Bay Area (Chapple et al., 2017). It seeks to extend our understanding of gentrification and displacement into the commercial realm through both macro and micro analyses. The macro-analysis extends our existing multi-level databases for the nine-county Bay Area and Los Angeles County (which include establishment-level data, real estate transactions, demographics, housing affordability, rail transit stations, joint development, and other variables) with a new, more detailed analysis of retail change, including business dynamics such as relocation and closure.

From this dataset, we investigate where commercial gentrification has occurred and its relationship to fixed rail transit. We then link this information to rail transit ridership data to assess the corresponding impact of commercial change on transit trips. We also analyze additional data on traffic crashes to understand the links between commercial gentrification and traffic safety.

Following these quantitative analyses, we identify four case study neighborhoods for in-depth qualitative research. Case study areas consist of one matched pair in both Los Angeles and the Bay Area: one transit-proximate neighborhood that has experienced commercial gentrification and one that has not. In these case study areas, we use a qualitative approach to assess the relationship between commercial gentrification, transit, and traffic crashes.

Figure 2.1: A small business in Oakland, CA that has closed down. Photo taken by authors, May 2017.

III. LITERATURE REVIEW

LITERATURE REVIEW

Gentrification and displacement are important concerns in many urban neighborhoods and draw significant attention in research and policy circles. Most of this attention has focused on residential gentrification: the transition of working-class, low-income neighborhoods because of an influx of capital and new residents of higher income and educational attainment. Gentrification, which transforms neighborhoods and can displace residents, has also been linked to significant changes in commercial landscapes (Chapple & Jacobus, 2009). This phenomenon - dubbed 'commercial gentrification' in this report - is largely understudied. This literature review focuses especially on the relationship between transit access and commercial gentrification. Although residential gentrification research has shown that the presence of a transit stop may induce neighborhood residential gentrification (Chapple et al., 2017), we do not know if transit investment relates to commercial gentrification.

Research on the nature of commercial change in gentrifying neighborhoods is scarce and tackles various topics, ranging from where such gentrification may occur, what the impacts may be, and to who benefits from it. The phenomenon of commercial gentrification has been documented internationally including in Australia (Bridge & Dowling, 2001), Turkey (Istanbul) (Ergun, 2004), China (Beijing (Zheng & Kahn, 2013) and Shanghai (Zukin, Sharon, Kasinitz, & Chen, 2015)), South Korea (Seoul) (Lim, Kim, Potter, & Bae, 2013), the Netherlands (Doucet, 2014; Zukin, Sharon et al., 2015), Spain (Janoschka, Sequera, & Salinas, 2014), Latin America (Janoschka et al., 2014; Schlack & Turnbull, 2015), Canada (Burnett, 2014; Zukin, Sharon et al., 2015), and the U.K. (Davidson & Lees, 2005; Dines, 2009; Ferm, 2016; Hamnett & Whitelegg, 2007; Percival, 2009). This literature review focuses primarily on U.S. and Canadian research.

The following sections review the mechanisms of commercial gentrification, empirical indicators of commercial gentrification, the different types of commercial gentrification, and potential effects associated with commercial gentrification, with some emphasis on transit-proximate neighborhoods.

Mechanisms of Commercial Gentrification

What mechanisms prompt gentrification? Hackworth and Rekers (2005) outline two competing theories of gentrification: cultural and economic. In the cultural approach to gentrification, the phenomenon is seen "as a spatial expression of critical class politics," while the economic perspective utilizes rent gap theory to argue that "the necessary condition for gentrification to occur is the availability of inexpensive real estate" (Ibid., p. 213). Even assuming that each of these theories has a basis in truth, it is difficult to unpack the mechanism by which commercial gentrification relates to residential gentrification (if it does at all). Changes in commercial districts have been noted as both a causal factor of and an outcome from residential demographic change (Chapple & Jacobus, 2009). Setting aside the directionality of residential and commercial gentrification, the literature identifies two market-driven mechanisms related to increases in the price of urban land that influence commercial gentrification: changes in the consumer base and increased cost of doing business.

Meltzer (2016) discusses how the process of commercial gentrification can occur through changes in consumer demand, which result from changes in the consumer base itself. She theorizes that changes in the consumer base brought about by residential gentrification may lead to changes in both the business environment and local patrons (Ibid.). In an analysis of how retail reinvestment might lead to neighborhood revitalization, Chapple and Jacobus (2009) show that changes in the demographic composition of residential neighborhoods in the San Francisco Bay Area resulted in significant shifts in the mix of commercial establishments. These changes may negatively impact existing business, whose products and services become less tailored to neighborhood demand. And while the changes can also result in the creation of new businesses, potentially underwritten with greater capital investment, the process could also lead to stiffer competition (which may, in turn, lead to lower prices for consumers - a potentially positive result). This added competition could produce challenges that are further exacerbated by increased startup and/or operating costs because of the appreciation of property values and rent increases in a neighborhood (Meltzer 2016).

Increasing property values may halt new local business startups and put existing establishments out of business, if appreciation is not accompanied by revenue gains to offset the costs (Ibid.). Meltzer does note, however, that these pressures take a longer time to materialize because commercial leases are typically longer than residential leases, allowing commercial rents to remain stagnant while residential rents appreciate (Ibid.). Although there does not appear to be research on the scale of and relationship between these mechanisms, both seem to be at play in many commercially gentrifying districts.

The mechanisms of commercial gentrification documented by Meltzer are market-driven but there is also a possibility that they are triggered by public investments that make a neighborhood more accessible or appealing (Ibid.). These could include new transit lines, parks, or street improvements.

Empirical Indicators of Commercial Gentrification

Although there is no academic consensus on how to define commercial gentrification, it is clear that commercial gentrification is context-specific and can take different forms; certain factors can be indicative of commercial gentrification in some areas but not in others. This section reviews the most commonly identified indicators of commercial gentrification, while recognizing that some aspects of this phenomenon are not measurable and are inherently subjective and context-specific. These commonly identified indicators measure first a new dynamic of change in establishments and second a new type of establishments. Dynamic measures track (1) increased establishment turnover, churn, and decreased retention, and (2) disproportionate impacts to minority-owned establishments. New types of establishments include (1) the rise of establishments that 'signal' to particular consumer groups, and (2) the opening of chain stores and simultaneous decline of small businesses.

Turnover, Churn & Retention

Commercial gentrification is characterized by an influx in capital that manifests itself in changes to brick and mortar commercial establishments. These changes can be measured quantitatively as changes in the number of business establishments and as the capacity of existing businesses to survive changes in rents and operating costs. A 2016 study by Meltzer and Capperis used longitudinal business data to examine the impact of business 'churn' on types of business activity, commercial infrastructure, and the consumer profile of a neighborhood. The study found that "consumer-related characteristics explain turnover more than those related to the local commercial environment", identifying consumers as those living within a neighborhood census tract (Ibid., p. 2). This study defined retail business churn by taking the sum of all moves into and out of a neighborhood and dividing by the midpoint number of retail establishments over the time period. Low rates of business retention have also been suggested as a measure of commercial gentrification, based on the notion that neighborhood businesses in commercially gentrifying neighborhoods would have a more difficult time keeping up with rising rents and may be forced to give way to newer, better-capitalized establishments. However, Meltzer (2016) found, in New York City, that the retention rate was essentially the same across both gentrifying and non-gentrifying neighborhoods. Commercial change has also been measured using density of establishments, employment, and establishment diversity and size (Chapple & Jacobus, 2009; Dalal & Goulias, 2014; Meltzer & Schuetz, 2012; Ong et al., 2014; Plowman, 2014; Schuetz, 2014; Schuetz, Kolko, & Meltzer, 2012), although not necessarily in the specific context of commercial gentrification.

Disproportionate Impacts to Minority-Owned Establishments

Neighborhood-based small businesses are often referenced as an important entrepreneurship vehicle for minority and immigrant populations (Sutton, 2010). Sometimes, however, neighborhood change in the form of commercial gentrification harms these minority-owned businesses, because of either a shifting market or rising rents. Recent research tracking changes to Asian-owned establishments in Los Angeles supported the hypothesis that commercial gentrification may be disproportionately harmful to minority-owned establishments (Ong et al., 2014). Similarly, in the Mission district of San Francisco, a neighborhood undergoing a commercial transformation that caters to a new, high-income demographic, researchers found a higher rate of closure of Hispanic-owned businesses, relative to other businesses in the Mission (Center for Community Innovation, 2014). Thus, a decline in minority-owned establishments is likely an indication that commercial gentrification is occurring.

Signal Establishments

A somewhat subjective list of 'signal' establishments that may indicate commercial gentrification is often defined in the literature using NAICS codes or other establishment-type classification (Center for Community Innovation, 2014; Meltzer & Schuetz, 2012; Plowman, 2014; Schuetz, 2014). Meltzer and Capperis (2016) used NAICS codes to divide establishments into buckets of "necessary", "discretionary", "frequent", and "infrequent" types. Necessary establishments are businesses that fulfill everyday, immediate needs of residents, and include grocery stores, gas stations, and hardware stores. Discretionary establishments "provide more luxury or

recreational services or goods that are not considered basic, but certainly enhance quality of life" (Ibid., p. 9). These include specialty food, wine, and home furnishing stores. Frequent stores provide "frequently consumed and/or perishable goods, whereby short travel times are essential to their appeal" (Ibid., p. 10). In addition to grocery stores and restaurants, frequent establishments include banks, laundromats, and pharmacies. Infrequent establishments are businesses that have market share outside local neighborhoods, offering items like furniture, clothing, and recreational goods.

These four categories allowed Meltzer and Capperis to develop a "hierarchy of local services," whereby frequent and necessary establishments contribute to a neighborhood's well-being by serving a broad market that cuts across income classes, while infrequent and discretionary goods offer "local luxuries" catering to only one, high-income group (Ibid.). Frequent and necessary establishments were found to have higher retention rates than discretionary and infrequent ones, suggesting that they are less susceptible to shocks and changes in consumer demand. Although this study was more oriented towards the impact of signal establishments on turnover and retention, the implication of these distinctions is that decreasing shares of frequent and necessary establishments or increasing shares of discretionary and infrequent establishments could indicate commercial gentrification.

Chains & Small Businesses

In addition to specific commercial uses corresponding to commercial gentrification, some research suggests that establishment size and presence of chain stores could also differ between commercially gentrifying and non-commercially gentrifying neighborhoods. Many have noted that small businesses are vulnerable to being replaced by chain stores, a process seen as more commonly occurring in gentrifying neighborhoods (Basker, 2005; Haltiwanger, Jarmin, & Krizan, 2010; Neumark, Zhang, & Ciccarella, 2008). Meltzer and Capperis (2016) found that organizational structures like chains are better capitalized than independent operators and more likely to enter neighborhoods with lower housing prices and higher-income households. Zukin et al. (2009) found that once gentrification processes kick in and population density increases, "chain stores open, bidding up rents above the level many of the pioneers can afford" (p. 62). The same study found that since the 1990s, New York's gentrifying neighborhoods have seen the share of small chain boutiques significantly increase, while the share of large corporate chain stores has only increased somewhat. Using New York City micro-data on businesses, Meltzer (2016) showed that gentrifying neighborhoods are more likely to attract chains to replace displaced businesses than businesses in other neighborhoods. However, her definitions of small business and chain stores were broad, as she defined small businesses as having fewer than 100 employees and chain stores as those "linked to at least one other establishment through a common headquarters" (Ibid, p. 64).

It is worth discussing the limitations of using small business and chain business classifications to measure commercial gentrification. This method, for one, discounts the possibility that larger businesses and chain businesses, being better capitalized, may offer improved working conditions, wages, or benefits (e.g. Starbucks may offer employees health insurance whereby a local small coffee shop may not). It also presupposes that larger businesses and chain

businesses do not provide important goods and services for a neighborhood at low cost to its residents (e.g. Walgreens may sell toothpaste and toilet paper at a lower cost than a corner bodega). Thus, this metric focuses on a specific interpretation of 'commercial gentrification' (replacement of small individual businesses by larger businesses and chain stores) rather than taking into account actual services, products, or employment opportunities provided to the neighborhood.

Types of Commercial Gentrification

The following section synthesizes the common types of commercial gentrification identified in the literature. While there is considerable overlap between types of commercial gentrification, and the list is by no means exhaustive, we find at least four categories impacted by the mechanisms identified in the previous section: retail upscaling, spaces of commodification, art districts, and transit-oriented districts.

Retail Upscaling

The most commonly documented type of commercial gentrification is changes to the retail composition of an area, or 'upscaling.' This includes the process of 'boutiquing' of streetscapes (Zukin et al., 2009) and development of a particular selection of products and services that appeal to higher-income consumers; for example, organic, gourmet, or environmentally-friendly goods (Sullivan, 2014). Scholars such as Bridge and Dowling (2001) in Sydney and Zukin et al. (2009) in New York City have shown that the upscaling of the retail sector changes shopping opportunities for long-term residents by catering to the needs of new, more affluent, and more mobile residents. These upscale products potentially represent an inequitable distribution of retail access, as upscaling often translates to higher prices. In their study of retail patterns from 1979 to 1990 in Harlem and Williamsburg, Zukin et al. (2009) argue that the arrival of boutiques and other retail establishments to these areas did not serve the needs of the existing, low-income residents.

Spaces of Commodification (Corporatized Commercial Gentrification)

Unlike retail upscaling, which is driven largely by changes in consumer tastes, commodification implies that gentrification is created and marketed by business interests, public entities, or public-private partnerships as a convenient tool to promote consumption. This form of "corporatized gentrification" (Hackworth, 2002) has been documented in a number of ethnic and low-income neighborhoods, where business interests seek to market ethnic cultures or aestheticize poverty for cultural tourism purposes, (Burnett, 2014; Gotham, 2005; Hackworth & Rekers, 2005).

In their exploration of ethnic neighborhoods in Toronto, Canada, Hackworth and Rekers (2005) found that the use of business improvement areas to package the ethnicity of neighborhoods for consumption by tourists and visitors - whether done deliberately or not - added value to neighborhood properties. This valorization translated into changes in the local commercial and residential real estate market that were associated with gentrification and displacement, such

as increased housing costs. In addition, the authors documented a decline in the population that identified with the historical ethnicities of the neighborhoods, an increase in the number of restaurants targeting tourists and newcomers, and a decrease in the number of groceries that served the ethnic population (Terzano, 2014).

Also working in Canada, Burnett (2014) documented - through site visits and analysis of public discourse - how Downtown Eastside of Vancouver became a dining destination. The Downtown area was marked by a history of poverty and homelessness that led to significant urban redevelopment. As a result, both new and revitalized restaurants, cafés, and bars created new spaces of consumption and transformed the neighborhood into a dining destination (Ibid., p. 157). Burnett argued that "the presence of poor and marginalized residents has become a competitive niche for the promotion of distinctive and authentic culinary adventures" or "poverty tourism" (p. 157). The impact, however, of poverty tourism is the displacement of existing residents and businesses as well as the commodification of the people themselves (Ibid., pp. 157-158).

Tourism gentrification is another type of change that is mentioned in the literature as occurring in both North America and abroad (Gladstone & Préau, 2008). Tourism gentrification can be linked with the broader commercial hospitality industry, which "is becoming increasingly important for the branding and promoting of cities" (Bell, 2007). In his study of eight neighborhoods located within or bordering the major tourist zone in post-Katrina New Orleans, Gotham (2005) referred to tourism gentrification in the Vieux Carré as "the transformation of a middle-class neighborhood into a relatively affluent and exclusive enclave marked by a proliferation of corporate entertainment and tourism venues" (Ibid., p. 1,099). Somewhere in between tourism gentrification, commercial hospitality, and ethnic packaging is the case of Los Angeles' Chinatown. The area was considered a slum at the turn of the 20th century and has undergone a revival since the 1960s, led primarily by a coalition of ethnic entrepreneurs and city agencies (Lin, 2008). This revival slated the area as a cultural and tourist destination with a dedicated Metro rail station. As a result, however, a discrepancy has emerged between the needs of the existing senior population in Chinatown and the new commercial services that may not fit their needs (Jan Lin, 2008).
As with ethnic packaging and other forms of space commodification, tourism gentrification may be led not only by private development interests, but also by municipalities hoping to attract tourism dollars by marketing a neighborhood's ethnic identity. The result is a commercial base that may not serve existing residents and may even create a sense of exclusion through symbolic racial, class, or age boundaries (Burns, Lavoie, & Rose, 2012; Karsten, 2014).

Art Districts

A special type of commercial gentrification may occur through the designation of arts districts. Arts districts often begin as locations where pioneering low-income artists find places to live and work, but they often result in the commodification of art and culture by business interests. Increases in rents and displacement of low-income residents and artists can follow. Municipalities frequently support such arts district designations. In Los Angeles, for example, a downtown Arts District was developed to attract tourist dollars, spark retail growth, and

attract other artists as residents or commercial stakeholders (Collins & Loukaitou-Sideris, 2016). In Oakland, the City actively formalized an informal arts district in order to spur downtown redevelopment (Chapple, Jackson, & Martin, 2010). Shkuda (2013) argues that government funding for the arts and the art market are central to commercial gentrification in areas such as New York's SoHo neighborhood. Shkuda (Ibid.) also argues that it is the sweat equity of artists themselves - the "artist as developer" (Shkuda, 2015) - which draws other artists, consumers, and tourists, eventually producing "the customer base for area retail" and giving these places a distinctive commercial landscape (Shkuda, 2013, p. 601).

Transit-Oriented Districts

Mixed land uses and retail opportunities are a key part of transit-oriented development (TOD), but studies on the relationship between retail change and transit investments are only now emerging. Most research to date has focused on the relationship between rail proximity and commercial property values (Cervero & Duncan, 2002) or commercial building permit activity (Guthrie & Fan, 2013). This research has found a positive association between rail proximity and both property values and building permit activity, which suggests a possibility of a positive association with retail gentrification (Cervero & Duncan, 2002; Guthrie & Fan, 2013). Schuetz (2014) explored whether or not new rail stations in California resulted in changes in retail employment, and found little support for such a relationship.
By looking more directly into the impacts of transit-induced commercial gentrification in L.A. County, Ong et al. (2014) found that growth in Asian and small commercial establishments located in transit neighborhoods lagged behind the county average, despite the fact that real estate activity was higher in transit areas than in the county as a whole (Ibid.). In the Mission district of San Francisco, researchers found a simultaneous rise in the number of regionally-serving and decline in locally-serving establishments as well as a higher rate of closure of Hispanic-owned businesses, when compared to other businesses in the Mission (Center for Community Innovation, 2014). Studying six transit-proximate neighborhoods in Los Angeles, a UCLA study found different degrees of commercial gentrification in them, suggesting that commercial gentrification may occur in similar patterns to residential gentrification, appearing in certain neighborhoods but not in others (Cranor et al., 2015). However, there is little knowledge regarding which characteristics of transit-proximate neighborhoods may be conducive to commercial gentrification.

Potential Effects of Commercial Gentrification

Gentrification pressures bring with them critical tradeoffs for both businesses and residents. While gentrification is often described in negative terms because it can lead to displacement, commercial changes can also be characterized as neighborhood or retail revitalization (Chapple & Jacobus 2009). Indeed, the long-term effects of retail upgrading are still unclear - who benefits and who loses? Does a neighborhood's retail access increase? Does local employment increase?

Only a few studies have explored the impacts of commercial gentrification and they have produced mixed results. In a study of neighborhood retail change in residentially-gentrifying neighborhoods of New York City, Meltzer and Schuetz (2012) found that retail access

improved at a notably higher rate in low-value neighborhoods that "experienced upgrading or gentrification", as "low-income neighborhoods have lower densities of both establishments and employment, smaller average establishment size, and less diverse retail composition" and "fewer chain stores and restaurants, somewhat contrary to conventional wisdom" (Ibid., p. 88). Interviewing residents of changing New York neighborhoods, Freeman and Braconi (2004) found that most lauded the return of supermarkets and drugstores, rather than lamenting the invasion of restaurants and expensive boutiques. The authors argued that if this does not lead to widespread displacement, gentrification can help to "increase socioeconomic, racial, and ethnic integration" in both residential and commercial areas (Ibid., p. 39).

Some argue that under certain conditions, commercial changes associated with gentrification may benefit local businesses. If transit investments, for example, result in increased pedestrian traffic from transit riders and station-area development, this could lead to more patrons for nearby businesses, higher sales, and more employees in commercial districts. Commercial districts may also benefit from forces associated with residential gentrification. As a neighborhood's consumer income and population density increase, business sales may also increase because of more customers and/or more disposable incomes (Meltzer, 2016).

However, even if changes to a local consumer base result in neighborhood economic development, the benefits for businesses could be outweighed by the rising rents and operating costs. In addition, different tastes and a different socio-demographic composition of a new consumer base could result in stagnant or falling sales for certain existing businesses (Ibid.).

These realities beg the question of who benefits and who suffers from commercial gentrification. After examining overall retail establishment growth in the San Francisco Bay Area, Chapple and Jacobus (2009) observed that this growth was more associated with neighborhoods becoming middle- or upper-income, as opposed to 'bipolar' (a bi-modal distribution of high and low incomes). This process of growth was not necessarily tied to the displacement of lower-income households. The authors called for more research to explore "whether low-income residents face better outcomes living in middle-income or bipolar neighborhoods" (Ibid., p. 61). Some research has found links between residential gentrification and the decline of small, ethnically-owned businesses (Meltzer & Schuetz, 2012; Ong et al., 2014).

One study found that the employment gains in gentrifying neighborhoods primarily benefited new, rather than existing, businesses (Plowman, 2014), while Meltzer and Ghorbani (2017) found that neighborhoods undergoing gentrification see an increase primarily in service-sector, low-wage local jobs. After examining transit-proximate neighborhoods, a UCLA study found that the rising land values and subsequent rents associated with TOD could displace locally-serving enterprises, resulting in an increase in boutique retail stores that do not meet the budgets and cultural preferences of existing residents (Cranor et al., 2015). In another study, Cheshire (2013) argued that residents in changing neighborhoods are not actually benefitting from some of the new amenities that commercial gentrification brings to the neighborhood because they have little use for goods and services they cannot afford.

There is also no consensus in the literature regarding the relationship between the

environmental benefits of TODs and commercial gentrification. Nearly three-quarters of automobile trips are made for non-work activities like shopping, errands, or entertainment (Santos et al., 2011). Proponents of TOD argue that such developments support environmental objectives because they create walkable nodes that integrate transit infrastructure, housing, and retail, thus reducing automobile trips and greenhouse gas emissions (GHGs) (Arrington & Cervero, 2008; Bartholomew & Ewing, 2011). It is also argued that investments around transit stations that result in commercial development could reduce transportation costs for residents (Cervero, Robert et al., 2004).

That being said, many of these potential benefits have been called into question and the downsides of commercial gentrification are also documented. Some have suggested that gentrification and displacement associated with TOD could result in more automobile trips and greater GHG emissions (CHPC, 2014). This process could occur as lower-income residents, who are more likely to make use of transit services, are displaced to areas where transit may not be as reliable or provided at all, therefore shifting to auto transportation. If these residents are replaced by higher-income residents who are more likely to drive - or by commercial uses that are more likely to generate auto trips - it is possible the net effect could be an increase in regional automobile trips. These outcomes may be avoided by increasing density around transit stations (Chapple et al., 2017).

Lastly, there is no peer-reviewed literature examining the relationship between commercial gentrification and traffic safety at transit stations. This research gap represents one of the major questions this study addresses.

Summary

In short, the academic literature has only just begun to explore commercial gentrification. Much about the phenomenon is not yet fully understood, including what kind of effects commercial gentrification can be expected to have to area employees, consumers, and residents. Commercial gentrification's relationship with traffic crashes and transit ridership is similarly unknown.

Though commercial gentrification manifests itself in many different forms, depending on the local context, some aspects of commercial gentrification have been slowly uncovered through qualitative and quantitative research. Theories of commercial gentrification rest largely on either economic or cultural arguments, and leverage urban social understandings of race and class. To measure commercial gentrification, scholars have examined the dynamics and types of business transformation, looking at establishment turnover, churn, and retention, as well as the presence (or absence of) 'signal establishments' and chain/non-chain establishments. Some specific types of commercial gentrification have already been identified: retail upscaling, spaces of commodification, art districts, and transit-oriented districts. The research presented in this report fills some of the gaps in our understanding of commercial gentrification, with particular respect to its relationship with transit ridership and traffic crashes.

IV. DEFINING COMMERCIAL GENTRIFICATION

DEFINING COMMERCIAL GENTRIFICATION

Operationalizing the concept of commercial gentrification is challenging. As previously discussed, very few past studies have attempted to develop a quantitative definition of commercial gentrification. By drawing on key characteristics and features of commercial gentrification (such as changes in consumer base and increased cost of doing business, which are discussed in the literature review), this report develops a binary 'commercially gentrified/not commercially gentrified' dummy variable that can be applied to metropolitan areas in California. This variable makes use of data from the National Establishment Time-Series (NETS) dataset, which the authors have purchased from Walls & Associates for the state of California from 1990 to 2013. Using NETS, we created a commercial gentrification variable applied to the 1990-2000 and 2000-2013 time periods.

Because commercial gentrification is defined by multiple characteristics, we created definition parameters that measured infrequent establishment churn, discretionary establishment churn, minority-owned establishment share, and non-chain small business share. Including these measures of both business dynamics and type is the best way to encompass the many different forms that commercial gentrification takes in different contexts, from low-income or ethnic neighborhoods to established commercial strips. We then rescaled each parameter to a simple 0-100 index, weighted the four indices according to our interpretation of commercial gentrification, and summed them into a single, consolidated 'commercial gentrification index' for each census tract.[1] Because the focus of this research is commercial gentrification, we applied this index only to tracts defined as 'commercial'. Commercial tracts were defined based on employment density and percentage of commercial lot area. We classified the top 20% of commercial gentrification index tracts in each time period as commercially gentrified.

In short, a tract was considered commercially gentrified if it was a commercial tract and was in the top 20% of an index combining:

- Infrequent establishment churn: the rate at which infrequently-patronized businesses move into and out of a neighborhood.
- Discretionary establishment churn: the rate at which discretionary shopping businesses move into and out of a neighborhood.
- Minority-owned establishment share difference: the change over time in the share of businesses owned by minorities.
- Non-chain small business establishment share difference.

Using this definition, Figures 4.1-4.4 below show the census tracts in the Bay Area and Los Angeles County that are considered commercially gentrifying in the 1990-2000 or 2000-2013 time periods.

1 This report uses 2010 census tracts boundaries throughout.

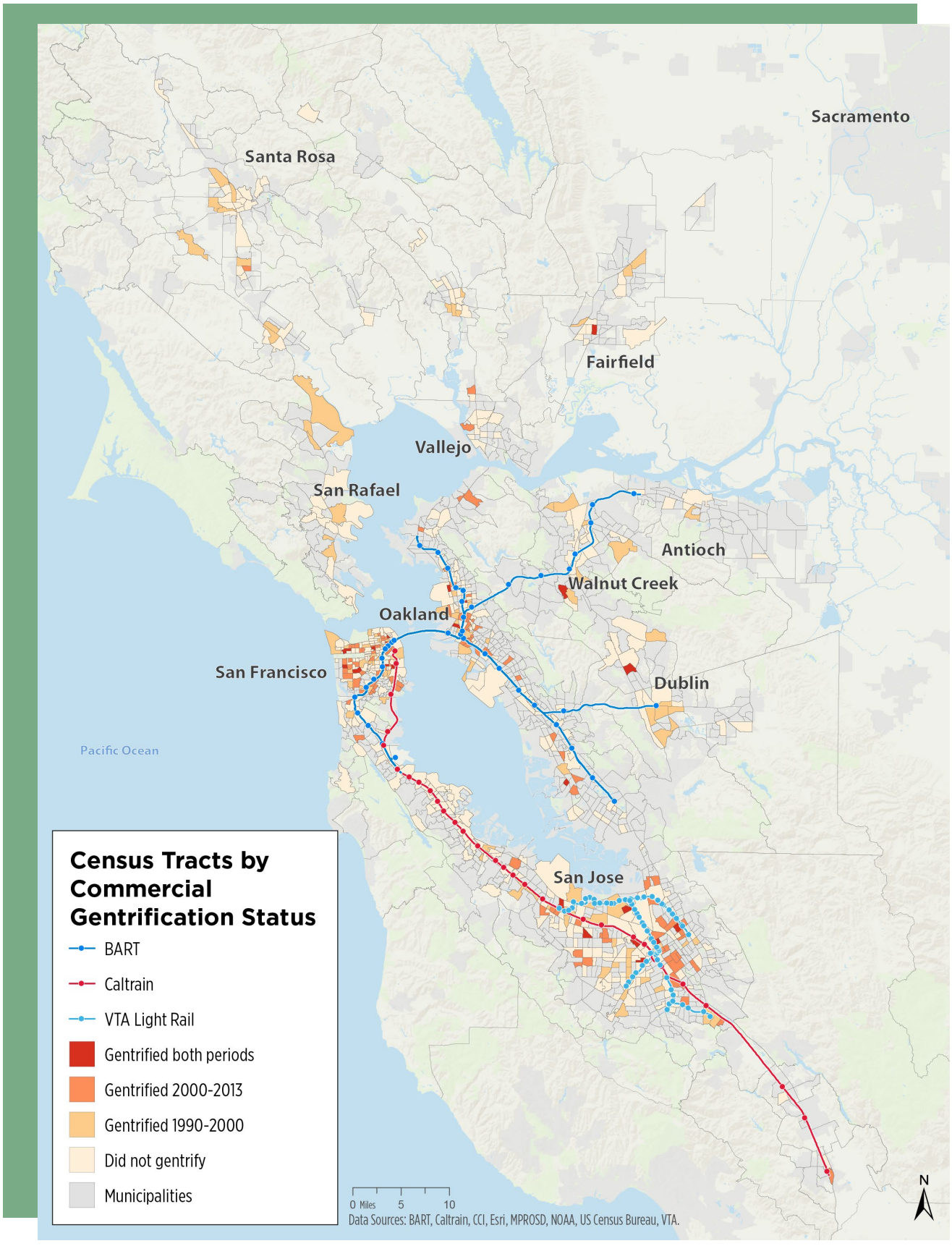

Figure 4.1: Commercial Gentrification in Bay Area Census Tracts, 1990-2013

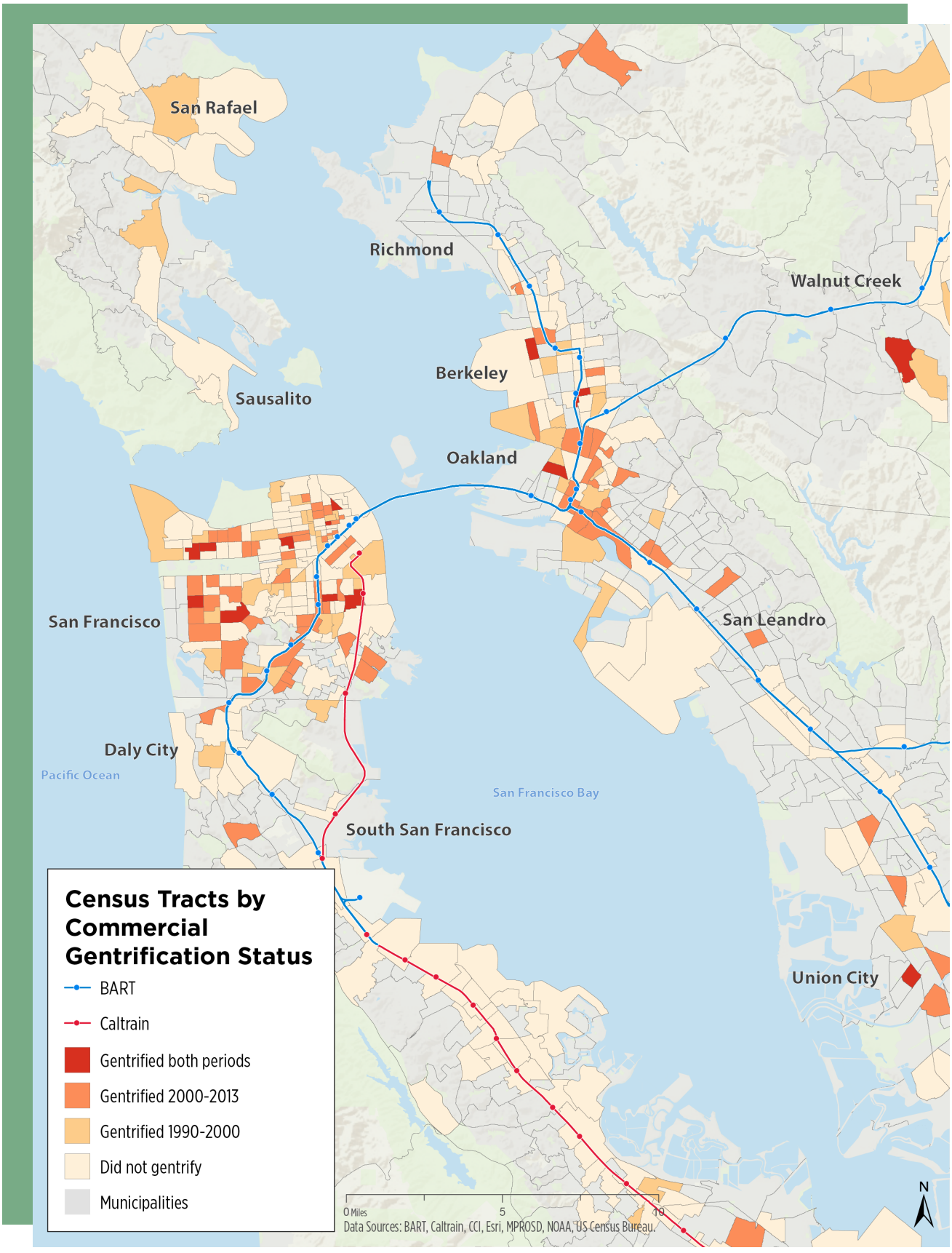

Figure 4.2: Commercial Gentrification in Bay Area Census Tracts, 1990-2013

Defining Commercial Gentrification

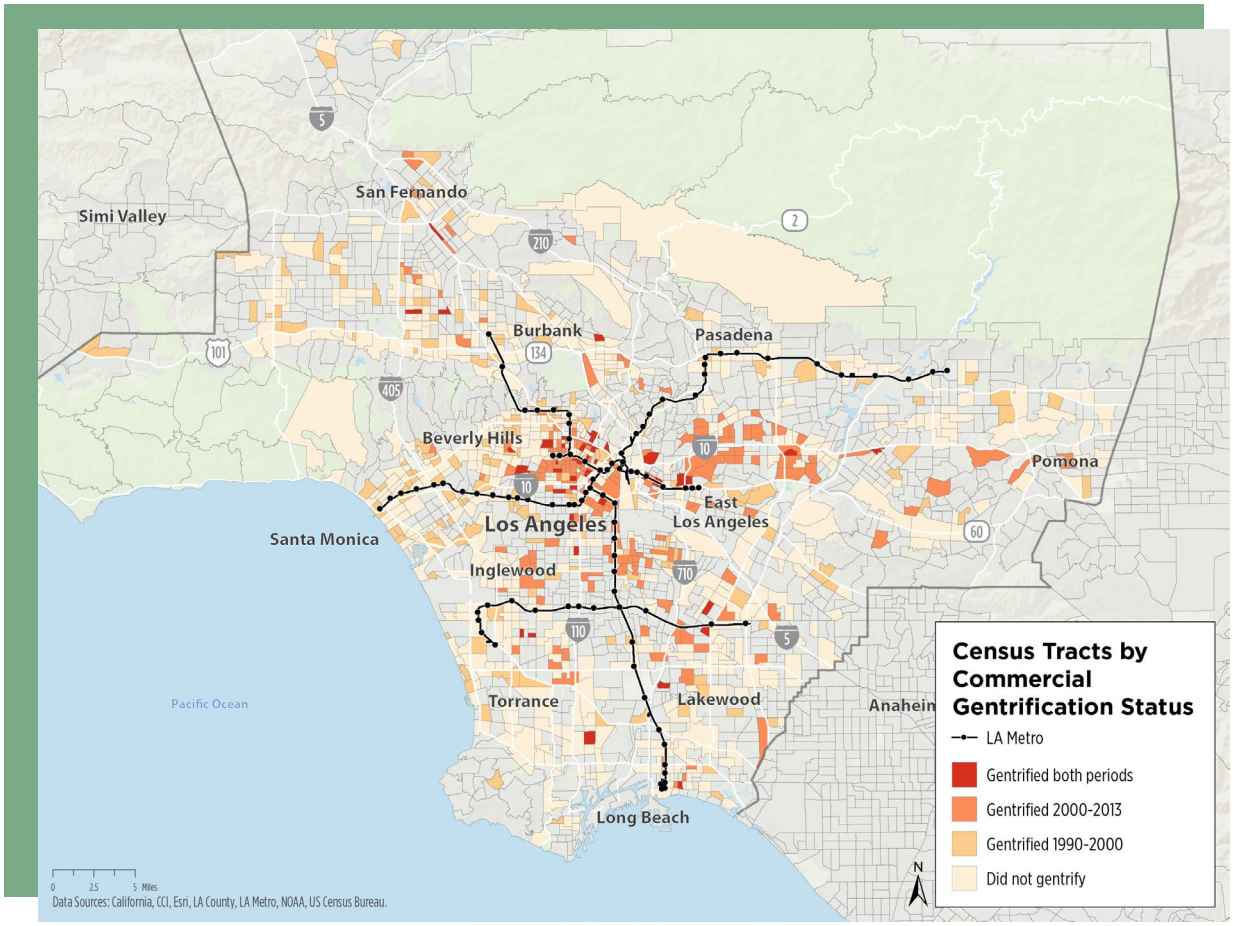

Figure 4.3: Commercial Gentrification in Los Angeles Census Tracts, 1990-2013

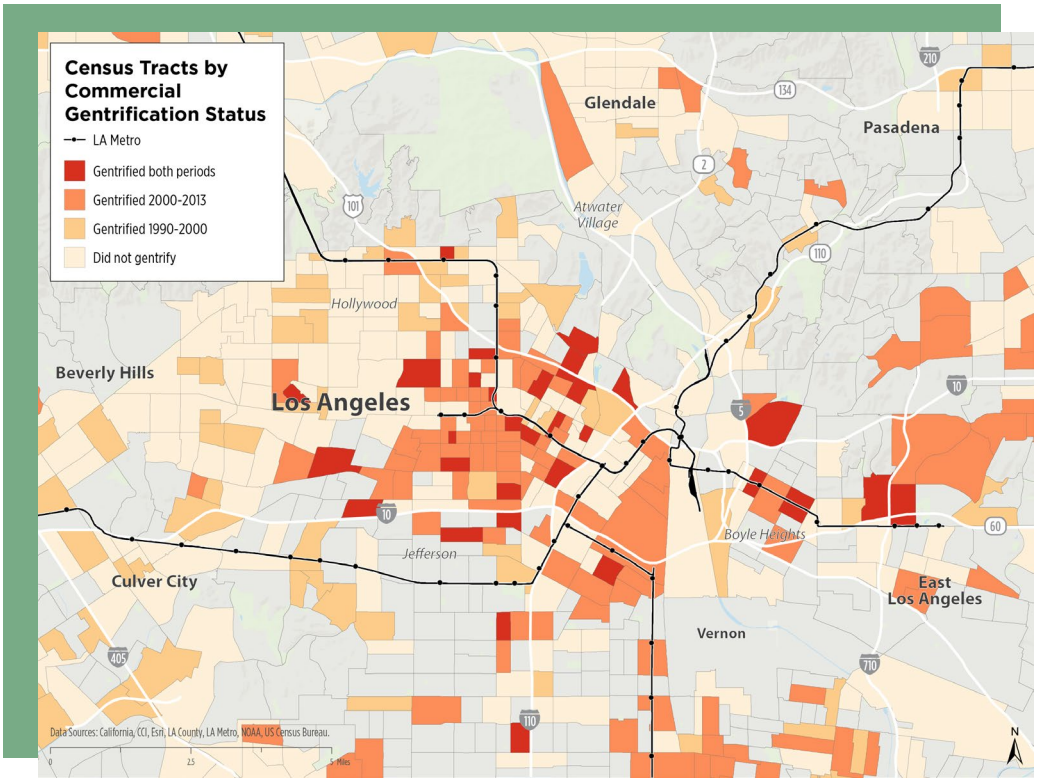

Figure 4.4: Commercial Gentrification in Los Angeles Census Tracts, 1990-2013

This definition of commercial gentrification largely measures changes in the composition of business establishments in a neighborhood and does not do as good a job in measuring the increased costs of doing business in a neighborhood, which could be identified through commercial rents or wages. Future research should incorporate these inputs where possible. An overview of the data used to calculate these indicators and a detailed description of how the indicators themselves were calculated is provided below.

Data Overview

NETS is a proprietary establishment dynamics database developed by Walls & Associates. We used the NETS database to calculate the number of establishments in each census tract in each study period year (1990-2013), as well as births, deaths, moves to, and moves from each census tract in each year of the study period. In order to exclude potential outliers of both extremely large and extremely small businesses, we dropped all establishments with one or zero employees or over $50,000,000 in sales in the year for which a statistic was calculated. The one-employee and $50,000,000-threshold were based on best practices culled from past research, most notably Chapple and Jacobus (2009). Establishments were assumed to be present in a given census tract by one of two methods: 1) if their given address was located in that census tract and the establishment had never moved; or 2) if the establishment had moved only once, then the year of establishment move was taken and the establishment's first address was used to assume the establishment's address prior to its move.

The moves, births, and death rate of establishments in a census tract were calculated using a combination of the NETS establishment database and NETS Moves database, which tracks establishment moves over time. For each census tract, we developed the following statistics. Methodological details pertaining to these four statistics are explained below.

- Annual in-migration rate of new establishments.
- Annual out-migration rate of existing establishments.
- Establishment death rate per year.
- Establishment birth rate per year.

These statistics also excluded establishments that had one or zero employees or over $50,000,000 of sales in the year of their move. The count of establishments that moved into the tract in a given year was normalized over the total number of tract establishments plus the number of establishments that in-migrated. The out-migrating establishments figure was likewise calculated. For time periods such as 1990-2000 or 1990-1992, the rate of establishments that in-migrated and out-migrated were both calculated by normalizing the total number of in- or out-migrating establishments for the time period over the total number of establishments for the time period plus the total number in- or out-migrating establishments for that period.

While 85% of the nine-county Bay Area NETS data had latitude/longitude geocoded to the address level, 15% was only geocoded to a zip code centroid level. As such, additional processing was required to acquire latitude/longitude pairs that could be tied to the census tracts of the establishments. We geocoded these addresses using ESRI's geocoding service.

Defining a Commercial District

To ensure that the census tracts yielded by our commercial gentrification index were indeed commercial districts and not statistical anomalies (e.g., a few establishments in a residential neighborhood), we developed a definition for commercial districts that can be applied throughout California. To be a commercial district a census tract must have: a) an establishment density greater than the regional median or b) a commercial lot area ratio greater than the regional median - a definition that encompasses districts in different urban settings, from city to suburb.[2] Establishment density was calculated by dividing the total establishments in each tract by the tract's land area. Commercial lot area ratio was defined as the tract's commercial lot area divided by the tract's total lot area. This was calculated using DataQuick assessor data, which totals each tract's lot area by use.

The resulting tracts selected by each of these two conditions for the Bay Area and Los Angeles County are shown in Figures 4.5-4.7.

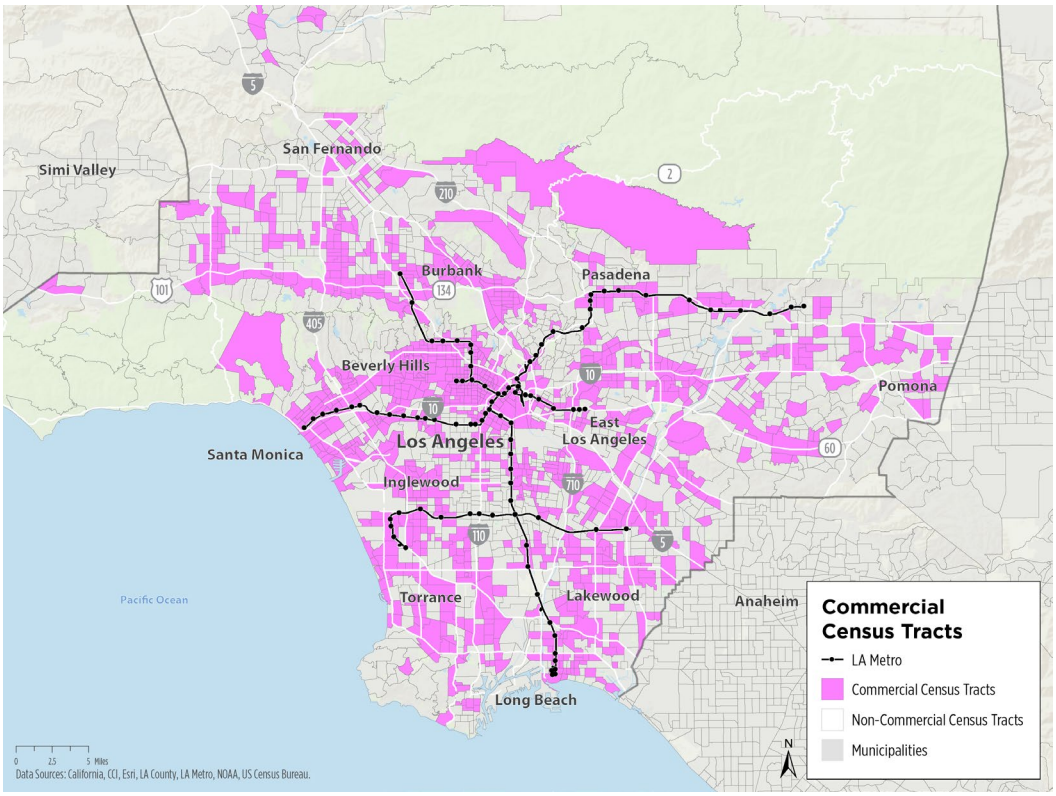

Figure 4.5: Los Angeles Commercial Census Tracts

2 The establishment density definition (a) seems to favor small lot, commercial corridors. A good example of this is the Ventura Blvd. corridor in the San Fernando Valley. This corridor has high establishment density but may not have as high commercial lot acreage relative to total lot acreage. Definition (a) picked up this whole corridor while definition (b) did not. Definition (b) seems to favor large lot commercial development, like malls and big box stores. This type of development has a high commercial footprint, but may not have as many establishments per area. It is also worth noting that this definition seems to pick up a more dispersed set of tracts. In an effort to provide an inclusive definition of commercial districts, we considered a tract as a commercial district if it satisfied either of the two definitions described above.

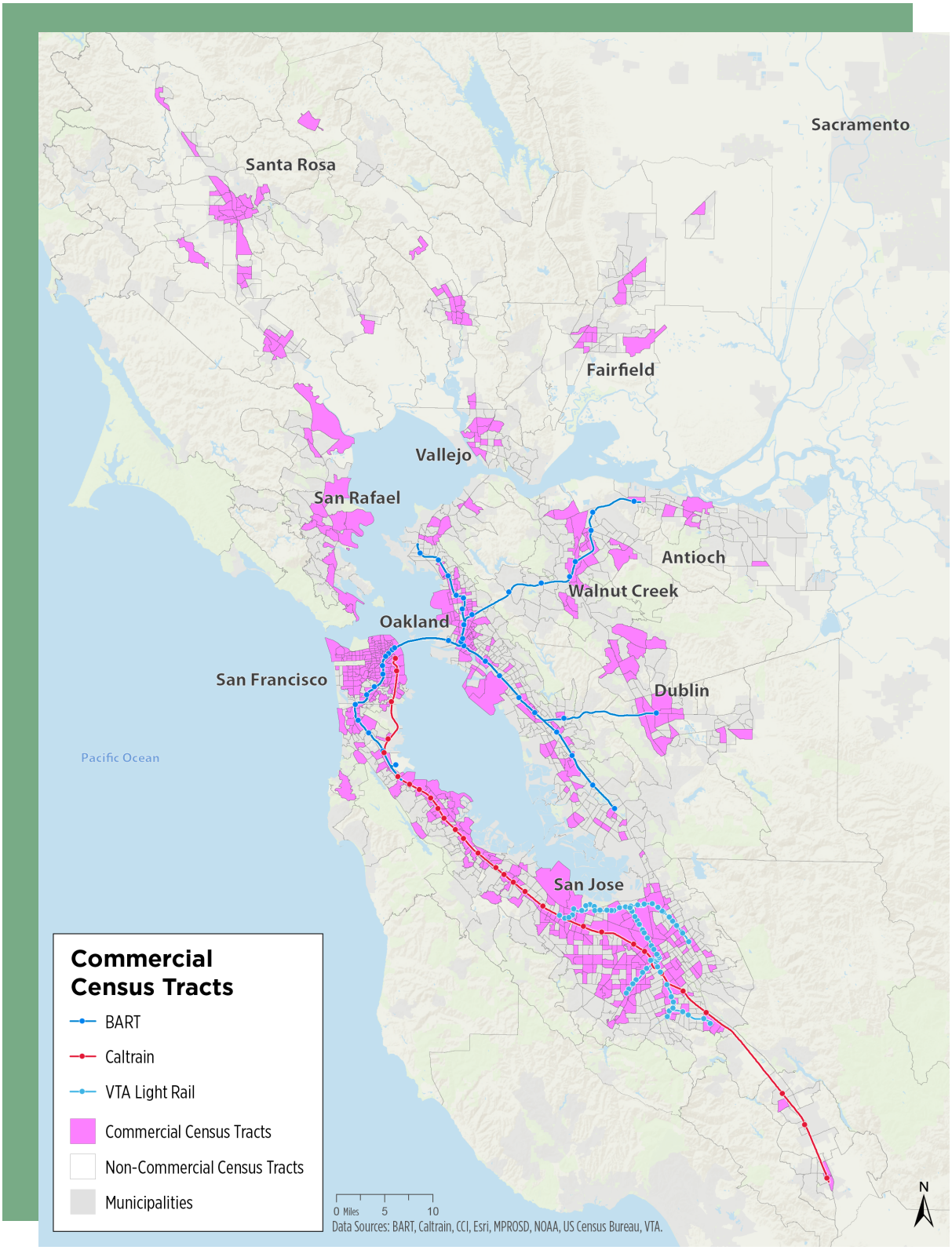

Figure 4.6: San Francisco Commercial Census Tracts

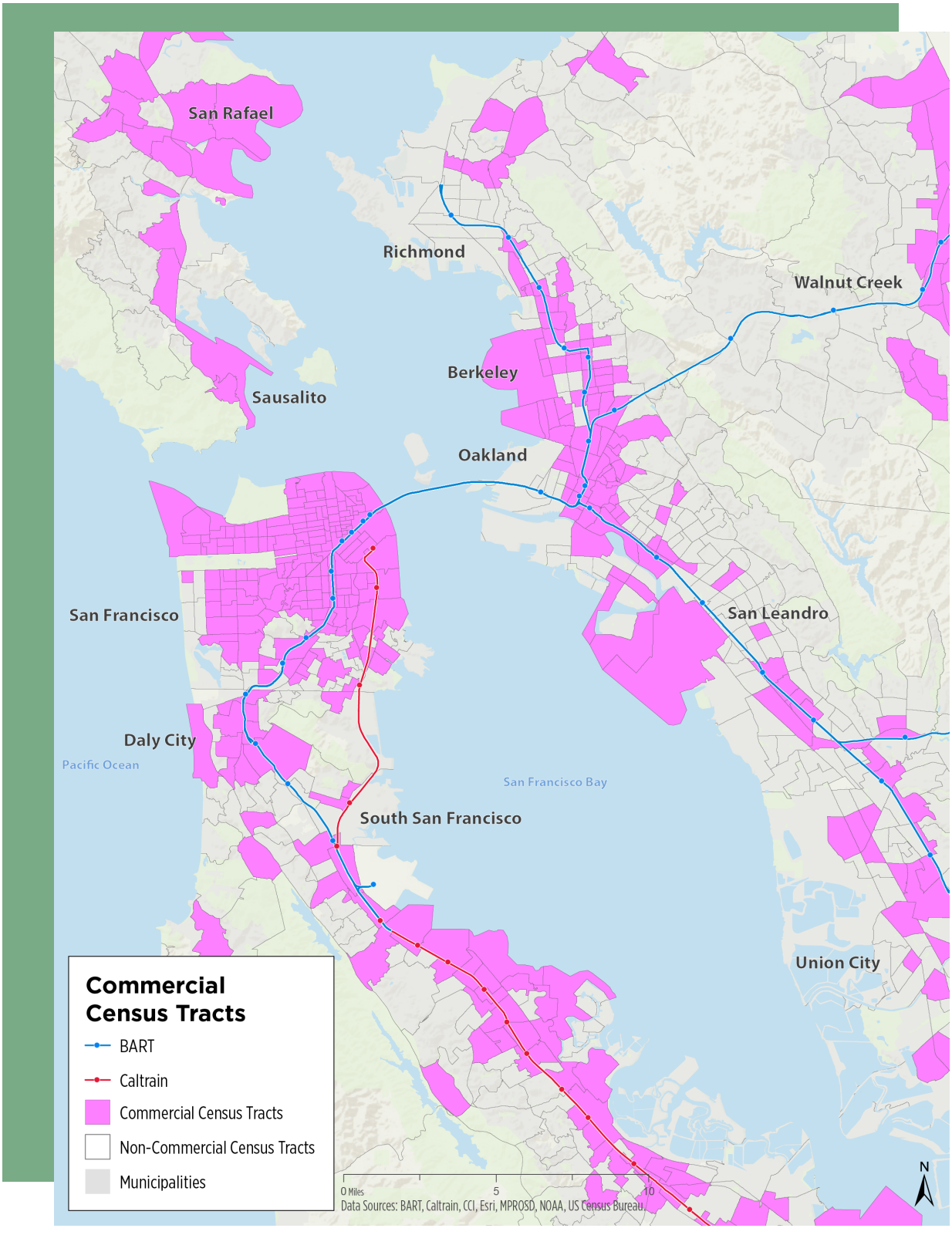

Figure 4.7: San Francisco Commercial Census Tracts, SF-Oakland Region

Infrequent & Discretionary Establishment Churn

This indicator combines two concepts from Meltzer and Capperis (2016): establishment churn and signal establishments. In order to measure establishment churn, Meltzer and Capperis took the sum of establishment moves into and out of a neighborhood and divided it by the midpoint number of establishments over the time period (Ibid.). They used North American Industry Classification System (NAICS) codes to define infrequent (not shopped at often) and discretionary (optional spending for consumers) business establishments (Ibid.). For our study, we measured the churn of both infrequent and discretionary establishments, which we have identified as signals of commercial gentrification. As with our other indicators, this signal establishment churn was measured at the census tract level for both 1990-2000 and 2000-2013. The formulas for these indicators are summarized in Figure 8 below.

Figure 4.8: Equations for Discretionary Establishment Churn (CDE) & Infrequent Establishment Churn (CIE)

$$C_{DE} = \frac{B_{DE} + IM_{DE} + D_{DE} + OM_{DE}}{(D_{DE*} + OM_{DE*})/2}$$

$$C_{IE} = \frac{B_{IE} + IM_{IE} + D_{IE} + OM_{IE}}{(D_{IE*} + OM_{IE*})/2}$$

*At start of decade

BDE = Births of Discretionary Establishments
IMDE = In-Migration of Discretionary Establishments
DDE = Deaths of Discretionary Establishments
OMDE = Out-Migration of Discretionary Establishments
XIE = X of Infrequent Establishments

To calculate infrequent and discretionary establishment statistics for each census tract, this research uses the NETS six-digit NAICS variables, which provide classifications for each year of an establishment's existence. Infrequent and discretionary establishments were defined using the same NAICS codes used in Meltzer and Capperis (2016). We used these definitions to create an inventory of the number of infrequent and discretionary establishments per tract per year (Aee Table A1 in the appendix for a full list of NAICS codes included in this definition). We then rescaled the signal establishment churn indicators on 0-100 indices and added them to the composite gentrification index.[3]

3 For example, the churn of discretionary establishments in the Bay Area from 1990-2000 was re-scaled to a 0-100 index with minimum value 0, maximum value 100, mean of 8.1, and standard deviation of 5.9.

Minority-Owned Establishment Share Difference

Because race is central to many theories of gentrification, we included a race-based parameter in our definition of commercial gentrification. To calculate minority-owned establishment share difference for each census tract, we used the NETS dummy variable for a minority-owned establishment.[4] To create a minority-owned establishment rate, counts of each census tract's minority-owned businesses were normalized over the number of establishments in the census tract. Next, the study period's end year rate was subtracted from its start year rate. If minority-owned establishments are disappearing at a greater rate in one tract than in others, then this may indicate commercial gentrification. The formula we used is summarized in Figure 9 below.

Figure 4.9: Equation for Minority-Owned Establishment Share Difference (DiffMOE)

$$Diff_{MOE} = (ED_{MOE}/ED_{TE}) - (SD_{MOE}/SD_{TE})$$

EDMOE = End of Decade Count of Minority-Owned Establishments
EDTE = End of Decade Count of Total Establishments
SDMOE = Start of Decade Count of Minority-Owned Establishments
SDTE = Start of Decade Count of Total Establishments

We next rescaled the minority-owned establishment share difference parameter on a 0-100 index, with higher index values denoting a lower share change over time (the highest value share change being given score 100, the lowest value change being given score 0). When adding the indexed parameter to the composite gentrification index, we chose to weight it three times as high as each of the signal establishment indicators, in order to stress the racial component of commercial gentrification, which we feel is of elevated importance in the California metropolitan context. This is supported by gentrification literature arguing on behalf of a salient racial element in commercial neighborhood change (Center for Community Innovation, 2014; Ong et al., 2014; Sutton, 2010).

Non-Chain Small Business Establishment Share Difference

To calculate non-chain small business establishments for each census tract, this research used the number of employees and the NETS variable 'related', which provides a count of associated establishments. An establishment was considered a non-chain small business if it had fewer than 20 employees and fewer than five related establishments. This definition ensures a small establishment size but allows for a handful of related businesses. We allowed small chains to be included in this definition because regional businesses with multiple establishments are sometimes characterized as local businesses and are not considered chains in the same way that a larger corporate chain might be. The formula we used is summarized in Figure 10 below.

4 The extent to which business respondents identify as a minority-owned business is not known. For example, it is not know what percentage of white Latino business owners identify as a minority-owned business. This is one problem with using this method.

Figure 4.10: Equation for Non-Chain Small Business Establishment Share Difference (DiffSB)

$$Diff_{SB} = (ED_{SB}/ED_{TE}) - (SD_{SB}/SD_{TE})$$

EDSB = End of Decade Count of Non-Chain Small Businesses
EDTE = End of Decade Count of Total Establishments
SDSB = Start of Decade Count of Non-Chain Small Businesses
SDTE = Start of Decade Count of Total Establishments

Once created, we rescaled the non-chain small businesses share difference indicator on a 0-100 index with higher index values denoting a lower share difference. When adding the indexed indicator to the composite index, we chose to weight it three times as high as each of the signal establishment indicators. This weighting was based on gentrification literature arguing on behalf of the strong role that chain businesses play in both perceived and real commercial district change (Basker, 2005; Haltiwanger et al., 2010; Meltzer, 2016b; Meltzer & Capperis, 2016; Neumark et al., 2008; Zukin, 2009).

An example of the practical application of this definition is illustrated below for the Oakland neighborhood of Temescal (census tract 4011), which, when measured from 2000-2013, had an infrequent establishment churn rate of 3.79, a discretionary establishment churn[5] rate of 2.83, a -.033 change in the share of minority-owned establishments, and a non-chain establishment share difference of -0.12. This gives the Temescal neighborhood a total index score – after weighting of individual parameters - of 216.93. Because we identify commercially gentrified neighborhoods as the top 20% of tracts on our commercial gentrification index, this tract is defined as commercially gentrifying (it is in the 80th percentile). Table 4.1 shows the indexing and weighting scheme for Temescal.

Table 4.1: Creating Composite Commercial Gentrification Index for Temescal

Variable	Raw Value	Re-Scaled to 1-100 Index	After Weighting
Infrequent Est. Churn	3.79	14.59	14.59 *(x1)*
Discretionary Est. Churn	2.83	10.87	10.87 *(x1)*
Minority-Owned Est. Diff.	-0.033	46.17	138.51 *(x3)*
Non-Chain Est. Diff.	-0.12	17.65	52.94 *(x3)*
Sum Total			216.93

5 Churn is defined as number of establishments that move into, move out of, die in, or are born in, a census tract, divided by total number of establishments. Average churn for infrequent establishments in the Bay Area is 3.37.

Using this definition, we yielded 131 commercially gentrifying census tracts in each time period for the Bay Area. These amounted to roughly eight percent of all tracts. For Los Angeles County, this definition yielded 227 commercially gentrifying census tracts in each time period, or approximately 10% of all tracts. This definition was used throughout this report to investigate commercial gentrification's relationship with transit proximity and ridership, traffic crashes, and transit ridership.

Summary

In short, a census tract was considered commercially gentrifying if it was defined as a commercial district and fell within the top 20% of a composite gentrification index scored on the following weighted parameters:

- Infrequent Establishment Churn (higher churn is more gentrifying)
- Discretionary Establishment Churn (higher churn is more gentrifying)
- Minority-Owned Establishment Share Difference (lower difference is more gentrifying)
- Non-Chain Small Business Establishment Share Difference (lower difference is more gentrifying)

V. PREDICTING COMMERCIAL GENTRIFICATION

PREDICTING COMMERCIAL GENTRIFICATION

Introduction

In an attempt to quantifiably predict commercial gentrification at the census tract level, we performed probit regression analyses using our NETS-based definition of commercial gentrification as the dependent variable, the presence of a rail transit station as an independent variable and control variables gathered from a variety of sources. This portion of the report describes our methodology for conducting the regression analyses and reviews the findings produced by the models.

Two probit regressions were conducted: one for each study region (the Bay Area and Los Angeles). The regressions used nearly identical independent variables, with adjustments to reduce multicollinearity.. The dependent variable represents commercial gentrification that occurred from 2000-2013 and is regressed upon demographic and built environment statistics for the baseline year of the analysis (in this case, the year 2000).

Variable Construction

Our regression models use a dummy variable of commercial gentrification from 2000-2013 as the dependent variable and a suite of general demographic and built environment variables as independent variables. The dummy commercial gentrification variable (1 = tract commercially gentrified, 0 = tract did not commercially gentrify) used an equivalent definition for both Los Angeles and the Bay Area. The parameters that determine whether or not a census tract commercially gentrified by this definition are laid out in Section IV of this report.

The remainder of the variables included in our regressions were sourced from the decennial census, the Center for Community Innovation's (CCI) residential gentrification work (Chapple et al., 2017), the Environmental Protection Agency (EPA) Smart Location Database (SLD), and NETS. Table 5.1 shows the variables included, their descriptions, and their sources.

Commercial Gentrification & Residential Gentrification

Of particular interest to this research is the relationship between commercial gentrification and residential gentrification. Intuition suggests that there should be a distinct relationship between the two, with a commercially gentrified neighborhood following an influx of new residents, or new residents flocking to a commercially gentrified commercial district. The data analyzed in this report, however, do not bear out a clear consistent relationship between the two.

Tables 5.2 and 5.3, and the maps in Figures 5.1 and 5.2 below, show the overlap amongst commercially and residentially gentrified tracts in both Los Angeles and the Bay Area. The residentially gentrified designation is from Chapple et al. (2017), and the commercially gentrified designation is from this report. The temporally dispersed nature of the two types of gentrifi-

Variable Name	Description	Source
Transit-proximate (1/0)	Variable indicating the presence of high-quality transit within ½-mile of the tract. High-quality transit defined by the Strategic Growth Council as having high frequencies *and* permanent infrastructure as follows: (1) Frequency: high quality transit must have peak period headway frequency of every 15 minutes or less and service seven days a week. (2) Permanent Infrastructure: must operate on a railway or be transit service with BRT features that either fully or partially operate on a dedicated bus-only lane, or uses HOV or HOT lanes.	Strategic Growth Council
Non-Hispanic black	Percent of population identifying as non-Hispanic black	Decennial Census; 2000
Hispanic	Percent of population identifying as Hispanic	Ibid.
Foreign-born	Percent of population that is foreign-born	Ibid.
College-educated	Percent of population 25 and older with a college education or greater	Ibid.
Median household income	Median household income	Ibid.
Units built pre-1950	Percent of housing units built pre-1950	Ibid.
Population renting	Percent of population renting	Ibid.
Residentially gent. or adjacent to residentially gent. (1/0)	Dummy variable indicating tract residentially gentrified from 1990-2000 or was adjacent to a tract that residentially gentrified from 1990-2000	Chapple et al.; 2017
Employees per sq. mi.	Employees per sq. mi. for businesses with greater than one employee and fewer than $50M in annual sales	NETS; 2000
Population density	Population per sq. mi.	Decennial Census; 2000
Road network density	Total road network density	EPA SLD; 2014
Street intersection density	Street intersection density (weighted, auto-oriented intersections eliminated)	EPA SLD; 2014

Table 5.1: Variables Included in Commercial Gentrification Regressions

cation suggests that commercial and residential gentrification do not follow a distinct pattern, whereby one consistently precedes the other. The mixed results of a residential gentrification variable in this report's regression analysis corroborate hypotheses that gentrification is highly context-specific.

		Commercial Gentrification (n = 262)	
		'90-'00	'00-'13
Residential Gentrification	'90-'00	16	15
(n = 168)	'00-'13	11	18

Table 5.2: San Francisco Bay Area Commercial & Residential Gentrification Tracts

		Commercial Gentrification (n = 454)	
		'90-'00	'00-'13
Residential Gentrification	'90-'00	9	17
(n = 163)	'00-'13	13	15

Table 5.3: Los Angeles Commercial & Residential Gentrification Tracts

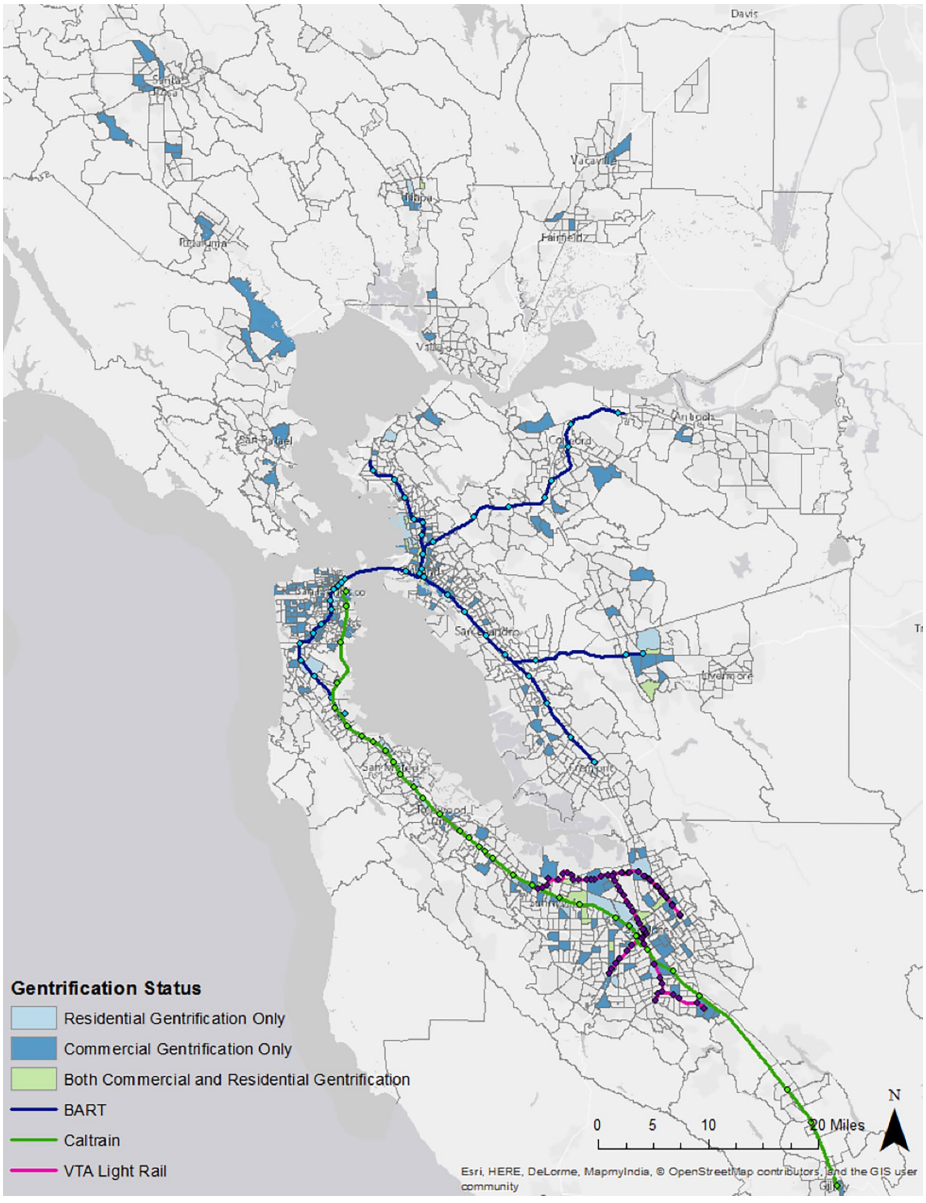

Figure 5.1: Map of Commercial & Residential Gentrification in Bay Area

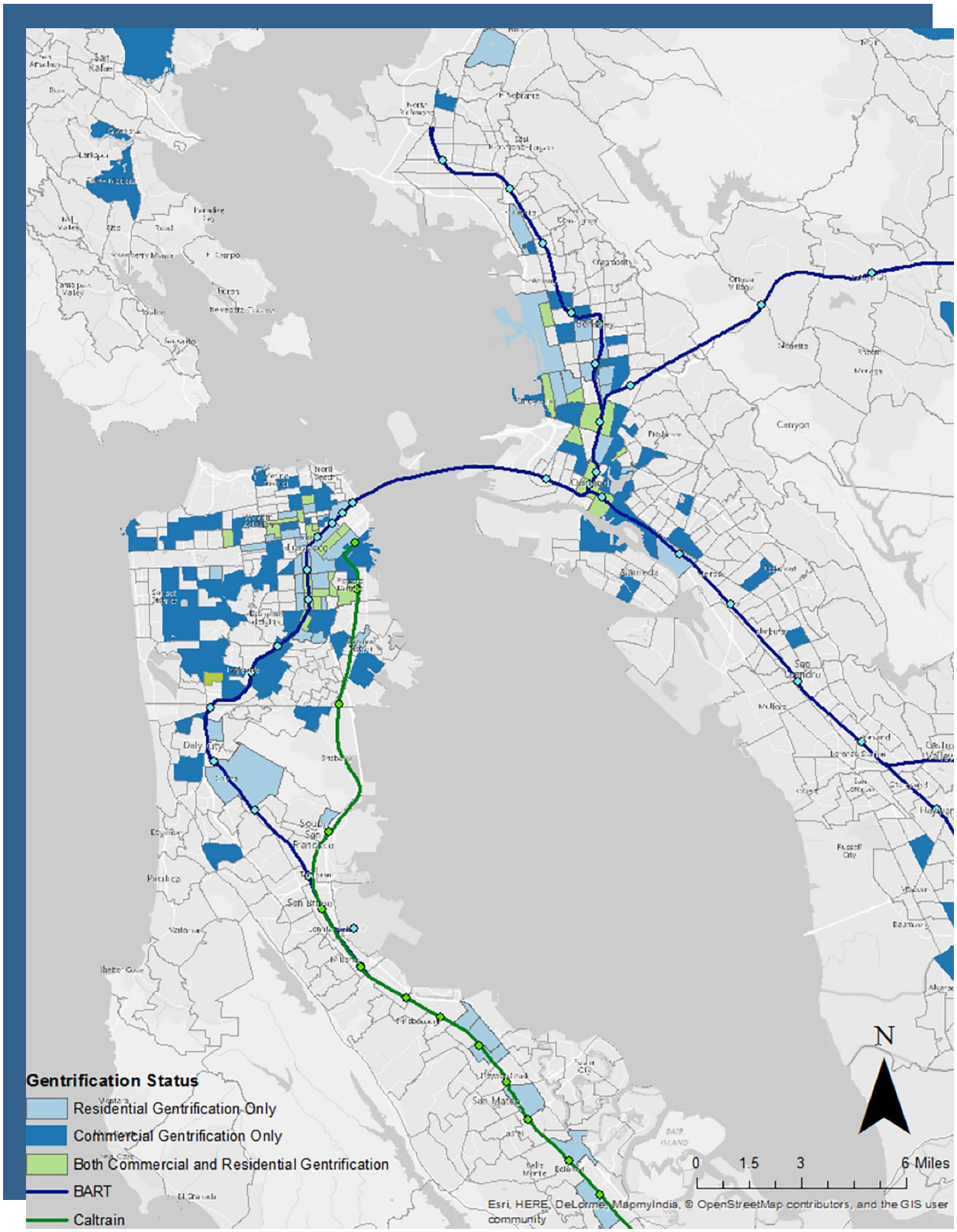

Figure 5.2: Map of Commercial & Residential Gentrification in Bay Area, SF-Oakland Region

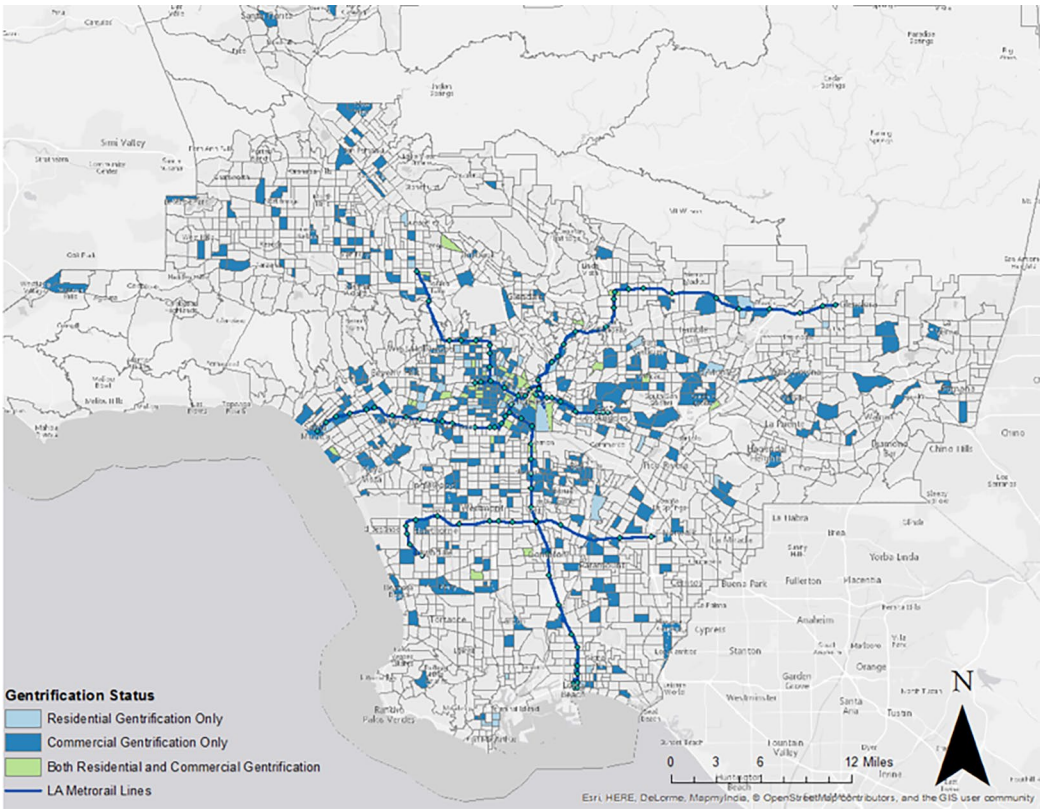

Figure 5.3: Map of Commercial & Residential Gentrification in Los Angeles

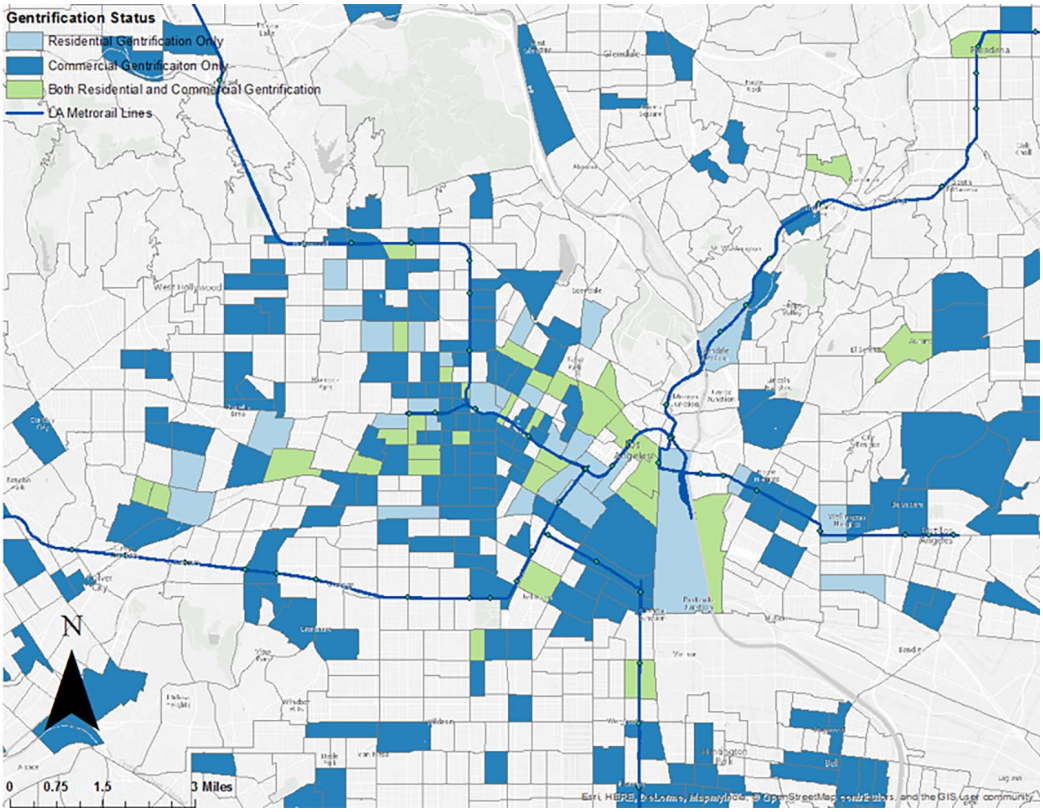

Figure 5.4: Map of Commercial & Residential Gentrification in Downtown Los Angeles

In an attempt to more accurately model the relationship between residential gentrification and commercial gentrification, we incorporated a residential gentrification and adjacency variable into our commercial gentrification regressions. This binary variable indicated if a tract had residentially gentrified in the 1990-2000 period or it was adjacent to a tract that had residentially gentrified in this period (adjacent tracts were identified using a combination of ArcMap and Stata). The incorporation of adjacency into the model was meant to account for neighborhood gentrification 'spillover', whereby a gentrified neighborhood begins to affect an adjacent neighborhood by virtue of proximity.

Bay Area

In the Bay Area, a probit regression with commercial gentrification as the dependent variable was conducted for all commercial districts, for a total of 628 census tracts. See Table 5.4 for descriptive statistics. Only six variables significantly influenced the commercial gentrification dependent variable (See Table 5.5). The variable of primary interest, transit proximity, was not significant. Another control variable of note - residential gentrification (or adjacency to a residential gentrification tract) - was also not significant. This suggests that residential and commercial gentrification may not necessarily be co-occurring phenomena in the Bay Area.
The variables that were significant were the 2000 census tract percentage of non-Hispanic black residents, percentage of foreign-born residents, percentage of college-educated residents, percentage of renters, population density, and street intersection density.

Of the significant independent variables in the Bay Area regression model, we see that the 2000 non-Hispanic black population, the 2000 foreign-born population, the 2000 college-educated population, the 2000 population density, and the 2014 street intersection density are all positively associated with an increase in the probability of commercial gentrification. We also see that the 2000 renting population in a tract is associated with a slight decrease in the probability of commercial gentrification. Street intersection density is by far the variable with the strongest magnitude marginal effect, suggesting that the general walkability of a neighborhood (an area with high intersection density can be assumed to be more walkable) may be an important precondition for commercial gentrification. It is curious that population density is not as strong a predictor (as this and street intersection density could both proxy for density of built form) as street intersection density. This suggests that - in the Bay Area - a critical mass of population is not necessarily associated with walkability, and that walkability is a more important predictor of commercial gentrification.

Los Angeles

A probit regression analysis with commercial gentrification as the dependent variable was also conducted for 1,066 commercial census tracts in Los Angeles, returning nine significant variables. Table 5.6 presents the descriptive statistics for the variables in the model. As with the Bay Area model, the variable indicating the presence of a transit station was not significant (See Table 5.7). The residential gentrification (or adjacency to residential gentrification) variable, however, was significant in the Los Angeles model, suggesting that - at least in this context - residential gentrification may reliably precede commercial gentrification.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Com. gent. '00-'13 (1/0)	628	0.209	0.407	0	1
Transit-proximate (1/0)	628	0.234	0.424	0	1
% non-Hispanic black (2000)	628	8%	12%	0%	73%
% Hispanic (2000)	628	19%	17%	1%	85%
% foreign-born (2000)	628	30%	15%	0%	82%
% w/ college degree (2000)	628	39%	20%	4%	84%
% units built pre-1950 (2000)	628	33%	28%	0%	90%
% pop. renting (2000)	628	55%	24%	4%	100%
Res. gent. or adjacent to res. gent. '90-'00 (1/0)	636	0.302	0.459	0	1
Employment density (2000)**	629	60	148	0	2,585
Pop. density (2000)***	628	15	17	0	168
Street intersection density (2014)**	636	1	1	0	8

***In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.4: Descriptive Statistics for Bay Area Commercial Gentrification Probit Regression

Dependent Variable	*Commercial Gentrification '00-'13 (1/0)*			
Independent Variables	dy/dx	P>|z|	[95% Conf.	Interval]
Built Environment				
% units built pre-1950 (2000)	0.001	0.263	-0.001	0.002
Employment density (2000)**	-0.0002	0.168	-0.0004	0.0001
Pop. density (2000)***	0.002	0.042	0.0001	0.005
Street intersection density (2014)**	0.053	0.011	0.012	0.093
Socioeconomic				
% w/ college degree (2000)	0.003	0.046	0.0001	0.005
% renting (2000)	-0.003	0.002	-0.004	-0.001
% non-Hispanic black (2000)	0.006	0.000	0.004	0.009
% Hispanic (2000)	0.0004	0.716	-0.002	0.003
% foreign-born (2000)	0.009	0.000	0.007	0.011
Other				
Transit-proximate (1/0)	-0.006	0.882	-0.079	0.068
Res. gent. or adjacent to res. gent. '90-'00 (1/0)	-0.021	0.548	-0.088	0.046
N	628			
Pseudo R2	0.161			
Correctly classified	79.46%			

***In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.5: Average Marginal Effects, Bay Area Commercial Gentrification Probit Regression

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Com. gent. '00-'13 (1/0)	1,082	0.210	0.407	0	1
Transit-proximate (1/0)	1,082	0.095	0.294	0	1
% non-Hispanic black (2000)	1,078	9%	14%	0	94%
% Hispanic (2000)	1,078	45%	29%	3%	98%
% foreign-born (2000)	1,078	40%	17%	1%	79%
Median household income (2000)	1,082	$54,683	$24,565	$0	$219,824
% units built pre-1950 (2000)	1,078	27%	18%	0	90%
% renting (2000)	1,078	64%	24%	5%	100%
Res. gent. or adjacent to res. gent. '90-'00 (1/0)	1,082	0.172	0.377	0	1
Employment density (2000)**	1,068	56	77	0	822
Pop. density (2000)***	1,081	16	14	0	125
Street intersection density (2014)**	1,082	1	1	0	7

***In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.6: Descriptive Statistics for Los Angeles Commercial Gentrification Probit Regression

Dependent Variable	*Commercial Gentrification '00-'13 (1/0)*			
Independent Variables	dy/dx	P>|z|	[95% Conf. Interval]	
Built Environment				
% units built pre-1950 (2000)	0.002	0.013	0.0004	0.003
Employment density (2000)**	-0.0004	0.037	-0.001	-0.00003
Pop. density (2000)***	0.003	0.009	0.001	0.005
Street intersection density (2014)**	-0.058	0.033	-0.112	-0.005
Socioeconomic				
Median household income (2000)*	-0.004	0.013	-0.007	-0.001
% pop. renting (2000)	-0.004	0.000	-0.006	-0.002
% pop. non-Hispanic black (2000)	0.004	0.000	0.002	0.006
% pop. Hispanic (2000)	0.0009	0.087	-0.0001	0.002
% pop. foreign-born (2000)	0.008	0.000	0.005	0.010
Other				
Transit-proximate (1/0)	0.016	0.671	-0.059	0.091
Res. gent. or adjacent to res. gent. '90-'00 (1/0)	0.058	0.040	0.003	0.113
N	1,066			
Pseudo R2	0.218			
Correctly classified	80.77%			

**In thousands of dollars. **In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.7: Average Marginal Effects, Los Angeles Commercial Gentrification Probit Regression

Amongst the nine significant variables, we see that employment density, street intersection density, median household income, and percent renting negatively predict commercial gentrification, while the percent of units built pre-1950, the population density, the percent of non-Hispanic black residents, the percent of foreign-born residents, and preceding residential gentrification (or adjacency to residential gentrification) positively predict commercial gentrification. The strongest predictors are residential gentrification (or adjacency) and street intersection density, which is negatively associated with commercial gentrification.

Summary

In summary, probit regression models for both Los Angeles and the Bay Area find that the presence of a rail transit station within a census tract is not a significant predictor of commercial gentrification. We also find that residential gentrification only significantly predicts commercial gentrification in Los Angeles, corroborating understandings of commercial and residential gentrification as context-specific phenomena.[6]

Four baseline variables were significant in both the Los Angeles and Bay Area models: percent population that is non-Hispanic black, percent population that is foreign-born, percent population that is renting, and population density. Although the magnitude of effect was different in the two regions, the direction of association was the same for all four variables, suggesting that these may be generalizable contributing factors to commercial gentrification, at least in high-cost and demographically diverse U.S. metropolitan areas.

The primary difference in significant independent variables across the Bay Area and Los Angeles regressions was street intersection density, which - although significant in both regions - was a strong negative predictor of commercial gentrification in Los Angeles and a strong positive predictor of commercial gentrification in the Bay Area. This marked difference reflects the difficulty of measuring and analyzing commercial gentrification across regions with different demographic and built environment characteristics, while also highlighting the context-specificity of the phenomenon. Clearly, the built environment of the Bay Area has a very different relationship with commercial gentrification than it does in Los Angeles.

These effects can be summed up as such: a neighborhood with a greater percentage of non-Hispanic black residents, a greater percentage of foreign-born residents, a smaller percentage of renters, and greater population density is more likely to become commercially gentrified over the course of approximately one decade. This, of course, is suggested within the context of a high-cost and diverse U.S. metro area, and from 2000-2013. It is unclear whether these results can be generalizable outside of these geographic and temporal parameters. Table 5.8, below, reviews the direction and magnitude of these effects.
Reversed Residential & Commercial Gentrification?

6 It is important to note that definitions of residential gentrification are also context-specific and were developed to reflect the phenomenon's unique occurrence in both San Francisco and Los Angeles. It is unclear how this variation in definition affects outcomes of analysis in this report but it is important to note. Methodology for defining residential gentrification in Los Angeles and the Bay Area can be found in Chapple et al. 2017, pp. 64-67.

		Marginal Effects	
Variable	Increase Unit	Los Angeles	Bay Area
Pop. density (2000)	1,000 per sq. mi.	.003	.002
% renting (2000)	One percent	-.004	-.003
% non-Hispanic black (2000)	One percent	.004	.006
% foreign-born (2000)	One percent	.008	.009

Table 5.8: Marginal Effects for Variables Significant in Same Direction for Los Angeles & Bay Area

Reversed Residential & Commercial Gentrification?

To model the potential for alternate roles of commercial and residential gentrification in Los Angeles and Bay Area neighborhoods, we also conducted regression analyses that reversed the roles of commercial and residential gentrification. These probit regressions, presented below in Tables 5.9 and 5.10, suggest an opposite ordering of commercial gentrification and residential gentrification. In Los Angeles, commercial gentrification (or adjacency to a commercially gentrified tract) in 1990-2000 was not a significant independent variable predicting residential gentrification in 2000-2013. In the Bay Area, on the other hand, commercial gentrification (or adjacency to a commercially gentrified tract) in 1990-2000 was a significant positive predictor of residential gentrification in 2000-2013.

Concluding Thoughts

Although our findings do not produce a significant and consistent direction of influence regarding commercial and residential gentrification across our two study regions, we do uncover region-specific patterns of influence. In the San Francisco Bay Area, it seems that commercial gentrification may precede residential gentrification, while in the Los Angeles region, residential gentrification may precede commercial gentrification.

This suggests an important difference between the Bay Area and Los Angeles regions that contributes to a reversed ordering of commercial and residential gentrification. We hypothesize that this may be due to a 'hotter' real estate market in the Bay Area, whereby commercial retailers seek to preempt residential gentrification by moving to or near areas where gentrification has already started to occur, thereby getting a jumpstart on future business. The general walkability of neighborhoods in our study regions may also affect the ordering of commercial and residential gentrification. In the Bay Area, our proxy for walkability (street intersection density) showed a significant positive correlation with commercial gentrification, while in Los Angeles, street intersection density produced a significant negative correlation with commercial gentrification. To the extent that walkability affects commercial gentrification, it clearly has a different, more positively associative effect in the Bay Area, suggesting that there is something about the Bay Area built form that induces commercial gentrification differently.

Predicting Commercial Gentrification

Dependent Variable	*Residential Gentrification '00-'13 (1/0)*			
Independent Variables	dy/dx	P>|z|	[95% Conf.	Interval]
Built Environment				
% units built pre-1950 (2000)	0.001	0.000	0.0004	0.001
Employment density (2000)**	0.00001	0.758	-0.00007	0.0001
Pop. density (2000)***	-0.001	0.014	-0.002	-0.0002
Street intersection density (2014)**	-0.001	0.828	-0.014	0.011
Socioeconomic				
Median household income (2000)*	-0.001	0.017	-0.002	-0.0002
% renting (2000)	0.001	0.105	-0.0001	0.001
% non-Hispanic black (2000)	.000002	0.995	-0.0006	0.001
% Hispanic (2000)	-0.00002	0.894	-0.0003	0.0003
% foreign-born (2000)	0.001	0.002	0.0005	0.002
Other				
Transit-proximate (1/0)	0.013	0.257	-0.010	0.036
Com. gent. or adjacent to com. gent. '90-'00 (1/0)	-0.008	0.324	-0.024	0.008
N	2,321			
Pseudo R2	0.196			
Correctly classified	96.55%			

**In thousands of dollars. **In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.9: Los Angeles Probit Regression Including Commercial Gentrification (or Adjacency) from '90-'00

Proximity to rail transit stations is not a significant predictor of commercial gentrification in either region, which is an important finding suggesting that TOD may not be more likely than other development to produce commercial displacement or other negative outcomes. The small number of rail transit-proximate census tracts input into these regressions (182 in the Bay Area and 143 in Los Angeles), however, may play a role in the lack of significance in the results. It is certainly possible that a change in the number of transit stations (or a change in definition of a transit-proximate tract) could affect the transit-proximate variables' significance and magnitude.

Dependent Variable	*Residential Gentrification '00-'13 (1/0)*			
Independent Variables	dy/dx	P>|z|	[95% Conf.	Interval]
Built Environment				
% units built pre-1950 (2000)	0.001	0.003	0.0002	0.001
Employment density (2000)**	0.00005	0.100	-.00001	0.0001
Pop. density (2000)***	-0.002	0.005	-0.003	-0.001
Street intersection density (2014)**	0.002	0.824	-0.013	0.016
Socioeconomic				
% w/ college degree (2000)	-0.0004	0.307	-0.001	0.0004
% renting (2000)	0.001	0.000	0.0004	0.001
% non-Hispanic black (2000)	0.002	0.000	0.001	0.003
% Hispanic (2000)	0.001	0.070	-0.0001	0.002
% foreign-born (2000)	0.001	0.012	0.0003	0.002
Other				
Transit-proximate (1/0)	0.018	0.188	-0.009	0.044
Com. gent. or adjacent to com. gent. '90-'00 (1/0)	0.030	0.016	0.006	0.054
N	1,547			
Pseudo R2	0.206			
Correctly classified	94.54%			

***In hundreds per sq. mi. ***In thousands per sq. mi.*

Table 5.10: Bay Area Probit Regression Including Commercial Gentrification (or Adjacency) from '90-'00

All said, more research that addresses specific metro areas' relationships with commercial and residential gentrification is needed. This work should focus on understanding what characteristics of the urban fabric in each metro region are most closely tied to the ordering of commercial and residential gentrification.

VI. TRANSIT RIDERSHIP & COMMERCIAL GENTRIFICATION

TRANSIT RIDERSHIP & COMMERCIAL GENTRIFICATION

In a fashion similar to the previously discussed commercial gentrification regressions, we conducted linear regressions to model the relationship between commercial gentrification and transit ridership in the Bay Area and Los Angeles. These regressions were also of the 'baseline statistics' type; most of the independent variables measure demographics and the built environment in the year 2000, while modeling the change in total census tract transit ridership from 2000 to 2013. Detailed information on variance inflation factors used to measure multicollinearity can be found in the tables in Appendix B.

We conducted two linear regressions with robust standard errors - one for Los Angeles and one for the Bay Area - with change over time in transit ridership from 2000 to 2013 as the dependent variable. The regressions used baseline independent variables, including dummy variables for residential and commercial gentrification from 1990 to 2000. Only census tracts with transit stations present were used for these regression analyses; the Los Angeles regression used 46 census tracts, and the Bay Area regression used 87 census tracts. A third linear regression with robust standard error was conducted, combining the Bay Area and Los Angeles census tracts. Only one of the regressions showed a significant relationship between gentrification and transit ridership, suggesting that residential gentrification (at the 90% significance level) may precede transit ridership reductions in the Los Angeles context. However, we should note that we did not control for overall changes in transit system ridership, which may account for some of the changes attributed to residential gentrification.

Although literature on the subject of neighborhood change and resultant changes in transit ridership is scarce, there is some evidence for both increased and decreased transit use in gentrifying neighborhoods. A 2007 examination of Canadian cities found that residents of gentrified neighborhoods were less likely to be transit users, despite their "political support for the notion" (Danyluk & Ley, 2007, p. 2,208). More recently, and in the California metro context, it was found that gentrification and displacement will likely not increase vehicle miles traveled for a neighborhood (Chapple et al., 2007, pp. 179-180). That being said, it has been noted that more research on the subject would be helpful (Ibid., p. 179).

Variable Construction

To develop the dependent variable of total tract ridership change from 2000-2013, we collected ridership data from various transit agencies, summing ridership figures in census tracts where more than one station or service was located. In the Bay Area, we used Caltrain, Bay Area Rapid Transit (BART) and the Santa Clara Valley Transportation Authority (VTA) light rail ridership data. In Los Angeles, LA Metro was used to measure transit ridership.

Transit Ridership

After producing ridership figures per tract for each study year, we calculated the percent change in tract ridership from 2000 to 2013 (2001 to 2013 for Los Angeles), producing our dependent variable. This dependent variable was regressed with a number of independent variables, which can be seen in Table 6.1.

Variable	Description	Data Source; Year
Commercial gent. '00-'13	Dummy variable indicating tract commercially gentrified from 2000-2013	Center for Community Innovation
Non-Hispanic black	Percent of population identifying as non-Hispanic black	Decennial Census; 2000
Hispanic	Percent of population identifying as Hispanic	Ibid.
Foreign-born	Percent of population foreign-born	Ibid.
College degree or greater	Percent of population 25 and older with college education or greater	Ibid.
Median household income	Median household income	Ibid.
U% units built pre-1950	Percent of housing units built pre-1950	Ibid.
Renting	Percent of population renting in 2000	Ibid.
Residential gent. '90-'00	Dummy variable indicating tract residentially gentrified from 1990-2000	Center for Community Innovation
Residential gent. '00-'13	Dummy variable indicating tract residentially gentrified from 2000-2013	Center for Community Innovation
Employees per sq. mi.	Employees per sq. mi. for businesses with greater than one employee and fewer than $50M in annual sales	NETS; 2000
Population density	Population per sq. mi.	Decennial Census; 2000
Road network density	Total road network density	EPA SLD; 2014
St. intersection density	Street intersections per sq. mi. (weighted, auto-oriented intersections eliminated)	EPA SLD; 2014

Table 6.1: Variables Included in Ridership Regressions

Bay Area

Table 6.2 presents the descriptive statistics for the Bay Area model and Table 6.3 presents the linear regression results. In the Bay Area, none of the variables were significant, including the variables of interest: commercial and residential gentrification for 1990-2000. This greatly limits any conclusions that can be drawn regarding the influence of commercial gentrification on transit ridership in the Bay Area.
Bay Area

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
% change in ridership '00-'13	87	0.26	1.25	-0.80	10.97
Commercial gent. '90-'00 (1/0)	87	0.16	0.37	0	1
Residential gent. '90-'00 (1/0)	87	0.13	0.33	0	1
% non-Hispanic black (2000)	87	8%	10%	1%	52%
% Hispanic (2000)	87	24%	20%	2%	85%
% foreign-born (2000)	87	33%	14%	5%	79%
% w/ college degree or greater (2000)	87	35%	19%	2%	84%
Median household income (2000)	87	$76,612	$27,205	$17,694	$144,940
% units built pre-1950 (2000)	87	29%	23%	0%	78%
% renting (2000)	87	58%	22%	6%	99%
Employees per sq. mi. (2000)	87	9,613	29,326	7	258,492
Population per sq. mi. (2000)	87	8,571	7,349	23	42,323
Road network density (2014)	87	25	8	3	42
St. intersections per sq. mi. (2014)	87	128	75	7	546

Table 6.2: Descriptive Statistics for Bay Area Ridership Linear Regression

Dependent Variable	*% change in ridership*		
Independent Variables	Coeff.	Sig.	Beta
Built Environment			
% of units built pre-1950 (2000)	1.039	0.111	0.192
Employment density (2000)**	-0.071	0.195	-0.168
Pop. density (2000)**	-0.319	0.157	-0.188
Road network density (2014)	3.628	0.139	0.222
Street intersection density (2014)	-0.075	0.586	-0.045
Socioeconomic			
Median household income (2000)*	1.988	0.175	0.433
% renting (2000)	2.830	0.161	0.504
% non-Hispanic black (2000)	-2.232	0.392	-0.172
% Hispanic (2000)	-2.245	0.225	-0.354
% foreign-born (2000)	-0.248	0.717	-0.029
% w/ college degree or greater (2000)	-3.098	0.315	-0.465
Gentrification			
Commercial gentrification '90-'00 (1/0)	-21.748	0.436	-0.064
Residential gentrification '90-'00 (1/0)	-18.832	0.532	-0.050
N	87		
Constant	-169.056	0.04	.
R-squared	0.124		

**In thousands of dollars. **In hundreds per sq. mi.*

Table 6.3: Results for Bay Area Ridership Linear Regression

Los Angeles

The dependent variable for the Los Angeles model was measured as a percent change in LA Metro ridership from 2001 to 2013, and included only the Blue, Red, and Green lines. Gold, Orange, and Expo lines were not included, as they opened after 2001. Median household income was excluded because of multicollinearity issues. There were 46 census tracts with ridership in both 2001 and 2013, all of which were included in the regression. Descriptive statistics for the variables in the Los Angeles model are shown in Table 6.4.

The Los Angeles regression with robust standard errors produced only one significant result (albeit at a 90% confidence level), which is the dummy variable for residential gentrification in 1990-2000. That being said, the F value for the model is a high .75, suggesting that the overall model may not be significant and should be interpreted with caution. Interpretation of the residential gentrification variable suggests that for census tracts where residential gentrification occurred from 1990-2000, a decrease in 25 percentage points can be expected in the change of ridership from 2001-2013. Table 6.5 presents the regression results.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
% change in ridership '01-'13	46	0.39%	0.28%	-0.11%	1.20%
Commercial gent. '90-'00 (1/0)	46	0.11	0.31	0	1
Residential gent. '90-'00 (1/0)	46	0.09	0.28	0	1
% non-Hispanic black (2000)	46	17%	15%	1%	54%
% foreign-born (2000)	46	42%	18%	16%	77%
% w/ college degree or greater (2000)	46	15%	14%	1%	55%
% housing built pre-1950 (2000)	46	31%	18%	0%	84%
% renting (2000)	46	71%	25%	10%	99%
Employees per sq. mi (2000)	46	10,880	16,961	46	82,196
Population per sq. mi. (2000)	46	15,676	12,699	7	45,246
Roads network density (2014)	46	25	7	9	45
St. intersections per sq. mi. (2014)	46	122	77	18	422

Table 6.4: Descriptive Statistics for Los Angeles Ridership Linear Regression

Combined Bay Area & Los Angeles

A linear regression with robust standard error was also performed for the combined Los Angeles and San Francisco regions. By combining the regions into a single model, we achieved a greater number of observations for the analysis, albeit by including a dummy variable for region (1 = L.A., 0 = S.F.). Because the Los Angeles dependent variable measures percent change in ridership from 2001 to 2013, the combined model was altered so that all tracts reflected change over time from 2001 to 2013. Percent Hispanic and percent college-educated were dropped

Dependent Variable	*% change in ridership*		
Independent Variables	Coeff.	Sig.	Beta
Built Environment			
% of units built pre-1950 (2000)	0.150	0.471	0.097
Employment density (2000)	0.000	0.547	-0.159
Pop. density (2000)	0.000	0.340	0.288
Road network density (2014)	0.003	0.661	0.086
Street intersection density (2014)	0.000	0.727	-0.108
Socioeconomic			
% renting (2000)	0.002	0.454	0.188
% non-Hispanic black (2000)	-0.001	0.859	-0.036
% foreign-born (2000)	-0.260	0.632	-0.168
% w/ college degree or greater (2000)	0.002	0.554	0.120
Gentrification			
Commercial gentrification '90-'00 (1/0)	-0.152	0.373	-0.172
Residential gentrification '90-'00 (1/0)	-0.249	0.052	-0.256
N	46		
Constant	0.214	0.469	
R-squared	0.153		

Table 6.5: Results for Los Angeles Ridership Linear Regression

because of multicollinearity issues. Table 6.6 presents the descriptive statistics for the combined model and Table 6.7 the model results.

The results of the regression corroborated findings produced in earlier models, in that there is not a great deal of significance. In this combined region model, only the baseline percent of population renting was significant. The percent renter significance mirrors a finding from earlier regressions modeling commercial gentrification, where percent renters was found to be a significant predictor of commercial gentrification in both regions. Here, we find percent renters to be a significant predictor of an increase in transit ridership, suggesting, perhaps, that renters are more likely to use transit.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
% change in ridership '01-'13	112	0.37%	1.23%	-0.84%	9.76%
Commercial gent. '90-'00 (1/0)	112	0.12	0.32	0	1
Residential gent. '90-'00 (1/0)	112	0.11	0.31	0	1
% non-Hispanic black (2000)	112	12%	13%	39%	54%
% foreign-born (2000)	112	37%	17%	10%	79%
Median household income (2000)	112	$60,648	$28,950	$11,375	$144,940
% renting (2000)	112	64%	24%	6%	100%
Employees per sq. mi (2000)	112	11,267	27,775	7	258,492
Population per sq. mi. (2000)	112	12,006	10,539	7	45,246
% housing build pre-1950 (2000)	112	32%	21%	0%	84%
St. intersections per sq. mi. (2014)	112	126	66	7	422
Region (1=L.A.)	112	0.41	0.49	0	1

Table 6.6: Descriptive Statistics for Los Angeles & Bay Area Combined Ridership Linear Regression

Dependent Variable	*% change in ridership*		
Independent Variables	Coeff.	Sig.	Beta
Built Environment			
% of units built pre-1950 (2000)	0.000	0.982	-0.002
Employment density (2000)	0.000	0.905	-0.008
Pop. density (2000)	0.000	0.419	-0.063
Street intersection density (2014)	0.000	0.669	-0.026
Region (1=L.A.)	0.251	0.105	0.101
Socioeconomic			
Median household income (2000)	0.000	0.098	0.233
% renting (2000)	0.010	0.047	0.200
% non-Hispanic black (2000)	0.001	0.881	0.013
% foreign-born (2000)	-0.001	0.904	-0.008
Gentrification			
Commercial gentrification '90-'00 (1/0)	0.553	0.364	0.145
Residential gentrification '90-'00 (1/0)	-0.160	0.359	-0.041
N	112		
Constant	-0.881	0.147	
R-squared	0.052		

Table 6.7: Results for Los Angeles & Bay Area Combined Ridership Linear Regression

Summary

Regressions attempting to model ridership in the San Francisco Bay Area and in Los Angeles did not produce many significant results; only one independent variable in Los Angeles produced a finding with a p-value under .1. This is likely partially due to the small sample size of observations (46 for Los Angeles and 87 for the Bay Area). The one arguably significant outcome from the regressions occurred in Los Angeles and suggests that a census tract that residentially gentrified from 1990-2000 would likely see a 25-point reduction in percentage change of ridership from 2000-2013.

Although a single significant result is grounds only for speculation, the result of preceding residential gentrification leading to reduced ridership may be explained by the fact that gentrified neighborhoods are generally home to wealthier residents, who may drive more and use transit less than people with lower incomes (Pollack, Stephanie et al., 2010, p. 24). This would match with recent displacement research findings indicating that transit proximity in Los Angeles and the Bay Area is associated with a loss of low-income households (Chapple et al., 2017).

VII. PREDICTING TRAFFIC CRASHES

PREDICTING TRAFFIC CRASHES

This section of the report examines the safety impacts of commercial gentrification in the Bay Area and Los Angeles. Crash data used are from the California Statewide Integrated Traffic Records System (SWITRS) and the geocoded database of crashes established by SAFETREC at UC Berkeley.

We gathered descriptive statistics about different types of crashes around commercial stations in the Bay Area and Los Angeles. Next, we examined the impact of transit investment on crashes by exploring the differences in crashes before and after a rail station opened. We also analyzed the differences between pedestrian and cyclist crashes in commercially gentrified station areas and non-commercially gentrified station areas. We explored the influence of commercial and residential gentrification - as well as neighborhood socio-demographic and built environment characteristics - on pedestrian and cyclist collisions using regression analyses. Together, these analyses help identify preliminary associations between crashes and built-environment characteristics that are later explored through qualitative case study analysis.

Variable Construction

In this section, we outline the methodology for constructing a station area-level database and undertaking statistical analysis of collisions around transit stations.

For the purposes of analyzing crashes in transit station areas, we classified a transit station area as a 'commercial station' if any part of a commercial census tract (see definition in section IV) overlaps with a ½-mile circular buffer around the station. This same approach was used to define commercially gentrified and residentially gentrified stations. A key challenge we faced was reconciling differences in geographical and temporal scales in the various source datasets. Geographical scales included x/y coordinate point data, census tracts aggregations, and block group aggregations. The years for which various data are available was also not entirely consistent across source datasets (See Table 7.1).

Table 7.1, below, shows the number of total stations, the number of stations that opened between 1997 and 2015, and the number of commercial stations and commercially gentrified stations in Los Angeles and the Bay Area.

Los Angeles				Bay Area			
Total	Opened '97-'15	Commercial	Commercially Gent.	Total	Opened '97-'15	Commercial	Commercially Gent.
95 (100%)	38 (40%)	87 (92%)	36 (38%)	132 (100%)	60 (45%)	125 (95%)	69 (52%)

Table 7.1: Number of Stations in Los Angeles & Bay Area

Crash Data

The collision data used from SWITRS are individual records of all incidents reported within ½-mile of a transit station from January 1, 1997 to December 31, 2015. SWITRS includes information on the location, date, day of the week, time, and type of roadway on which the collision occurred. There is also information on the modes involved (pedestrian, bicyclist, motorcycle, private automobile, or truck), and whether alcohol was involved. Our analysis is limited to collisions that occurred within a ½-mile circular buffer of rail transit stations. Figures 7.1 and 7.2 show the distribution of these collisions for parts of the Bay and LA Area, respectively.

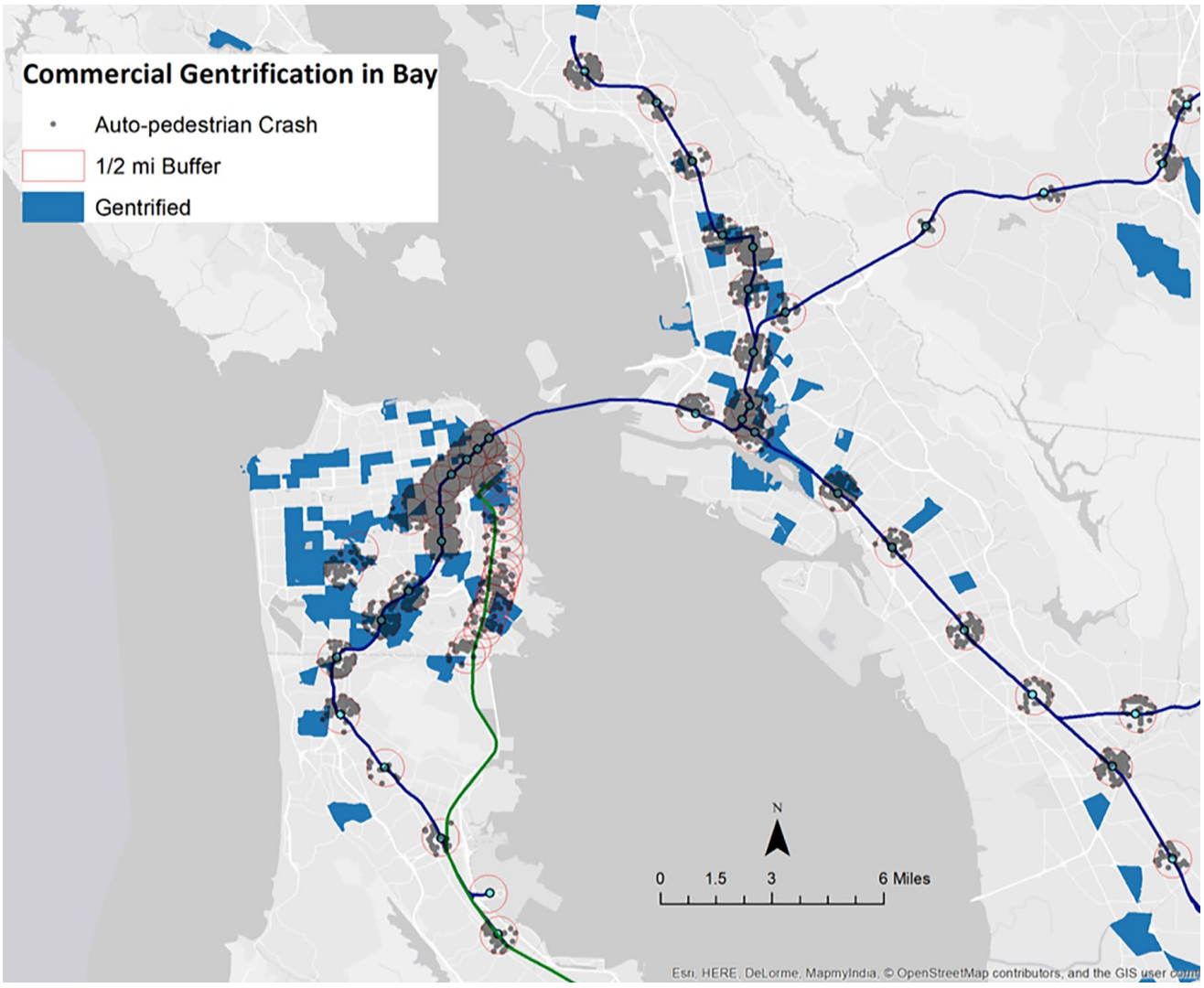

Figure 7.1: Collisions and Commercially Gentrified Tracts, SF-Oakland

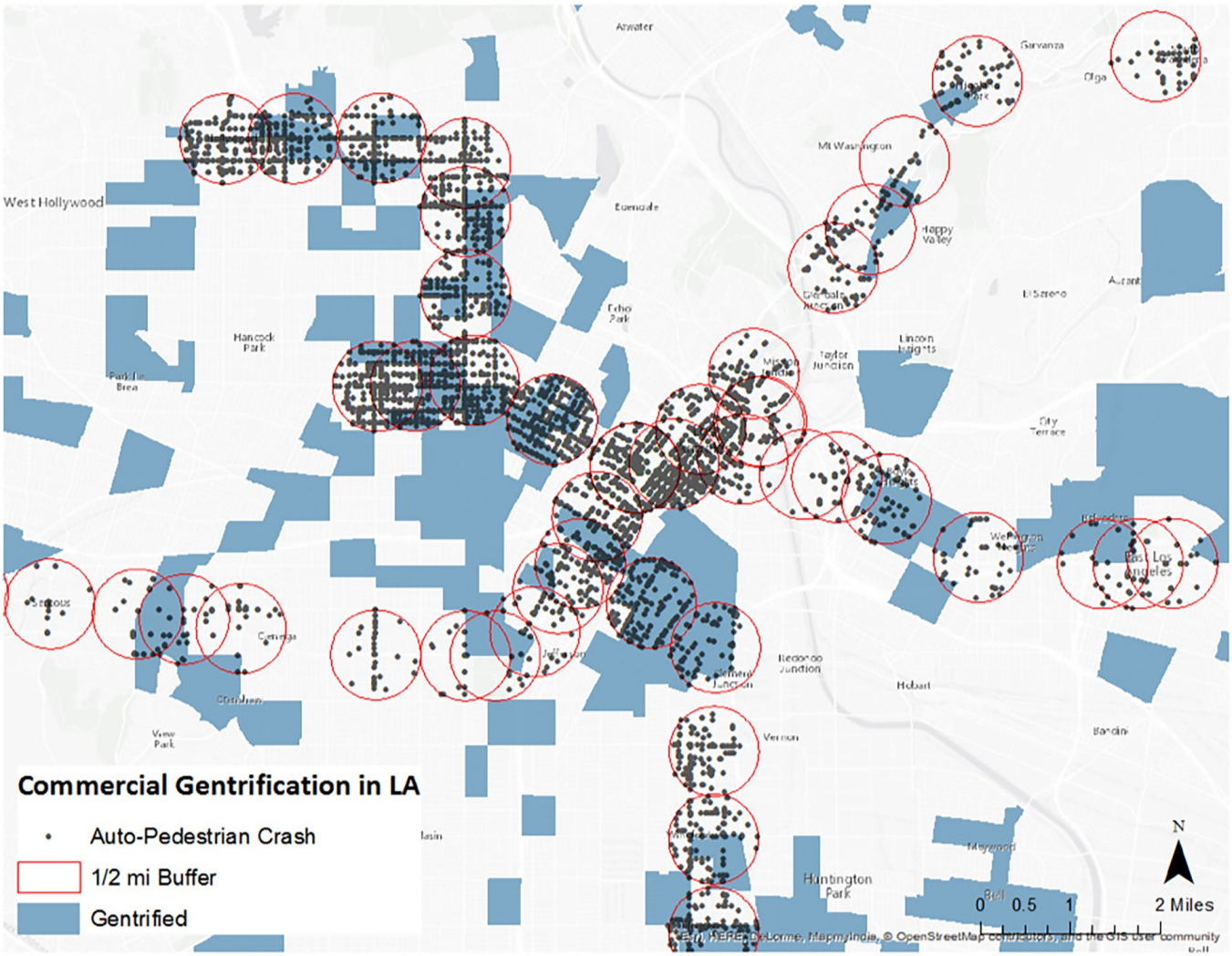

Figure 7.2: Collisions and Commercially Gentrified Tracts, Downtown Los Angeles

For collisions in the Bay Area, we included those that occurred within ½ mile of a the following types of stations: Bay Area Rapid Transit (BART), MUNI light rail, Santa Clara Valley Transportation Authority (VTA) light rail and for Los Angeles we included Metro rail. We then coded collisions according to whether they had occurred before or after the station opened. Stations that opened in the same location as an existing station were excluded from our analysis.

To address the temporal difference between the years a station opened and the available crash data, we created two variables that allowed us to examine the average number of crashes across time: years the station has been in operation and years for which we have data. If no specific opening date for a station could be found, the 15th day of the known opening month was assumed; if no opening month was given, we assumed July 1 of the known opening year. Table 7.2, below, indicates the variables used in our crash analyses, along with their data sources.

Variable	Description	Data Source; Year
Commercially Gent.	Dichotomous; ½-mile buffer intersects with census tract that commercially gentrified from 2000-2013	See section IV
Commercial	Dichotomous; ½-mile buffer intersects with census tract identified as commercial from 2000-2013	See section IV
Bike	Collision that involved at least one bicycle	SWITRS; 1/1/1997 to 12/31/2015
Ped.	Collision that involved at least one pedestrian	Ibid.
Ped. & Bike	Collision that involved at least one pedestrian OR bike	Ibid.
Truck	Collision that involved at least one truck	Ibid.
Motor Vehicle	Collision that exclusively involved motor vehicles	Ibid.
Alcohol Use	At least one participant in the collision was intoxicated	Ibid.
Death	At least one participant died in the collision	Ibid.
Auto-Ped.	Collision involving motor vehicle with a pedestrian	Ibid.
Daily Rate of Collisions	Avg. collisions per day, calculated by dividing total collisions by number of days over which collisions occurred.	Ibid.
Change in Collision Rate	% change in daily rate of collisions after the station opened, compared to daily rate before station opened.	Ibid.
Avg. Annual Collisions	Total collisions divided by number of days from station opening date to 12/31/2015, divided by 365.	Ibid.
Pop. Density[a]	[Total pop. in block group * area weight] / [Total acres unprotected land in block group * area weight]	SLD v2.0[b]; 2010 Census
Employment Density[a]	[Number of workers in block group * area weight] / [Total acres unprotected land in block group* area weight]	SLD v2.0; 2010 Census; LEHD
Road Density[a]	[Total roads in block group * area weight] / Total area of block group AC_TOT * area weight];	SLD v2.0
% Hispanic	[Total Hispanic pop. in block group * area weight] / [Total pop. in block group * area weight]	ACS 5-year estimates; 2013

*(a) To arrive to total population, number of workers, and total roads, we multiplied the respective density variable provided in the SLD by the appropriate land area value used for the provided density. For instance, total roads = total road network density variable D3a * total geometric area of block group variable AC_Tot.*
(b) See SLD 2.0 User Guide, version March 14, 2014, for data sources and variable construction.

Table 7.2: Variables Included in Analysis of Crashes

Findings

Descriptive Statistics: Frequency of Collisions

Tables 7.3 and 7.4[7] show the mean and median yearly averages of collisions around commercial stations in the Bay Area and Los Angeles, respectively. We can see that collision averages were higher in Los Angeles than in the Bay Area for all categories of collisions. In both areas, the mean and median of collisions involving different modes were higher in the commercially gentrified stations than in the commercial stations that have not gentrified. Almost twice as many crashes were reported at commercially gentrified than at non-gentrified commercial stations in the Bay Area (apprx. 102 compared to apprx. 50, respectively). Similarly, in Los Angeles, the number of crashes reported in commercially gentrified stations was more than twice as high as in non-gentrified commercial stations (apprx. 137 compared to apprx. 61 respectively).

	All Commercial Station Areas		Commercially Gentrified		Not Commercially Gentrified	
	Mean	Median	Mean	Median	Mean	Median
Bike	8.5	4.2	12.9	6.4	3.9	2.5
Truck	1.9	1.2	2.5	1.6	1.4	0.7
Motor Vehicle	56.6	48.2	71.7	59.8	41.3	31.2
Pedestrian	11.4	4	18.3	11.4	4.4	2.9
Alcohol Use	7.1	5.5	9.5	8	4.6	3.3
Total	76.2	55.7	102.3	82.3	49.6	36.8

Table 7.3: Bay Area, Mean & Median Annual Collisions

	All Commercial Station Areas		Commercially Gentrified		Not Commercially Gentrified	
	Mean	Median	Mean	Median	Mean	Median
Bike	0.676	0.132	0.427	0.196	0.871	0.080
Truck	-0.533	-0.630	-0.547	-0.555	-0.523	-0.647
Motor Vehicle	-0.271	-0.344	-0.306	-0.342	-0.247	-0.359
Pedestrian	-0.018	-0.128	-0.054	-0.202	0.013	-0.046
Alcohol Use	-0.094	-0.146	-0.111	-0.148	-0.082	-0.139
Total	-0.236	-0.281	-0.270	-0.288	-0.212	-0.275

Table 7.4: Bay Area, Mean & Median Percent Change in Collisions after Station Opening

7 Percentage expressed as decimal, i.e. "1.03"= 103% increase.

Tables 7.5 and 7.6 show the mean and median percentage change of collisions after station opening in the Bay Area and Los Angeles respectively. We can see that for the Bay Area, the percentage change of crashes increased after station opening only for crashes involving cyclists, and decreased for all other types of crashes. For Los Angeles, the percentage change of crashes increased after station opening for crashes involving cyclists or pedestrians, and decreased for crashes involving only motor vehicles, trucks, or alcohol.

	All Commercial Station Areas		Commercially Gentrified		Not Commercially Gentrified	
	Mean	Median	Mean	Median	Mean	Median
Bike	9	6.5	12.8	11.3	5.5	4.6
Truck	2.6	1.8	3.7	2.8	1.6	1.5
Motor Vehicle	75.2	50.3	105.1	85.6	47.6	44.3
Pedestrian	13.5	8.1	19.8	15	7.6	6.6
Alcohol Use	8.1	6	11.3	8.3	5.1	4.5
Total	97.5	65.5	137.4	111.9	60.7	54.7

Table 7.5: Los Angeles, Mean & Median Annual Collisions

	All Commercial Station Areas		Commercially Gentrified		Not Commercially Gentrified	
	Mean	Median	Mean	Median	Mean	Median
Bike	0.831	0.859	1.157	1.170	0.632	0.558
Truck	-0.048	-0.210	-0.288	-0.278	0.099	-0.104
Motor Vehicle	-0.054	-0.059	-0.084	-0.130	-0.036	-0.036
Pedestrian	0.092	0.059	0.026	0.023	0.133	0.138
Alcohol Use	-0.073	-0.137	-0.170	-0.176	-0.014	-0.056
Total	0.002	-0.013	-0.019	-0.017	0.014	0.016

Table 7.6: Los Angeles, Mean & Median Percent Change in Collisions after Station Opening

Table 7.7, below, examines the overall collision trends in the Bay Area for commercial station areas. It shows how many station areas have increasing or decreasing rates of collisions after the station opened. We observe the following trends:

- Total collisions decreased around most stations in the Bay Area between 1997 and 2015 after the station opened, a trend that was more pronounced in commercially gentrified station areas.
- Bike collisions generally increased after stations opened, especially in commercially gentrified station areas.
- Pedestrian/automobile collisions decreased in most station areas after station opening.
- Collisions involving trucks decreased in the vast majority of commercial and commercially gentrified station areas after station openings.
- Collisions involving use of alcohol decreased in most commercial and commercially gentrified station areas after station openings.

Collision Type	# Station Areas w/ Increasing Crashes	# Station Areas w/ Decreasing Crashes	# Commercially Gentrified Station Areas w/ Increasing Crashes	# Commercially Gentrified Station Areas w/ Decreasing Crashes
Bike	37	20	20	5
Truck	5	54	1	24
Alcohol Use	16	43	7	17
Pedestrian	20	32	7	17
Motor Vehicles	5	55	1	24
Total	6	54	1	24

Table 7.7: Number of Bay Area Stations with Increasing or Decreasing Collisions

Table 7.8, below, examines the overall collision trends in Los Angeles for commercial station areas. Trends of note include:

- Bicycle collision rates generally increased across all types of station areas in Los Angeles after the opening of the station, with the only exception of two non-commercially gentrified stations.
- Pedestrian collision rates increased at most station areas but decreased at most commercially gentrified station areas.
- Truck collision rates decreased in all commercially gentrified station areas and in the majority of non-gentrified ones (27 out of 37) after the opening of a station.
- The majority of station areas saw collision rates involving only motor vehicles decrease after the opening of the station, in both all station areas and in commercially gentrified station areas.
- Collisions involving alcohol decreased in most station areas after the opening of the station; this decrease was especially notable in commercially gentrified station areas.

Collision Type	# Station Areas w/ Increasing Crashes	# Station Areas w/ Decreasing Crashes	# Commercially Gentrified Station Areas w/ Increasing Crashes	# Commercially Gentrified Station Areas w/ Decreasing Crashes
Bike	35	2	14	0
Truck	10	27	0	14
Alcohol Use	12	25	1	13
Pedestrian	22	15	6	8
Motor Vehicles	11	26	3	11
Total	18	19	5	9

Table 7.8: Number of Los Angeles Stations with Increasing or Decreasing Collisions

T-tests

We prepared two t-tests for each study region to examine the association of commercial gentrification with the rate of collisions surrounding the stations. The first test examined whether commercially gentrified stations had higher crash rates than non-commercially gentrified stations. To do this, we utilized an independent samples t-test, comparing crash rates after each station had opened. Because the t-test measures correlation, rather than causal impact, a second test was performed to try to isolate the impact of the station opening on the collision rate at each station. For this test, we calculated the percentage change in collision rate for each station after the station opened. Only stations that opened between 1997 and 2015 were used for this analysis. The test examined whether stations opening in commercially gentrified areas showed statistically significant differences in their collision rates from non-commercially gentrified stations. We again used an independent samples t-test.

To construct the rate of collision and identify changes in the rate, we first calculated the number of collisions by station, identifying which had occurred before and which after a station's opening. Starting in 1997 (the first year of SWITRS data), we identified the rate of collisions per day for each station area, before and after the station had opened, by dividing the total number of collisions before and the total number of collisions after the station's opening by the total number of days from January 1, 1997 to the day of the station opening, and the total number of days from the station opening until December 31, 2015, respectively. We produced collision rates for pedestrian, bike, alcohol-involved, and motor vehicle crashes. We were unable to examine the before and after effects for stations that had opened prior to 1997.

Table 7.9 shows the number of Bay Area stations included as part of the dataset. In this case, all stations could be used for the first test (comparing the crash rates between commercially gentrified and non-commercially gentrified stations), since all stations had opened prior to 2015. Sixty of the 132 stations opened between 1997 and 2015, and thus could be included in the second test.

Number of Stations	Total Station in Dataset	Stations Opened from 1997-2015
Commercial Stations	125	60
Commercially Gentrified from 2000-2013	69	35
Total	132	60

Table 7.9: Number of Stations in Bay Area Dataset

Table 7.10 shows the numbers of Los Angeles stations used in each of the t-tests. In Los Angeles, there are a total of 94 stations, but only 38 stations opened between 1997 and 2015. Thirty-seven of the 38 stations are in commercial areas, and 14 of these stations commercially gentrified between 2000 and 2013. For the first t-test, we examined a total of 75 commercial stations, comparing the post-opening crash rates at the 36 commercially gentrified stations to the crash rates at the 39 (75-36) commercial stations that have not commercially gentrified.

Number of Stations	Total Stations in Dataset	Stations Opened Pre-2015	Stations Opened from 1997-2015
In Commercial Area	87	75	37
Commercially Gentrified from 2000-2013	36	36	14
Total	94	81	38

Table 7.10: Number of Stations in Los Angeles Dataset

Table 7.11 shows the corresponding correlations from the first t-test for the Bay Area. Again, we looked only at stations located in commercial areas. The Bay Area shows a strong correlation between commercially gentrified stations and a higher rate of collisions across all categories.

Variable	Correlation w/ Commercial Gentrification	Significance
Bike	.387	.000***
Truck	.250	.005***
Alcohol Use	.405	.000***
Pedestrian	.371	.000***
Motor Vehicles	.369	.000***
Total	.406	.000***

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.11: First T-Test, Bay Area General Correlation for Crashes After Station Opening

Table 7.12 presents the results of the first t-test for Los Angeles, looking at the correlation between commercial gentrification and the rate of collisions in the corresponding station area after each station opened. All crash categories show a significant correlation (at the 99% level) between the rate of collisions and the status of the station area as commercially gentrified. In other words, we found the rate of collisions in commercially gentrified station areas was higher for all types of crashes than it was in non-commercially gentrified station areas. This association, however, could easily be caused by a lurking variable. One hypothesis is that commercial gentrification is more likely to occur at stations that receive more traffic and thus have higher rates of collisions, irrespective of the degree of gentrification. Station areas that were not located in commercial census tracts were not included as part of this test.

Variable	Correlation w/ Commercial Gentrification	Significance
Bike	.480	.000***
Truck	.418	.000***
Alcohol Use	.477	.000***
Pedestrian	.460	.000***
Motor Vehicles	.431	.000***
Total	.473	.000***

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.12: First T-Test, Los Angeles General Correlation for Crashes After Station Opening

Tables 7.13 and 7.14 show the results of the second t-test for the Bay Area. No crash types were significant when looking at the percent change in the collision rate after a station opened in the Bay Area, or when comparing commercially gentrified and non-commercially gentrified stations. This analysis suggests that commercial gentrification is not a significant explanation for shifts in the rate of collisions after station openings in the Bay Area.

Variable	Correlation w/ Commercial Gentrification	Significance
Bike	-.077	.568
Truck	-.031	.817
Alcohol Use	-.040	.764
Pedestrian	-.076	.594
Motor Vehicles	-.147	.261
Ped. & Bike	-.094	.481
Total	-.150	.252

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.13: Second T-Test, Bay Area Correlations for Percent Change in Collisions After Station Opening

Variable	T-Statistic	Significance
Bike	.645	.523
Truck	.258	.798
Alcohol Use	.331	.742
Pedestrian	.535	.595
Motor Vehicles	1.207	.232
Ped. & Bike	.724	.472
Total	1.210	.231

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.14: T-Test for Crash Rates in Commercially Gentrified vs. Non-Commercially Gentrified Bay Area Station Areas

Table 7.15 presents the results of the second t-test for Los Angeles, which examines the correlation between percent change in crashes after opening and a station area's commercial gentrification status. The results show two variables as significant at the 99% confidence level and one significant at the 90% confidence level. The percentage change in the bicycle-involved collision rate after the station opened is likely to be greater at commercially gentrified stations than at non-commercially gentrified stations. This may mean that commercially gentrified areas attract more vehicular and bicycle traffic, and hence are likely to experience more collisions. The other two significant variables – collisions involving trucks and those involving alcohol - showed a negative association with commercial gentrification, meaning that the rate of change was likely to be lower in stations that had not commercially gentrified than in stations that had. This trend was significant at the 95% level for collisions involving alcohol and at the 90% level for collisions involving trucks. Perhaps fewer trucks traveled to commercially gentrifying transit areas (due to a loss of warehouse and/or industrial space) or perhaps improvements in traffic control infrastructure reduced the rate of collisions for trucks. The association of gentrifying transit areas with relatively lower rates of collisions involving alcohol use is somewhat surprising, because the popular narrative (and interview-based data introduced later in this report) associates commercial gentrification with an increasing number of bars and restaurants. That being said, it is possible that patrons of establishments in commercially gentrified areas have greater ability to afford taxis or ride-hailing services (Uber, Lyft, etc.), which reduce the likelihood of alcohol-involved crashes. Indeed, a number of interviewees in the case studies of commercially gentrified stations noted that they many of their patrons use ride-hailing services.

For the t-test shown in Table 7.16, we compared post-opening crash rates in the 14 commercially gentrified station areas in Los Angeles to crash rates in 23 non-commercially gentrified station areas. When we look at the corresponding t-test for these variables, we see that there was a statistically significant difference in bicycle collisions (at the 95% significance level) and in colli-

Variable	Correlation w/ Commercial Gentrification	Significance
Bike	.472	.003***
Truck	-.281	.092*
Alcohol Use	-.345	.004***
Pedestrian	-.254	.129
Motor Vehicles	-.148	.381
Total	-.122	.471

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.15: Second T-Test, Los Angeles Correlations for Percent Change in Collisions After Station Opening

sions involving trucks, pedestrians, and alcohol (at the 90% significance level) between the two types of stations. The association is positive for bicycle collisions, indicating that commercially gentrified station areas had higher rates of bicycle collisions than non-commercially gentrified station areas. On the other hand, commercially gentrified station areas had lower rates of collisions involving pedestrians, trucks or alcohol.

Test	T-Statistic	Significance
Bike	3.161	.004***
Truck	-2.208	.037**
Alcohol	-2.403	.022**
Pedestrian	-1.744	.090*
Motor Vehicles	-.888	.381
Total	-.729	.471

****p ≤ 0.01; ** ≤ 0.05, * ≤ 0.1*

Table 7.16: T-Test for Crash Rates in Commercially Gentrified vs. Non-Commercially Gentrified Los Angeles Station Areas, Equal Variances Not Assumed

Regression Model Results

Regression Variables

To conduct regression analyses, we constructed three dependent variables and tested three categories of independent variables with each dependent variable. The dependent variables were the average annual:

- Total collisions at each station.
- Collisions at each station involving bikes or pedestrians.
- Collisions at each station involving autos and pedestrians.

Predicting Traffic Crashes

To calculate the average annual collisions, we tabulated the total collisions that occurred after a station opened using the same approach outlined for the descriptive statistical tests. We then calculated the number of years the station had been operating by calculating the total number of days from the station opening until December 31, 2015 and dividing by 365.
In our regression models, we used three categories of independent variables:

- Traffic level exposure related to the built environment (road intersection density and street intersection density).
- Pedestrian exposure (population and employment density).
- Socioeconomic characteristics of the population (poverty rate, share of population identifying as Hispanic, commercial gentrification, and residential gentrification).

There was considerable multicollinearity amongst the traffic and sociodemographic factors, and as a result only one variable for each factor was included in the final regression models. In addition, we controlled for three outlier[8] stations in each area - BART Civic Center, BART Powell, and Muni Metro Van Ness St. in the Bay; and Civic Center, Pico, and Metro Center in Los Angeles. The outlier stations were controlled for by developing a dummy variable representing outlier or non-outlier station. In general, the complete exclusion of the variables does not change the relationships presented in the final models – neither the relative strength of the predictors, nor their direction change. The only changes we noted are in the adjusted r-squared values. For Los Angeles, adjusted r-squares decline for the first model on all collisions but increase for the bike-pedestrian and auto-pedestrian models. For the Bay Area, adjusted r-squared values decline in all three models when removing outliers. All variables in the regression models, with the exception of road density, are not normally distributed. To examine the robustness of our model given the non-normal distributions, we utilized various transformations and a negative binomial approach; however, all models showed the same direction and significance for most variables. For ease of interpretation, we present simple OLS regression results.

Data on residential gentrification came from Chapple et al. (2017). Data for the traffic and pedestrian exposure factors came from the EPA's Smart Location Database (SLD). Socioeconomic data used were from the 2009-2013 5-year American Community Survey (ACS). Data were originally collected at the census block group level and were area-weighted to the ½-mile circular buffer around stations.[9]

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8 We identified outliers using DFFIT and Cook's D statistics, both of which are very similar. A large DFFIT or Cook's D value indicates influential observations. The general cutoff of absolute two was used to identify influential observations.

9 Transforming the data into a station area-level database required two steps: 1) Using ArcMap, we created area weights for each block group that fell within the ½-mile circular buffer around each station. Shapefiles used to create the weights are from Tigerline. 2) Total roads, total street intersections, total population, and total employment are not provided in the EPA SLD (they are only provided as densities). In order to create area-weighted densities, we first calculated totals by multiplying the respective density by area. The resulting totals were then summarized and area-weighted with the census block group data in SAS 9.4. For ACS data, absolute numbers were also area-weighted before calculating percentages for these populations.

One limitation of weighting by area is that it assumes the population and built environment factors that contribute to crash exposure are evenly distributed across the geography. This assumption may lead to under- or overestimation of exposure. The magnitude of error introduced by this assumption should be assessed in future research, either using finer grain data or in situ observations.

Findings

We used OLS regressions to explore the relationship between commercial gentrification and all crash types, pedestrian-involved crashes, and auto-pedestrian crashes. The results of the final models are shown in Table 7.18 for Los Angeles, Table 7.20 for the Bay Area, and Table 7.21 for both areas combined.

Los Angeles

Table 7.17 presents the descriptive statistics for the Los Angeles regression model. As indicated in Table 7.18, commercial gentrification shows a significant positive relationship with increases in the average number of collisions, a relationship that holds for all three models. Residential gentrification is only significant in the model for all collisions. The percent Hispanic population shows a negative relationship in all three models, which does not support the assumption that collisions are more likely to happen in low-income, minority neighborhoods, a relationship

	Mean	Median	Min.	Max.	Std. Dev
Dependent Variables					
Annual Avg., All	111.33	80.50	9.53	391.91	82.33
Annual Avg., Bike & Ped.	25.23	19.73	1.00	101.04	21.36
Annual Avg., Auto-Ped.	14.10	9.96	0.50	60.00	12.10
Independent Variables					
Pedestrian Exposure					
Population Density	24.16	22.12	0.05	80.10	15.17
Employment Density	28.11	12.35	1.03	306.99	46.95
Traffic Level Exposure					
Road Density	25.42	24.75	11.45	40.43	6.18
Socioeconomic					
% Hispanic Pop.	0.54	0.54	0.13	0.98	0.25
Other Controls					
Years Operating	15.33	18.00	2.00	24.00	7.79

Table 7.17: Los Angeles Traffic Crash Regression Descriptive Statistics (n=81)

Dependent Variable	*All Collisions*			*Bike & Pedestrian*			*Auto-Pedestrian*		
Independent Variables	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta
Pedestrian Exposure									
Population Density	0.863	0.056	0.158	0.589	<.0001	0.415	0.446	<.0001	0.554
Employment Density	-0.156	0.416	-0.090	0.042	0.403	0.094	0.042	0.108	0.166
Traffic Level Exposure									
Road Density	0.781	0.435	0.058	0.300	0.259	0.085	-0.135	0.325	-0.068
Socioeconomic									
% Hispanic Pop.	-107.553	0.001	-0.322	-28.629	0.000	-0.330	-13.185	0.002	-0.268
Commercial Gent. (0/1)	57.898	<.0001	0.353	12.633	0.001	0.297	4.610	0.018	0.191
Residential Gent. (0/1)	39.576	0.005	0.240	3.788	0.303	0.088	3.425	0.074	0.141
Other Controls									
Years Operating	-3.327	<.0001	-0.317	-0.807	<.0001	-0.296	-0.304	0.004	-0.197
Outliers (0/1)	185.714	<.0001	0.433	19.569	0.060	0.176	12.338	0.023	0.195
Constant	135.136	<.0001		22.080	0.008		13.425	0.002	
Adjusted R2	0.638			0.625			0.6885		

Table 7.18: Los Angeles Traffic Crash Regression Results (valid n=80)

documented by Loukaitou-Sideris et al. (2007) for auto-pedestrian collisions in Los Angeles. The measure of traffic level exposure is not significant in any of the three models. Amongst the pedestrian exposure variables, only population density is significant and then only for auto-pedestrian crashes and crashes involving pedestrians and cyclists. The average annual number of collisions decreases with the length of time the station has been operating.

Bay Area

The descriptive statistics for the Bay Area model are show in Table 7.19 and the final model results in Table 7.20. The models for the San Francisco Bay Area are very different from those for Los Angeles, which may be indicative of the rich transit history in the Bay Area. Neither commercial nor residential gentrification show a significant relationship with increases in the average annual number of any type of collision. Unlike in Los Angeles, however, increases in the share of the Hispanic population are positively related to increases in all crashes. Increases in employment and road density are also significantly associated with increasing rates of collision – factors that were not significant in LA. As with LA, population density is only significant for auto-pedestrian and bike-pedestrian crashes. Further, similar to Los Angeles, the average number of collisions decreases with the length of time the station has been operating.

	Mean	Median	Min.	Max.	Std. Dev
Dependent Variables					
Annual Avg., All	58.97	48.93	6.24	256.94	48.58
Annual Avg., Bike & Ped.	13.54	7.11	0.27	80.17	16.15
Annual Avg., Auto-Ped.	7.39	3.56	0.00	53.78	9.80
Independent Variables					
Pedestrian Exposure					
Population Density	16.71	14.03	0.43	78.80	13.06
Employment Density	24.45	9.31	0.28	359.51	52.26
Traffic Level Exposure					
Road Density	24.03	24.06	2.92	42.38	7.48
Socioeconomic					
% Hispanic Pop.	0.24	0.19	0.04	0.76	0.15
Other Controls					
Years Operating	22.98	23.00	3.00	42.00	12.88

Table 7.19: Bay Area Traffic Crash Regression Descriptive Statistics (n=132)

Dependent Variable	*All Collisions*			*Bike & Pedestrian*			*Auto-Pedestrian*		
Independent Variables	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta
Pedestrian Exposure									
Population Density	0.343	0.341	0.092	0.372	<.0001	0.301	0.311	<.0001	0.414
Employment Density	0.192	0.005	0.206	0.080	<.0001	0.259	0.060	<.0001	0.323
Traffic Level Exposure									
Road Density	2.883	<.0001	0.444	0.686	<.0001	0.318	0.233	0.005	0.178
Socioeconomic									
% Hispanic Pop	55.920	0.006	0.170	4.358	0.383	0.040	2.522	0.387	0.038
Commercial Gent. (0/1)	9.416	0.171	0.097	1.748	0.307	0.054	0.744	0.455	0.038
Residential Gent. (0/1)	0.292	0.965	0.003	1.283	0.440	0.040	1.009	0.299	0.052
Other Controls									
Years Operating	-1.700	<.0001	-0.451	-0.318	<.0001	-0.254	-0.188	<.0001	-0.248
Outliers (0/1)	55.717	0.025	0.172	29.672	<.0001	0.275	15.665	<.0001	0.239
Constant	-1.148	0.924		-6.990	0.021		-2.352	0.180	
Adjusted R2	0.558			0.752			0.770		

Table 7.20: Bay Area Traffic Crash Regression Results (n=132)

Combined Los Angeles & Bay Area

The model presented in Table 7.21 combines all observations for both regions. Residential gentrification is not included in these models because it was defined differently for each of the two areas by Chapple et al. (2017) to account for variations in data availability by region. This set of models indicates that both measures of pedestrian exposure (population and employment density) are positively associated with increases in the average number all types of crashes, and traffic level exposure (defined as road density) is only significant for all collisions and bike- or pedestrian-involved crashes. The share of the Hispanic population also plays a significant role for auto-pedestrian collisions and incidents involving cyclists and pedestrians. Commercial gentrification plays a significant role for all crashes and for bike-pedestrian crashes, but not for auto-pedestrian crashes. Length of station operation is associated with a drop in crashes for all models.

Dependent Variable	*All Collisions*			*Bike & Pedestrian*			*Auto-Pedestrian*		
Independent Variables	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta	Coeff.	Sig.	Beta
Pedestrian Exposure									
Population Density	0.682	0.016	0.143	0.570	<.0001	0.426	0.432	<.0001	0.552
Employment Density	0.212	0.010	0.156	0.088	<.0001	0.231	0.066	<.0001	0.296
Traffic Level Exposure									
Road Density	2.019	0.000	0.207	0.461	0.001	0.169	0.060	0.397	0.037
Socioeconomic									
% Hispanic Pop	-32.885	0.069	-0.115	-12.564	0.004	-0.157	-6.088	0.009	-0.130
Commercial Gent. (0/1)	24.555	0.001	0.180	4.764	0.006	0.125	1.965	0.032	0.088
Other Controls									
Years Operating	-2.052	<.0001	-0.355	-0.429	<.0001	-0.266	-0.218	<.0001	-0.230
Outliers (0/1)	102.590	<.0001	0.250	19.981	0.000	0.174	11.207	<.0001	0.166
Region (1=LA)	37.672	<.0001	0.268	6.829	0.002	0.173	3.232	0.006	0.140
Constant	34.960	0.012		0.975	0.765		2.416	0.168	
Adjusted R2	0.548			0.675			0.728		

Table 7.21: Regression Results, Combined Los Angeles & Bay Area Station Areas

Summary

In both study regions, commercially gentrified station areas have higher rates of collisions per year than those station areas that have not experienced commercial gentrification. One possible explanation for this is that commercially gentrified station areas see more vehicular, pedestrian, and bicycle traffic, and hence are likely to experience more collisions. Future research should seek to identify and incorporate in the models traffic counts for study areas; such traffic counts may represent an important independent variable but were not available for the present study. Only in Los Angeles was the percent change after station opening in bike-involved, truck-involved, and alcohol-involved crashes significantly correlated with commercial gentrification. In the Bay Area, there were no changes in any crash types that were significantly associated with commercial gentrification.

Regressions conducted in this section show that, all else held equal, commercial gentrification has a positive relationship with average annual collisions in the Los Angeles and combined region models, and percent Hispanic population has a negative relationship with average annual collisions in Los Angeles but a positive relationship in the Bay Area. Pedestrian- and bicycle-involved crashes were only significantly predicted by commercial gentrification in the combined region and Los Angeles regressions.

These regression results provide some support for a hypothesis that commercially gentrified station areas pose additional risks to pedestrians and bicyclists. This may happen because commercially gentrified stations may attract more vehicular, pedestrian, and bicyclist traffic. The significant effect that commercial gentrification produces in Los Angeles (but not in the Bay Area) begs the question of difference between Los Angeles and Bay Area transit stations. Is there a significant difference in the streetscape and built environment around commercially gentrified Los Angeles stations that contributes to the increased rate of crashes, or are these figures purely a result of exposure? Further research on this subject is needed.

VIII. CASE STUDIES

CASE STUDIES

To produce a richer exploration of the subject matter at hand, we conducted interview- and observation-based case studies in both Los Angeles and the Bay Area. This qualitative research involved selecting two study areas for each region: one that commercially gentrified from 2000-2013 and one that did not commercially gentrify during that time period. In the Bay Area, adjacent census tracts were selected as study areas, whereas in Los Angeles, two non-adjacent but proximate station areas, both along the Metro Red Line, were selected as study areas.

For each case study area, we conducted in-person or phone interviews with merchants, shop managers, and real estate professionals working in commercial corridors in the transit neighborhoods. Long-time residents, shop employees, and a president of the board of a mixed-use building in one station area were also interviewed. We conducted six or more interviews in each tract or station area, as well as three or more interviews with real estate professionals for each study region. Interviews lasted approximately 15 to 45 minutes. Establishment employees and owners were asked questions about whether and how they felt the commercial district was changing. They were also asked to provide details on if and how pedestrian, bicycle, and vehicle traffic has changed over the last years, and what they believed might be causing those changes. Most interviews were conducted in-person and some were conducted by telephone after notes had been left for business owners. The full interview guide is provided in Appendix E. Interviews were supplemented with structured field observations that involved identifying certain built environment elements (e.g. sidewalk widths, traffic lights, marked crosswalks, etc.) that may have an impact on crashes. Observation conducted along commercial corridors was meant to identify the types of commercial storefronts that may characterize commercial areas that are currently, prone to, or not experiencing commercial gentrification. Observations were conducted by researchers who walked the length of the corridor once or more during the daylight hours. Commercial establishment characteristics recorded included standalone or strip mall establishments, presence of ethnic businesses, chain stores, and vacant or evicted properties, etc. (See Appendix F for complete observation instrument).

The primary purpose of the case studies was to produce greater detail and complement the results of the quantitative analyses. Data sources such as NETS, the ACS, and SWITRS are valuable tools that help researchers objectively identify trends and outcomes over time. The inflexibility of these statistics, however, can mask important human elements of city planning analyses: How do people feel about these changes? How do they respond to them? Are the changes a product of something that those affected can identify, but regression analysis cannot?

The value in qualitative case studies, therefore, is multifold: Qualitative research puts human faces to the changes happening in transit-proximate neighborhoods; it allows for guided speculation about the reasons, effects, and responses to these changes; and it produces rich information that supplements secondary data analyses.

Ground-Truthing Gentrification

In both Los Angeles and the Bay Area, we interviewed shop owners, managers, and real estate professionals about the changes (or lack thereof) occurring in our case study areas. We were able to apply our qualitative findings to our NETS-based definition of commercial gentrification, thereby developing more nuanced insights into the character of commercial gentrification in these areas.

San Francisco Bay Area

In the San Francisco Bay Area, we selected case study sites as commercial corridors within census tracts. We first selected two census tracts within one half-mile of a transit station: one that was commercially gentrified from 2000-2013, and one that was not. The tracts selected were Census Tract 4011 and 4013, both of which overlapped with a ½-mile radius from MacArthur BART station (See Figure 8.1). Detailed demographic and business characteristics for the Bay Area case study areas are found in Appendix C.

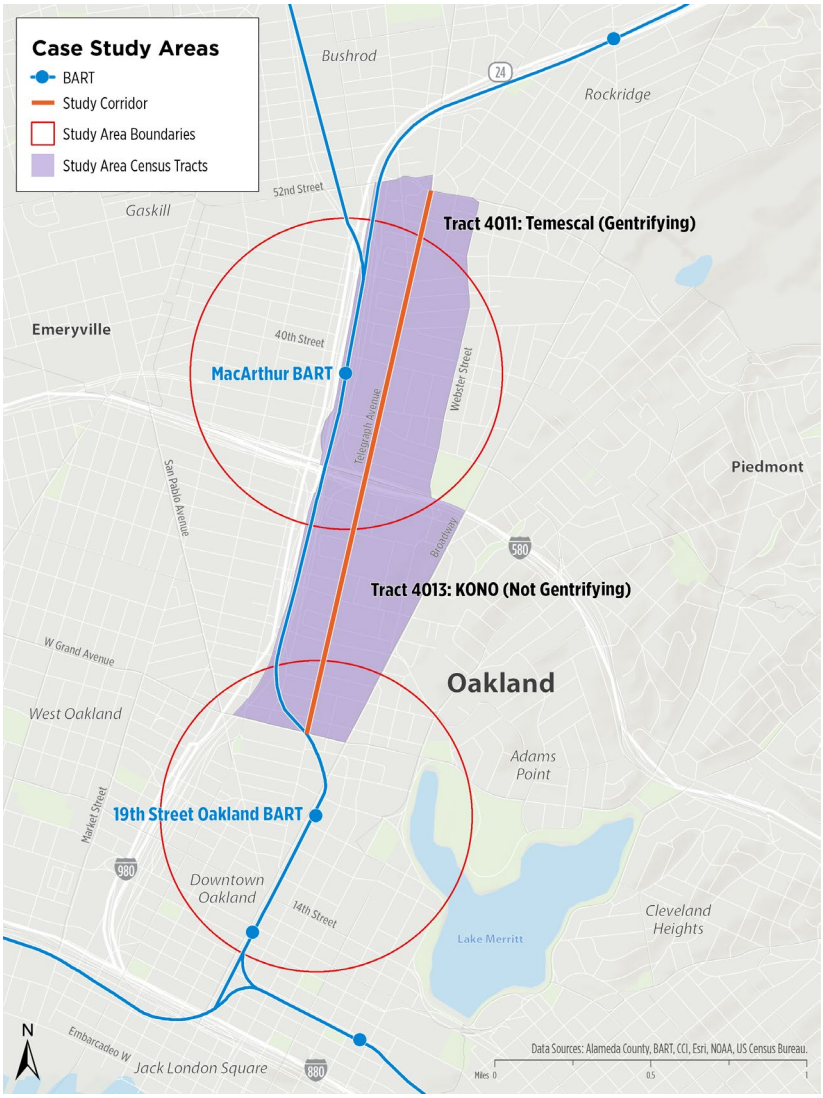

Figure 8.1: Map of Case Study Areas, San Francisco Bay Region

Tract 4011 is the Oakland neighborhood known as Temescal, while tract 4013 represents the Oakland neighborhood of KoNo (Koreatown/Northgate), both of which are Business Improvement Districts (BIDs) located within a half-mile of one or more transit stations. The MacArthur BART station, which sees an average of 8,826 station exits on a typical weekday ("Ridership Reports," 2017), is within a half-mile of both census tracts. A 2009 Center for Community Innovation study classified both neighborhoods as highly susceptible to residential gentrification (Chapple, 2009).

The commercial corridor in both census tracts was defined as Telegraph Avenue. In Temescal, the commercial corridor was defined as Telegraph from 51st Street to West MacArthur Boulevard, while in KoNo the commercial boulevard was defined from West Grand Avenue to 32nd Street. Observation and interviews were then conducted on these two commercial corridors.

The stretch of Telegraph Ave. in Temescal consists of a six-block strip of primarily small, locally-owned businesses that run through some of the more affluent neighborhoods in the MacArthur area, many of which have recently gentrified (Phillips, Flores, & Henderson, 2015). With the support of the Temescal BID, the 'hip' and 'cool' strip now displays banner-signs touting its restaurants, shopping, and 'authentic local flavor'. The neighborhood was once home to Italian, then African, and later Korean immigrants, but is now a predominantly white, middle- to upper-middle class area. National media has described Temescal as "Oakland's answer to San Francisco's Mission District and the city of Berkeley, drawing a mix of yuppies and plaid-wearing hipsters" (Woo, 2009), and the "hippest part of Oakland" (Haber, 2014).

According to a UC Berkeley Center for Community Innovation study, of the 224 commercial parcels along the Temescal stretch of Telegraph Ave., 49% turned over between 2007 and 2014 (Montojo & McElvain, 2015, p. 12). Twenty-five percent of the businesses replaced by 2014 were retail businesses, and another 17% were restaurants or food service establishments (Ibid.). The greatest change in business type occurred amongst service establishments, 35% of which were replaced by 2014 (Ibid.). Nearly all local-serving businesses that have closed, have been replaced by new local-serving establishments, and NETS data show that the ratio of regional to local-serving businesses has remained fairly consistent over time. However, certain names of new businesses suggest that, while they may still be local-serving, they cater to a new local demographic - one that differs from the clientele of replaced businesses. For example, several African/African-American hair salons and barber shops are among the replaced businesses, which reflects the decline in African-American residents throughout the MacArthur BART station area.

Basic descriptive statistics from the area show a neighborhood in transition. By and large, both census tracts have witnessed increases in population density and median household income in the past decade (See Table 8.1). The demographics of the area have changed, as well: There are fewer non-Hispanic blacks, more Latinos, and there has also been significant turnover in Asian/Pacific Islanders, and whites (See Table 8.1).

Both study areas in the Bay Area have seen significant growth in the number and density of business establishments, but have seen a decline in the average establishment size, as measured by number of employees. As can be seen in Table 8.2, the changes mirror higher-level regional

	Bay Area	San Francisco	Alameda County	Oakland	Temescal	KoNo
Total Population	7.0%	5.2%	6.3%	-0.6%	5.1%	43.0%
Population Density (per sq. mi.)	7.2%	4.8%	6.1%	-0.1%	0.5%	39.0%
Median Household Income (2013 $)	-10.4%	-3.4%	-7.8%	-6.1%	15.7%	26.3%
% Renting Households	4.3%	-2.5%	3.3%	1.8%	-2.0%	-8.7%
% Non-Hispanic White	-16.0%	-4.4%	-17.6%	11.0%	28.5%	-12.1%
% Black	-14.1%	-25.7%	-19.2%	-24.3%	-29.5%	-30.9%
% Asian/Pacific Islander	24.5%	7.7%	31.4%	8.8%	-24.6%	83.1%
% Hispanic	21.6%	7.7%	18.7%	17.4%	23.8%	125.5%
% Native American/Other	-10.6%	17.5%	-16.3%	0.6%	-86.1%	-35.7%
% Two or More Races	5.8%	9.4%	1.0%	23.9%	9.7%	-38.2%

Table 8.1: Change in Selected Demographic Characteristics from 2000-2013 – Bay Area

trends in direction, but the magnitude of changes in the case study neighborhoods is less than those at regional levels.

	Bay Area	San Francisco	Alameda County	Oakland	Temescal Study Area	KoNo Study Area
Total Establishments	65.3%	57.5%	61.2%	56.0%	43.2%	24.5%
Establishments per sq. mi.	65.3%	57.5%	61.2%	56.0%	43.2%	24.5%
Employees per establishment	-31.0%	-26.9%	-30.5%	-29.6%	-16.8%	-13.0%

Table 8.2: Change in Selected Business Characteristics from 2000-2013 – Bay Area

Field observations included counts of different business types along commercial corridors in the case study areas, with the intent of better understanding built environment characteristics in commercially gentrifying and non-commercially gentrifying areas. Figure 8.3, below, shows the establishment types that were recorded by researchers. Some establishment types are not mutually exclusive.

	Temescal, Commercially Gentrified	KoNo, Not Commercially Gentrified	Difference for Commercially Gentrified Tract
Standalone	118 (88%)	75 (96%)	-8%
Strip mall	16 (12%)	3 (4%)	+8%
Ethnic (non-Anglo)	28 (21%)	28 (36%)	-15%
Chain	5 (4%)	3 (4%)	0%
Vacant	7 (5%)	6 (8%)	-3%
For sale	1 (1%)	0 (0%)	+1%
For rent	5 (4%)	6 (8%)	-4%
'Trendy'	11 (8%)	6 (8%)	0%
Total Establishments	134	78	+56

Table 8.3: Establishment Type Counts, Bay Area Case Study Station Areas

Comparing business establishment counts in the commercially gentrified corridor (Temescal) and the non-commercially gentrified corridor (KoNo) yields some valuable insights (although differences may not be statistically significant). In the commercially gentrified district, we see significantly fewer ethnic establishments, which establishes some veracity for our definition of commercial gentrification (see section IV), as well as for the accuracy of the NETS data used in developing that definition (assuming there is significant overlap between 'ethnic' and minority-owned businesses). Also present in the commercially gentrified area are more strip mall establishments. Many of these establishments are part of the Temescal Plaza and Koryo Village shopping malls, which represent a significant amount of leasable commercial space.

There were only very slight differences in for sale or vacant properties in the two study areas - one percent more 'for sale' properties and three percent less vacant properties in the commercially gentrified area than in the non-gentrified area. These results, however, are close enough to zero to be considered null. Some interviews corroborated these findings, suggesting that the KoNo tract was less attractive to tenants but rapidly becoming more so. One real estate broker working in the area described the northern Temescal and Southern KoNo areas as "bookends - the best parts" of Telegraph and said that the KoNo tract had "done a 180" in the past few years and now "retail is totally taking off."

In the commercially gentrified Temescal neighborhood, many businesses noticed a change in the type of establishments in the area. One business owner remarked on the changing clientele in the neighborhood: "It would be amazing not to notice" the shift of businesses "catering towards higher incomes". Most interviewees - including real estate brokers - remarked particularly upon the increase of restaurants. Many referenced higher turnover and an influx of 'fancier' establishments, providing a more 'diverse' set of products and services.

When asked why nearby businesses may have closed down or moved out, a store operator

replied: “Increased rent is the main reason”. Most interview respondents described increasing rents in their leased space or at neighboring establishments. Two interviewees in the commercially gentrified Temescal census tract said their rent had been doubled when their lease was re-negotiated. One business manager said that a nearby fast food restaurant had gone out of business because the rent was prohibitively high: “That place was very busy all the time. And they still went out [of business].” These responses suggest that rent increases - more than changing customer preferences - may be a factor driving displacement of businesses. Changing customer preferences are likely also involved, however, as two Temescal merchants described having to change their inventory. One minority-owned shoe store operator described now “selling shoes that are not wanted for a cheap price.”

One real estate broker in the area described “classic retail dragging behind” other commercial storefront uses, such as restaurant and café space. Another broker working in the area agreed, and one clothing merchant in Temescal said that newer residents were not purchasing as much as her longer-term customers. Real estate brokers considered this to be a part of a macro-level trend in retail and not specific to the study area.

Although only some interviewees explicitly used the term “gentrification” to describe the changes occurring in the neighborhood, a number of businesses referenced increases in wealthier residents from San Francisco. One business operator speculated that “families are moving in from San Francisco because of affordable housing.”[10] Five interviewees explicitly mentioned noticing area demographic shifts towards white customers.

When asked what was driving increased rents and displacement pressures, most owners thought wealthier residents and the increased popularity of the neighborhood were to blame. One retailer said the increase in “more ‘namey’ restaurants” was bringing people in from out-of-town, and the Temescal neighborhood had been marketed by realtors as “lower Rockridge” in an attempt to associate the area with a wealthier, more upscale nearby neighborhood. A café owner described a similar ‘branding’ of the KoNo neighborhood: “They came down here and put up flags that said KoNo on them. They tried to pretend people called this neighborhood KoNo. And no one really does.” Another food establishment owner described the changes as happening because “restaurants moved in and showed people how nice the street is - it’s got nice trees - it’s a great neighborhood… it’s spreading down from [northern] Telegraph”.

Figure 8.2 shows a photograph of a typical upscale eatery in Temescal.

10 Interviews were not recorded to preserve interviewee’s privacy. Therefore, quotations are paraphrased based upon interview notes and for maximum clarity.

Los Angeles

In Los Angeles, the Hollywood/Vine and Vermont/Sunset LA Metro station areas were selected as case studies for a number of reasons, these are shown in Figure 8.3. Both stations are located on the Red Line, have been operating for the same number of years, and are near - but not adjacent - to one another. Despite these similarities, each station area has experienced neighborhood change differently, and both are understudied. Between 1990 and 2000, both stations commercially gentrified in at least one census tract within a ½-mile radius from the station. After 2000, however, only Hollywood/Vine gentrified both commercially and residentially. Detailed demographic and business characteristics for the Los Angeles case study areas are found in Appendix D.

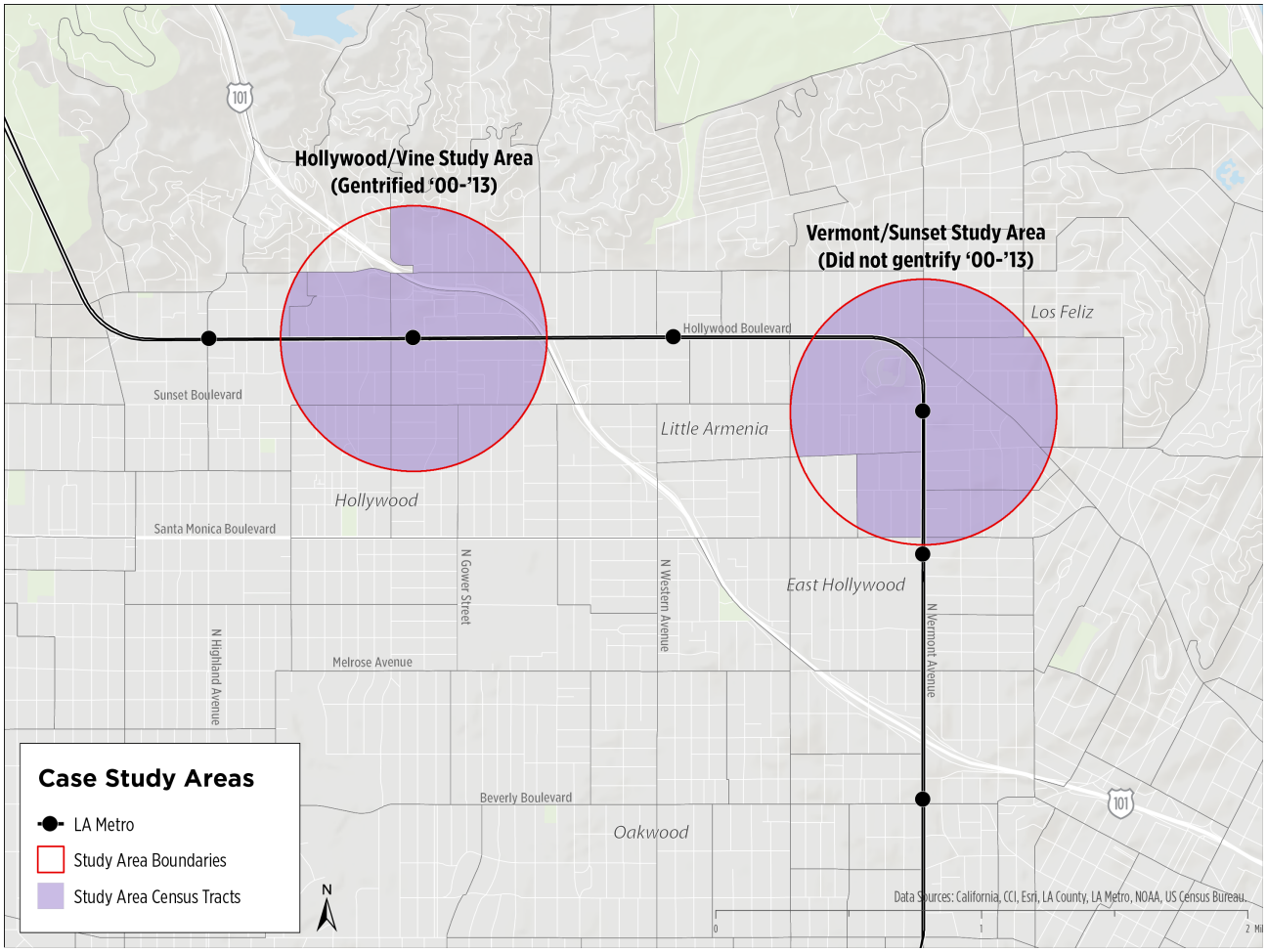

Figure 8.3: Map of Case Study Areas, Los Angeles Region

Table 8.3, below, presents selected demographic characteristics for our case study station areas, as well as Los Angeles County from 1990-2013. All of the data presented are area-weighted from census block group geographies. At a time of population growth (2000-2013) for Los Angeles County, the data show a decline in the population in both station areas, with non-commercially gentrifying station area Vermont/Sunset experiencing a greater loss. Mean household income has increased the most in the commercially gentrifying Hollywood/Vine station area, while

the shares of renters and residents of color in this station area have shown a more dramatic decrease. The Vermont/Sunset station area experienced a greater decline in the Hispanic population in the last decade than the region (where Hispanic share grew) or the Hollywood/Vine station area.

	LA County	Hollywood/Vine	Vermont/Sunset
Total Population	3.9%	-4.8%	-13.6%
Population Density (per sq. mi.)	4.0%	-4.8%	-13.6%
Mean Household Income (2013 $)	-4.6%	10.8%	7.4%
% Renting Households	1.92%	-2.78%	2.01%
% Non-Hispanic White	-11.29%	16.74%	27.96%
% Black	-14.29%	-51.32%	8.57%
% Asian/Pacific Islander	15.45%	-18.99%	5.92%
% Hispanic	7.40%	-6.23%	-10.36%
% Native American/Other	-16.46%	11.26%	-4.93%
% Two or More Races	-24.49%	-43.33%	-67.00%

Source: Tabulated by authors from 1990 and 2000 decennial census, and 2009-2013 5-year ACS. Station area characteristics are block group data, area weighted for ½-mile radius from the station.

Table 8.4: Change in Selected Demographic Characteristics from 2000-2013 – Los Angeles

As with the Bay Area, both study areas in Los Angeles have seen growth in the number and density of business establishments, but the magnitude of changes are less than those seen at the regional levels (See Table 8.5). Likewise, both areas have seen a decline in the average establishment size, as measured by number of employees.

	L.A. County	City of L.A.	Hollywood/Vine Study Area	Vermont/Sunset Study Area
Total Establishments	76.48%	64.54%	42.08%	55.28%
Establishments per sq. mi.	76.48%	64.54%	42.08%	55.28%
Employees per establishment	-39.90%	-38.14%	-30.03%	-35.11%

Table 8.5: Change in Selected Business Characteristics from 2000-2013 – Los Angeles

Table 8.6, summarizes the types of business establishments observed along the main commercial corridors within ½-mile of both case study station areas. A total of 87 establishments were counted for Vermont/Sunset, 13 more than in the commercially gentrified Hollywood/Vine area that had 74 commercial establishments. There was a slightly greater percentage of standalone businesses in the non-commercially gentrified station area of Vermont/Sunset than at commercially gentrified Hollywood/Vine, which had significantly more chain stores and slightly more trendy establishments (boutiques, out-of-place, especially hip, etc.).

	Hollywood/Vine, Commercially Gentrified	Vermont/Sunset, Not Commercially Gentrified	Difference for Commercially Gentrified Station
Standalone	69 (93%)	85 (98%)	-5%
Strip mall	5 (7%)	2 (2%)	+5%
Ethnic (non-Anglo)	14 (19%)	14 (16%)	+3%
Chain	35 (47%)	8 (9%)	+38%
Vacant	8 (11%)	9 (10%)	+1%
For sale	1 (1%)	0 (0%)	+1%
For rent	6 (8%)	1 (1%)	+7%
'Trendy'	4 (5%)	2 (2%)	+3%
Total Establishments	74	87	-13

Table 8.6: Establishment Type Counts, Los Angeles Case Study Station Areas

Local merchants described the length of their tenure in the commercially gentrified Hollywood/Vine station area as ranging from nine months to 45 years. The newer businesses tended to be upscale eateries and coffee shops, while the oldest businesses were a flower shop that had been in the area for 45 years and an Indian gift shop that had been in the area for 30 years.

In the non-commercially gentrified Vermont/Sunset station area, merchants interviewed had almost all been operating in their present locations for more than eight years, and a number of them for 15-20 years. Many of these businesses are small establishments that seem to appeal to a lower-income, primarily ethnic demographic (liquor stores, bars, beauty/hair salons, discount stores, and chain stores such as Payless Shoes and Fallas Paredes discount store). The vast majority of merchants interviewed in the Vermont/Sunset station area were Latino and Filipino.

All merchants interviewed in the Hollywood/Vine station area, with the exception of one who had arrived only 18 months ago, indicated that they had observed changes in the types of businesses opening in the neighborhood in recent years. Almost unanimously, the interviewees indicated that the changes included "more upscale restaurants," "new hotels and upscale clubs," "more small trendy stores," and "more tech companies." This matches with responses from the Bay Area study region, where interviewees reported upscale restaurants as a sign of a changing

neighborhood. One merchant emphasized the amount of new construction in the neighborhood and the number of tourists, while another talked about the redevelopment that accompanied the construction of the Metro stop. Figure 8.4 shows a photo of a typical upscale coffee shop at Hollywood/Vine.

Figure 8.4: An upscale coffee shop in the Hollywood/Vine station area. Photo taken by authors, May 2017.

Similarly, all three realtors interviewed about the Hollywood/Vine station area agreed that there are new types of establishments and customers coming into the area. According to them:

- "The neighborhood is becoming more trendy; more artistic places are moving in" (realtor 1).
- "There are more restaurants than before; some are higher-end and have their own type of clientele" (realtor 2).
- "There is more art culture and more small [boutique] type shops. There is now a skate shop that caters to a younger crowd and also sells art from locals. More restaurants are coming in, adding variety to the area" (realtor 3).

Merchants interviewed in the non-commercially gentrifying Vermont/Sunset station area, on the other hand, largely perceived very little change in the type of businesses and customers in the area, and only two noted more restaurants and coffee shops moving in. An ice cream store manager mentioned that "five months ago [the shop] experimented with selling teas, smoothies, and shakes - more healthier options. It was short-lived and abandoned."

Nine of the 14 businesses interviewed in the Hollywood/Vine station area reported changes in the kind of customers patronizing neighborhood stores. They talked about "more upscale customers," "more college and professional types," "larger lunch crowds," "more tourists," "higher-end spending folks, lots of Europeans, Australians, and Scientology people," and "more Metro users." The realtors talked about more "hipsters" and more "art-influenced" customers, who are attracted to the neighborhood's new commercial establishments. On the other hand, two business owners complained about "more homeless" people. It should be noted that the small number of merchants who did not witness changes in their customers were mostly establishments that had moved into the area in the past three-four years.

Vermont/Sunset, which did not commercially gentrify, is a low-income, primarily Latino neighborhood. Some longstanding merchants there indicated that Latino customers have increased over the past decade. This is interesting because the overall share of Hispanics in the neighborhood decreased by ~10% from 2000-2013 (See Table 8.3). One hair salon estimated that 80% of their clientele are Latinas, 10% are white, and 10% are Asian. A beauty salon indicated that in addition to Latinos, they have also seen an increase in Armenian and Filipino customers, and a decrease in whites and African-Americans. Most of the Vermont/Sunset area businesses described their customers as "regulars who live in the area," and only two businesses (a shoe store and a discount store) indicated that some of their clients are tourists. Only three businesses revealed their rent - which ranged from $830 to $1,800 per month (a bit over $1.00 per square foot) - while two others had experienced a rent increase in the last two years. None of the merchants interviewed intend to relocate, a possible sign that business in this low-income and ethnic neighborhood is stable and rents are still affordable.

One long-standing Indian gift store in the commercially gentrified Hollywood/Vine station area lamented that business had suffered in recent years because not many people came into the store. This response mirrored some of the findings in our Bay Area study region, where interviewees described a cooling of the traditional "soft retail" market. Businesses that were specifically identified as having been displaced were a small hamburger stand, a Korean grocery store that was replaced by Starbucks, a hat shop that became a fancy eatery, a luggage store, a nail salon, and a small camera store. Many respondents said these businesses could not make ends meet because of higher rents, a different customer base, or the negative effects of "prolonged construction".

Although some retail churn is normal (average 2000-2012 churn for 'infrequently patronized establishments' in a commercial census tract in Los Angeles is 4.33, representing the number of businesses that moved into the area, out of the area, opened in the area, and closed in the area, divided by the total number of businesses), realtors perceived a higher than normal turnover of neighborhood commercial properties, a phenomenon that was borne out by our observation (more storefronts were for sale/rent in the Hollywood/Vine station area). According to one realtor: "Some small businesses have closed but it is hard to know if rents went up or if their business was simply no longer attracting enough customers, or if it went out of style." That being said, all but two of the merchants interviewed indicated that they do not plan to relocate. Most of these establishments, however, had moved into the neighborhood after the opening of the Hollywood/Vine station.

Figure 8.5: A strip mall of small businesses in the Vermont/ Sunset station area. Photo taken by authors, May 2017.

In the non-commercially gentrified Vermont/Sunset station area, about half of the merchants interviewed were not aware of any stores that had closed or relocated, while the other half named some businesses that had closed. These included a vitamin store, an art store, a mobile phone store, and a beauty salon. The first two types of establishments may appeal to a more upscale customer demographic, which may not have been present in sufficient quantity in this neighborhood. Figure 8.5 shows a strip mall of small businesses in the Vermont/Sunset station area.

Only three merchants in the commercially gentrified Hollywood/Vine station area volunteered their rental rates, which varied significantly. A retail food store indicated that it pays $1.94 per sq. ft. per month and its rent was recently increased by $170 per month. A donut shop indicated that it pays $3.50 per sq. ft. per month, while an ethnic food restaurant reported a rent of $10.00 per sq. ft. per month. Most merchants had a five-year lease and a few had an eight- or 10-year lease. Realtors confirmed that the values of both residential and commercial properties in the area have increased in recent years. One realtor noted: “Residential properties are increasing in value because commercial properties are going up first. Development in commercial property and investment draws higher-end amenities first…rents have increased for sure.” According to another realtor: “Some people approach the neighborhood trying to buy or rent only to find that everything is now beyond their price range.”

When asked what drives the observed changes in the neighborhood, some merchants attributed it to the high demand for a centrally located neighborhood such as Hollywood/Vine. Others reported it as demand by new residents “of the Silicon Valley type.” However, the overwhelming response of merchants (9 out of 14) was that the change in the neighborhood occurred because

of the construction of high rises, renovated hotels, and the transit station.

Overall, our case study analysis of the Hollywood/Vine and Vermont/Sunset station area substantiated our definition of commercial gentrification and provided a more nuanced understanding of how these places did and did not experience commercial gentrification. Changes in the commercially gentrified Hollywood/Vine station area included wealthier customers, a more upscale built form, and dramatic increases in neighborhood traffic. In the non-commercially gentrified Vermont/Sunset station area, interviews and urban observation revealed less change over time and fewer chain stores, as well as fewer storefronts for sale/rent.

Transit & Commercial Gentrification

Our case studies also shined a light on commercial gentrification's relationship with transit in the Bay Area and Los Angeles. In both study regions, interviews with real estate professionals and merchants provided useful information about these connections.

In the Bay Area, most merchants and real estate professionals considered transit to be related to ongoing commercial gentrification pressures but not a primary driver of the phenomenon. One business owner in the commercially gentrified Temescal area said "I don't think transit is wagging the dog here," suggesting that proximity to MacArthur BART was not the driving force behind the commercial gentrification of the neighborhood. Most shop owners and real estate brokers suggested that the commercial gentrification was 'spreading' from other, more successful nearby neighborhoods, rather than from any particular BART station. Only one interviewee, a real estate broker, said that "transit access plays a huge role" in real estate market values in the Temescal and KoNo neighborhoods. Another real estate broker interviewed said that transit access was a part of rising property values "to a degree" but that the real driver was that "you can get more bang for your buck in Oakland...[it's] overflow from San Francisco...San Francisco is the lynchpin." A review of secondary literature shows community-based organization Causa Justa :: Just Cause claiming that "the gentrifying pressures on this area rest fundamentally on the neighborhood's connectivity, its access to major freeways, a BART transfer station, and the 1 and 57 bus lines. The transportation connections become even more important as San Francisco's workforce moves east, seeking cheaper rents" (collectivehistory, 2014).

When asked about how many of their customers used BART to access their stores, many business owners in both Temescal and KoNo acknowledged that some of their patrons took BART but few identified it as their customers' primary mode of transportation. One nail salon manager said that while many of his customers were BART riders, they didn't take BART to patronize his establishment specifically - they stopped in because it was located on their evening commute. A food establishment owner similarly described some of his customers as BART riders, but said that "not many people are taking BART just to get here." In this respect, transit access was perceived as playing a role in business success but was not identified by most merchants or real estate professionals as a primary driver of neighborhood change.

In Los Angeles, merchants had similar responses. In the non-commercially gentrified Vermont/Sunset station area, a number of shopkeepers perceived increases in pedestrians and cyclists as

a product of the Metro station but few brought up transit access as an important player in the commercial real estate marketplace, otherwise.

In the commercially gentrifying Hollywood/Vine station area, some merchants connected increased redevelopment and an increased number of tourists with the construction of the Metro stop but seemed to identify an influx of upscale restaurants with the changing neighborhood more than the improvement in transit access. Thirteen of the 14 interviewees knew of neighborhood businesses that had been displaced because of Metro construction, and a number of interviewees identified the Metro station as a contributing factor to the change in makeup of area businesses.

In both study regions, interview respondents generally acknowledged the role transit access plays in changing neighborhoods, but most merchants and real estate professionals considered the primary catalyst of commercial gentrification as existing elsewhere. That being said, a good deal of respondents connected new development and rising rents with displacement of businesses and neighborhood change. It is possible that these rising rents and new developments were catalyzed by improved transit access, thus creating a chain of causation from improved transit access to commercial gentrification. Regression modeling in section V of this report suggested that there is no significant connection between transit proximity and commercial gentrification, however, bolstering merchant and real estate professional's perceptions that transit access is not the driving force behind commercial gentrification.

Traffic Safety & Commercial Gentrification

Case study examination of both Los Angeles and Bay Area regions involved interviewing local shopkeepers and business community stakeholders in each region's case study areas, as well as observing certain high-crash intersections for characteristics that could be connected to commercial gentrification phenomena. Traffic safety implications were then drawn from these case study examinations.

Two to three intersections in each case study area were identified as high-crash intersections for pedestrians and cyclists,[11] and were then observed for visual obstructions, built environment features, and pedestrian counts. The goal of this observation was to identify characteristics of high-crash intersections in both commercially gentrified and non-commercially gentrified corridors.

11 In the Bay Area, high-crash intersections were identified using SWITRS data, whereby pedestrian- and cyclist-involved crashes were identified and geocoded to the nearest intersection. Intersections with the highest number of crashes (not normalized by exposure) were then selected for observation. These intersections overlapped with some of the corridors and intersections identified in the 2017 Draft Pedestrian Plan (Oakland Department of Transportation). In Los Angeles, high-crash intersections were identified through visual analysis of crash maps.

San Francisco Bay Area

Two high-crash intersections were identified for observation in each Bay Area study area. Both intersections were located on the high-traffic Telegraph Ave. corridor in Oakland, which was also the defined commercial district for the purposes of this study. Table 8.6 on the next page details the observed characteristics of the high-crash intersections. Figure 8.6 provides a view of a section of the KoNo study area.

In the Bay Area, most interviewees in both Temescal and KoNo noted increases in traffic of all types and modes. Most merchants in commercially gentrified Temescal described increases in the number of bicyclists and pedestrians. One food shop owner said "Our bike racks always fill up." This trend did not appear to be reflected in the KoNo tract, however, as only one of the merchants reported an increase in cyclists. Many interviewees described increased vehicle traffic and parking congestion. Parking congestion was singled out as a problem by a majority of the merchants, with many expressing concerns that parking congestion was getting worse. One longtime resident noted that new protected bike lanes had made parking extremely difficult and affected access to local businesses. While many interviewees said that built environment improvements like new crosswalks, signage, and bike lanes had made the area safer, others noted that the increased traffic had made the area less safe. Two merchants even relayed having witnessed bicyclist collisions near their stores. In the non-commercially gentrified KoNo tract, a long-time resident relayed having seen "Countless near-misses with bikes and pedestrians."

Figure 8.6: A green 'super sharrow' bike priority marking in KoNo, Oakland.

Merchants seemed well-aware of streetscape changes on Telegraph Ave. but didn't agree on whether or not the changes made the area safer or not. Some merchants thought it was a relatively safe street, while others thought the increase in cyclists resulted in more crashes. Merchants also disagreed on the magnitude of changes in traffic, with some saying there is "definitely more traffic" and others saying "vehicle traffic has gone up but not a lot".

One of the striking similarities amongst the observed high-crash intersections on Telegraph Ave. was the near-universal provision of what many planners would consider to be adequate active transportation infrastructure.

All four intersections are signalized, have bicycle lanes, and three out of four feature pedestrian medians and marked crosswalks. At the same time, the intersections also bear the hallmarks of high-density urban roadways: there are a number of curb-cut driveways within 200' of the intersections, visual impairment of intersections is relatively prevalent, and most of the intersections have an average of more than two auto travel lanes.

	Temescal, Commercially Gentrified		*KoNo, Not Commercially Gentrified*	
	Telegraph & 40th	Telegraph & MacArthur	Telegraph & Grand	Telegraph & Merrimack
Marked Crosswalks?	Yes	No	Yes	Yes
Median Refuges Present?	Yes	No	Yes	Yes
Traffic Light Controlled?	Yes	Yes	Yes	Yes
Bicycle Lanes Present?	Yes	Yes	Yes	Yes
Sidewalk Widths	10'	15'	10'	8'
# of Driveways w/in 200'	6	7	11	3
Average # Auto Lanes Entering Intersection	5	5	3	2
Visual Impairment				
Shrubbery	No	Yes	No	Yes
Parked Cars	Yes	Yes	No	No
Stopped Buses	Yes	Yes	.	Yes
Sidewalk Impediments				
Vendors	No	No	No	No
Wares	No	No	No	No
Construction	Yes	No	No	No
Pedestrian Behaviors				
Jaywalking Observed?	No	No	No	No
Midblock Crossing?	No	No	No	Yes

Table 8.7: High-Crash Intersection Observations, Temescal & KoNo

The greater percentage of strip mall-type establishments in commercially gentrified Temescal, versus KoNo (See Table 8.7), suggests that more auto trips may be generated in commercially gentrified areas, as strip mall establishments are probably more likely to be patronized by auto-borne customers. This hypothesis presumes an association between a strip mall-type built environment and commercial gentrification, which is corroborated somewhat by our Los Angeles observations (See Table 8.7), which show a similar pattern of a commercially gentrified neighborhood having more strip mall establishments. By this logic, a strip mall-type built environment - being, perhaps, more auto-centric - could be associated with more auto trips, which, in turn, could cause an increase in exposure of pedestrians and cyclists to crashes.

Los Angeles

In our Los Angeles study region, we selected three intersections in each case study area with a high concentration of pedestrian and bicycle collisions. We conducted pedestrian counts and observations of the built environment to complement our data and models and build a qualitative understanding of factors that may contribute to higher crash incidences.

Table 8.8, below, summarizes the findings from the observed high-crash intersections. The commercially gentrified Hollywood/Vine station area has a higher annual average number of collisions than the Vermont/Sunset station area (208 compared to 128, respectively, for years after the station opened) (SWITRS). However, both station areas have similar number of auto-pedestrian collisions (30 at Hollywood/Vine and 26 at Vermont/Sunset) (Ibid.). The high-crash intersections in the Vermont/Sunset station area have, on average, more auto lanes entering the intersection. All station areas have marked crosswalks and traffic lights in their vicinity but lack, however, pedestrian median refuges and bicycle lanes. All intersections at Hollywood/Vine had parked cars serving as visual impairments, while two of the three intersections at Vermont/Sunset had bus stops near the corner (there was only one at Hollywood/Vine).

	Hollywood/Vine, Commercially Gentrified			*Vermont/Sunset, Not Commercially Gentrified*		
	Hollywood & Vine	Hollywood & Cahuenga	Franklin & Argyle	Vermont & Sunset	Hollywood & Vermont	Sunset, Hollywood & Hillhurst
Marked Crosswalks?	Yes	Yes	Yes	Yes	Yes	Yes
Median Refuges Present?	No	No	No	No	No	No
Traffic Light Controlled?	Yes	Yes	Yes	Yes	Yes	Yes
Bicycle Lanes Present?	No	No	No	No	No	No
Sidewalk Widths	15′	15′	4-8′	12′	15′	15′
# of Driveways w/in 200′	0	0	0	4	7	4
Average # Auto Lanes Entering Intersection	5	4	6	6	6	4
Visual Impairment						
Shrubbery	No	No	No	No	Yes	No
Parked Cars	Yes	Yes	Yes	No	No	No
Stopped Buses	No	No	Yes	Yes	Yes	No
Sidewalk Impediments						
Vendors	Yes	No	No	No	No	No
Wares	No	No	No	No	No	No
Construction	No	No	Yes	No	No	No
Pedestrian Behaviors						
Jaywalking Observed?	No	No	No	No	Yes	No
Midblock Crossing?	No	No	No	No	Yes	No

Table 8.8: High-Crash Intersections Observations, Hollywood/ Vine & Vermont/Sunset

In the non-commercially gentrified Vermont/Sunset station area, we observed a number of driveways interrupting the sidewalk at high-crash intersections. This was not the case at the Hollywood/Vine station area intersections. In previous research, Loukaitou-Sideris et al. (2007) found that many high-crash intersections in Los Angeles had driveways in their vicinity and that some of the crashes at these intersections involved automobiles exiting the driveways and hitting pedestrians, which suggests that the non-commercially gentrified station area may have a streetscape element that poses greater risks for pedestrians than the commercially gentrified station area. Construction and street vendors blocking the pedestrian right-of-way were observed only at one Hollywood/Vine intersection. Jaywalking was more common at the Vermont/Sunset intersections.

Nearly all interviewees in the commercially gentrified Hollywood/Vine area commented on the increase in automobile, pedestrian, and bicycle traffic, and some merchants lamented a significant lack of parking. One businessperson described the situation: "streets are congested and people are flustered." Some merchants surmised that much of the foot traffic comes from the Metro station and the new higher-density residential apartments. Two interviewees said the combination of increased bicycle and auto traffic makes it very dangerous for people on bikes, and the majority of interviewees had witnessed traffic crashes in the neighborhood.

A number of respondents in the non-commercially gentrified Vermont/Sunset station area also noted the increasing traffic congestion and many complained about "the busy and dangerous intersections" and heavy traffic that often blocks streets, making parking challenging. Some also noted the increased presence of pedestrians and bikers because of the Metro station. This co-existence of heavy automobile traffic and increased pedestrian and bicycle traffic likely increases exposure of pedestrians and cyclists to crashes. Many respondents in the Vermont/Sunset station area had witnessed collisions and some wanted more traffic signals and bicycle lanes.

In the same station area, a number of merchants noted that the neighborhood has, in recent years, seen "more foot traffic," "more police activity," "more dirty sidewalks", and "more homeless." We observed a large homeless encampment near the Santa Monica and Vermont intersection. Other shopkeepers in the area said "this neighborhood has always experienced heavy automobile traffic and this hasn't changed. But now there are more people walking on the weekends."

As in the Bay Area study region, our observation yielded little conclusive evidence that one station area was seeing significantly more traffic than another. In both station areas, interviewees perceived an increase in traffic, difficulty parking, and a streetscape that was dangerous for people on bikes. That being said, observed high-crash intersections in Los Angeles study areas seemed to lack some of the best-practice street design (pedestrian median refuges, bicycle lanes, fewer travel lanes, etc.) that was present in Bay Area streets.

Case Study Conclusions

Interviews and urban observation in the Bay Area and Los Angeles returned some important findings. For one, rising rents were identified as relevant displacement pressure phenomena more often than were the changing preferences of customers, suggesting that merchants are facing the most significant pressure from landlords who perceive greater value in their properties. Pressure from changing demographics of customers that demand different products does not seem to be as significant a concern. Merchants in the Bay Area seemed to concur that high rents were spreading outward from northern Telegraph Ave., instead of outward from the BART station, corroborating the findings of our regression analysis, which suggested that transit was not significantly associated with commercial gentrification. In both the Bay Area and Los Angeles, merchants also agreed that restaurants were the most visible sign - and perhaps a catalyst - of commercial gentrification.

Transit access was generally acknowledged by interviewees as a significant factor in market value of commercial property but few considered it to be the most important driving force behind commercial gentrification. In all study regions, merchants acknowledged that some of their customers used rail transit but none considered it a primary mode that their business depended upon for success.

With respect to traffic safety, comparisons between commercially gentrified and non-commercially gentrified study areas in the Bay Area and Los Angeles produce few conclusive insights into the regression model findings in Section VII of this report, which indicate that commercially gentrified areas see significantly more crashes per year than non-commercially gentrified areas. Interviews in the Bay Area and Los Angeles' commercially gentrified and non-commercially gentrified study areas suggested that traffic was increasing in both areas, and merchants in the Bay Area were in disagreement over changes in safety that may have occurred in recent years. Little consensus was uncovered on whether increased exposure to automobile traffic was responsible for the increased number of crashes in commercially gentrified areas.

Communicating in English was a challenge throughout the interview process in both case study areas in the Bay Area. A number of business owners and managers did not speak English as a second language, so interview questions were translated into both Korean and Spanish. The language barrier was notable because it reflects upon merchants' ability to communicate and negotiate with landlords, planners, and other stakeholders shepherding neighborhood change. It is extremely likely that the language barrier is to the merchants' detriment in lease negotiations and planning discussions. In the Los Angeles case studies, limited English proficiency was not a challenge through the interview process, but some merchants expressed a preference for speaking in a language other than English.

IX. CONCLUSION & POLICY IMPLICATIONS

CONCLUSION & POLICY IMPLICATIONS

Conclusions

Through a literature review, statistical analysis, and qualitative case study analysis, we uncovered important findings regarding the relationships amongst commercial gentrification, transit access, transit ridership, and traffic crashes. The primary findings of this report are presented below, with policy implications and research needs following.

- Proximity to a transit station is likely not associated with commercial gentrification. More important factors that may induce commercial gentrification are the baseline demographics of the neighborhood, particularly the percent of non-Hispanic black, foreign-born, and renter residents, as well as the overall population density in the neighborhood.
- Commercial gentrification may contribute to increases in total, cyclist-involved, and pedestrian-involved average annual crashes around rail transit stations. It is unclear if this is directly due to the phenomenon of commercial gentrification or if it is related to an increase in pedestrian and cyclist traffic that occurs in commercially gentrified areas.
- Commercial gentrification does not appear to have a significant effect on rail transit ridership.
- Merchants relayed facing more pressure from rising rents than from changing customer demographics and demands. Most merchants do not see transit as the primary catalyst of these rent increases.
- Restaurants, cafés, and bars were prominent in both commercially gentrified case studies.
- Merchants in areas facing gentrification and displacement pressures may see their resilience to these pressures reduced by language barriers.

Policy Implications

We crafted specific policy recommendations that are derived from the findings in this report. The primary emphasis of these recommendations is on mitigating likely crash rate increases in commercially gentrified areas and informing transit-oriented development (TOD).

- While our quantitative research does not find a significant relationship between a neighborhood's proximity to transit and commercial gentrification, we believe that this may not represent a universal truth and this issue requires further probing. Policymakers should not assume that transit neighborhoods are not susceptible to commercial gentrification.
- The relationship between residential and commercial gentrification also needs further exploration. The results of this study are mixed, and it is not clear when and where one type of gentrification follows the other, or which comes first. We suspect that there may not be a universal pattern, and such relationships may change from one neighborhood to another.
- Our findings indicate that commercial gentrification is context-specific. Policymakers, therefore, should not only rely on aggregate data but also seek to identify what is happening on the ground in specific commercial transit neighborhoods. Commercial neighborhood stakeholders, such as merchants, property owners, and realtors can give good

information about gentrification trends, business closures or relocations, rent increases, etc.
- Commercial gentrification in a transit neighborhood is often accompanied by an increased incidence of crashes involving pedestrians and cyclists. This may well be because more pedestrians and cyclists are present in the neighborhood, increasing rates of exposure. Regardless of cause, the increased occurrence of crashes tells us that policymakers should focus resources towards traffic calming, safe streets infrastructure provision, and other proven traffic safety improvements.

Research Shortcomings & Next Steps

Research Shortcomings

This research has a number of significant shortcomings that should be addressed in future work. The most important of these shortcomings are listed below.

- This research did not examine who is served by establishments in commercially gentrified and transit proximate neighborhoods, nor were we able to assess changes in the prices of goods and services. This is important for understanding the implications of displacement and whether it affects important community service and product provision.
- This research includes no examination of the nature of employment provided by businesses in commercially gentrified and transit proximate areas. It is important to understand how employment access and demographics are affected by transit proximity and commercial gentrification.
- The analysis of crashes did not take into account automobile traffic volumes because of a lack of traffic count data.
- The surveys only targeted merchants who are currently operating along the commercial streets of four transit neighborhoods. It does not cover the perspectives of merchants who were displaced or closed because of commercial gentrification.

Research Next Steps

Future research should examine the following important questions, which are derived from findings and research shortcomings in this report.

- What happens to establishments after they are displaced? Is there a significant negative outcome for owners, employees, and the broader community? Or is this a more innocuous geographic reorganization of markets?
- This research suggests that rising rents are more responsible for commercial displacement than changing customer preferences, but falls short of producing conclusive evidence for this hypothesis. Future research should examine this question in greater depth.
- How is commercial gentrification related to residential gentrification? Which comes first, where? Future research should probe this association further.
- Implications of this research are inherently limited to the high-density, diverse metropolitan areas in the United States. Further research in smaller or less-dense regions of California, such as San Diego, Sacramento, and Fresno, should be pursued.

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XI. APPENDICES

Appendix A

Table A1: Classification for Bay Area Commercial Gentrification Probit Regression

	True		
Classified	D	~D	Total
+	25	23	48
-	106	474	580
Total	131	497	628
Classified + if predicted Pr(D)	>= .5		
True D defined as com_gen_00_13	!= 0		
Sensitivity	Pr(+| D)		19.08%
Specificity	Pr(-|~D)		95.37%
Positive predictive value	Pr(D| +)		52.08%
Negative predictive value	Pr(~D| -)		81.72%
False + rate for true ~D	Pr(+| D)		4.63%
False – rate for true D	Pr(-|~D)		80.92%
False + rate for classified +	Pr(D| +)		47.92%
False – rate for classified -	Pr(~D| -)		18.28%
Correctly classified	79.46%		

Table A.2: Classifications for Los Angeles Commercial Gentrification Probit Regression

	True		
Classified	D	~D	Total
+	56	35	91
-	170	805	975
Total	226	840	1,066
Classified + if predicted Pr(D)	>= .5		
True D defined as com_gen_00_13	!= 0		
Sensitivity	Pr(+| D)		24.78%
Specificity	Pr(-|~D)		95.83%
Positive predictive value	Pr(D| +)		61.54%
Negative predictive value	Pr(~D| -)		82.56%
False + rate for true ~D	Pr(+| D)		4.17%
False – rate for true D	Pr(-|~D)		75.22%
False + rate for classified +	Pr(D| +)		38.46%
False – rate for classified -	Pr(~D| -)		17.44%
Correctly classified	80.77%		

Table A.3: Classifications for Bay Area Residential Gentrification Probit Regression

	True		
Classified	D	~D	Total
+	1	2	3
-	84	1,487	1,571
Total	85	1,489	1,574
Classified + if predicted Pr(D)	>= .5		
True D defined as gent00_13	!= 0		
Sensitivity	Pr(+| D)	1.18%	
Specificity	Pr(-|~D)	99.87%	
Positive predictive value	Pr(D| +)	33.33%	
Negative predictive value	Pr(~D| -)	94.65%	
False + rate for true ~D	Pr(+| D)	0.13%	
False – rate for true D	Pr(-|~D)	98.82%	
False + rate for classified +	Pr(D| +)	66.67%	
False – rate for classified -	Pr(~D| -)	5.35%	
Correctly classified	94.54%		

Table A.4: Classifications for Los Angeles Residential Gentrification Probit Regression

	True		
Classified	D	~D	Total
+	2	0	2
-	80	2,239	2,319
Total	82	2,239	2,321
Classified + if predicted Pr(D)	>= .5		
True D defined as com_gen_00_13	!= 0		
Sensitivity	Pr(+| D)	2.44%	
Specificity	Pr(-|~D)	100.00%	
Positive predictive value	Pr(D| +)	100.00%	
Negative predictive value	Pr(~D| -)	96.55%	
False + rate for true ~D	Pr(+| D)	0.00%	
False – rate for true D	Pr(-|~D)	97.56%	
False + rate for classified +	Pr(D| +)	0.00%	
False – rate for classified -	Pr(~D| -)	3.45%	
Correctly classified	96.55%		

Table A.5: NAICS Codes Used for Identifying Infrequent Establishments

NAICS Code	Business Type
441110	New Car Dealers
441120	Used Car Dealers
441210	Recreational Vehicle Dealers
441221	Motorcycle, ATV, and Personal Watercraft Dealers
441222	Boat Dealers
441229	All Other Motor Vehicle Dealers
441310	Automotive Parts and Accessories Stores
441320	Tire Dealers
442110	Furniture Stores
442210	Floor Covering Stores
442291	Window Treatment Stores
442299	All Other Home Furnishing Stores
443111	Household Appliance Stores
443112	Radio, Television, and Other Electronics Stores
443120	Computer and Software Stores
443130	Camera and Photographic Supplies Stores
444110	Home Centers
444120	Paint and Wallpaper Stores
444130	Hardware Stores
444190	Other Building Material Dealers
444210	Outdoor Power Equipment Stores
444220	Nursery, Garden Center, and Farm Supply Stores
446199	All Other Health and Personal Care Stores
447190	Other Gasoline Stations
448310	Jewelry Stores
448320	Luggage and Leather Goods Stores
451110	Sporting Goods Stores
451120	Hobby, Toy and Game Stores
451130	Sewing, Needlework, and Piece Goods Stores
451140	Musical Instrument and Supplies Stores
453310	Used Merchandise Stores
453920	Art Dealers
453930	Manufactured (Mobile) Home Dealers
453991	Tobacco Stores
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)
541940	Veterinary Services
713120	Amusement Arcades
713950	Bowling Centers
812910	Pet Care (except Veterinary) Services

Table A.6: NAICS Codes Used for Identifying Discretionary Establishments

NAICS Code	Business Type
441110	New Car Dealers
441120	Used Car Dealers
441210	Recreational Vehicle Dealers
441221	Motorcycle, ATV, and Personal Watercraft Dealers
441222	Boat Dealers
441229	All Other Motor Vehicle Dealers
441310	Automotive Parts and Accessories Stores
441320	Tire Dealers
442110	Furniture Stores
442210	Floor Covering Stores
442291	Window Treatment Stores
442299	All Other Home Furnishing Stores
443120	Computer and Software Stores
443130	Camera and Photographic Supplies Stores
444110	Home Centers
444120	Paint and Wallpaper Stores
444130	Hardware Stores
444190	Other Building Material Dealers
444210	Outdoor Power Equipment Stores
444220	Nursery, Garden Center, and Farm Supply Stores
445291	Baked Goods Stores
445292	Confectionery and Nut Stores
445299	All Other Specialty Food Stores
445310	Beer, Wine, and Liquor Stores
446120	Cosmetics, Beauty Supplies, and Perfume Stores
446191	Food (Health) Supplement Stores
447190	Other Gasoline Stations
448310	Jewelry Stores
448320	Luggage and Leather Goods Stores
451110	Sporting Goods Stores
451120	Hobby, Toy, and Game Stores
451130	Sewing, Needlework, and Piece Goods Stores
451140	Musical Instrument and Supplies Stores
451211	Book Stores
451212	News Dealers and Newsstands
451220	Prerecorded Tape, Compact Disc, and Record Stores
452111	Department Stores (Except Discount Department Stores)
452112	Discount Department Stores
453110	Florists
453210	Office Supplies and Stationery Stores
453220	Gift, Novelty, and Souvenir Stores
453310	Used Merchandise Stores

453910	Pet and Pet Supplies Stores
453920	Art Dealers
453930	Manufactured (Mobile) Home Dealers
453991	Tobacco Stores
453998	All Other Miscellaneous Store Retailers (Except Tobacco Stores)
532230	Video Tape and Disc Rental
541940	Veterinary Services
713120	Amusement Arcades
713940	Fitness and Recreational Sports Centers
713950	Bowling Centers
722110	Full-Service Restaurants
722211	Limited-Service Restaurants
722212	Cafeterias, Grill Buffets, and Buffets
722213	Snack and Nonalcoholic Beverage Bars
722410	Drinking Places (Alcoholic Beverages)
812113	Nail Salons
812199	Other Personal Care Services
812910	Pet Care (except Veterinary) Services

Appendix B

Table B1: Variance Inflation Factor, Bay Area Ridership Linear Regression

Variable	VIF	1/VIF
Household income (2000)	5.36	0.186458
% college-educated (2000)	4.78	0.209004
Road network density (2014)	3.67	0.272605
% renting (2000)	3.26	0.306924
% Hispanic (2000)	3.12	0.320637
Street intersection density (2014)	2.49	0.402164
Population density (2000)	2.28	0.437920
% units built pre-1950 (2000)	1.82	0.549992
% foreign-born	1.71	0.585275
% non-Hispanic black	1.71	0.586136
Employees per sq. mi. (2000)	1.55	0.646252
Res. gent. '90-'00	1.18	0.844490
Com. gent. '90-'00	1.16	0.861573
Mean VIF	2.62	

Table B2: Variance Inflation Factor, Los Angeles Ridership Linear Regression

Variable	VIF	1/VIF
% foreign-born (2000)	3.28	0.305343
Street intersection density (2014)	3.03	0.330462
% renting (2000)	2.90	0.344542
Road network density (2014)	2.90	0.344979
Population density (2000)	2.89	0.346169
Employees per sq. mi. (2000)	2.25	0.444301
% non-Hispanic black (2000)	2.01	0.498109
% college educated (2000)	1.79	0.557833
Com. gent. '90-'00	1.64	0.608441
% units built pre-1950 (2000)	1.62	0.617279
Res. gent. '90-'00	1.14	0.876913
Mean VIF	2.31	

Table B3: Variance Inflation Factor, Combined Bay Area & Los Angeles Ridership Linear Regression

Variable	VIF	1/VIF
Median household income (2000)	4.30	0.232433
% renting (2000)	2.65	0.376779
% foreign-born (2000)	2.37	0.422118
Population density (2000)	2.15	0.465231
% non-Hispanic black (2000)	1.84	0.543517
Region	1.68	0.594473
Employees per sq. mi. (2000)	1.40	0.712082
% units built pre-1950 (2000)	1.40	0.712203
Street intersection density (2014)	1.32	0.757978
Com. gent. '90-'00	1.18	0.845828
Res. gent. '90-'00	1.11	0.904749
Mean VIF	1.95	

Appendix C

Detailed Characteristics of Bay Area Case Study Areas

Table C.1: Change in Selected Demographic Characteristics from 2000-2013 – Bay Area

	Bay Area	San Francisco	Alameda County	Oakland	Temescal	KoNo
			Population			
1990	6,023,577	723,959	1,279,182	372,242	3,922	2,472
2000	6,783,760	776,733	1,443,741	399,484	4,007	2,810
2013	7,257,501	817,501	1,535,248	397,011	4,210	4,018
Change 2000-2013	7.0%	5.2%	6.3%	-0.6%	5.1%	43.0%
			Population Density (per sq. mi.)			
1990	870	15502	1735	6640	11609	7613
2000	980	16634	1957	7127	11787	8672
2013	1051	17441	2077	7117	11846	12057
Change 2000-2013	7.2%	4.8%	6.1%	-0.1%	0.5%	39.0%
			Median Household Income (2013 $)			
1990	$78,083	$62,786	$70,546	$50,912	$39,450	$23,571
2000	$87,449	$77,230	$78,244	$56,019	$46,200	$27,725
2013	$78,388	$74,604	$72,112	$52,583	$53,438	$35,030
Change 2000-2013	-10.4%	-3.4%	-7.8%	-6.1%	15.7%	26.3%
			% Renting Households			
1990	43.6%	65.5%	46.7%	58.3%	81.8%	94.2%
2000	42.3%	65.0%	45.3%	58.6%	81.7%	96.1%
2013	44.1%	63.4%	46.8%	59.6%	80.1%	87.8%
Change 2000-2013	4.3%	-2.5%	3.3%	1.8%	-2.0%	-8.7%
			% Non-Hispanic White			
1990	60.7%	46.6%	53.2%	28.3%	36.4%	27.9%
2000	50.0%	43.6%	40.9%	23.5%	36.9%	24.1%
2013	42.0%	41.7%	33.7%	26.1%	47.5%	21.2%
Change 2000-2013	-16.0%	-4.4%	-17.6%	11.0%	28.5%	-12.1%

	Bay Area	San Francisco	Alameda County	Oakland	Temescal	KoNo
1990	8.6%	10.6%	17.4%	42.8%	41.7%	47.7%
2000	7.3%	7.6%	14.6%	35.1%	32.2%	49.0%
2013	6.3%	5.6%	11.8%	26.5%	22.7%	33.8%
Change 2000-2013	-14.1%	-25.7%	-19.2%	-24.3%	-29.5%	-30.9%
			% Asian/Pacific Islander			
1990	14.7%	28.4%	14.5%	14.2%	11.6%	16.2%
2000	19.3%	31.1%	20.9%	15.6%	12.6%	11.4%
2013	24.1%	33.5%	27.4%	17.0%	9.5%	20.8%
Change 2000-2013	24.5%	7.7%	31.4%	8.8%	-24.6%	83.1%
			% Hispanic			
1990	15.3%	13.9%	14.2%	13.9%	9.0%	7.4%
2000	19.4%	14.1%	19.0%	21.9%	11.8%	8.9%
2013	23.6%	15.2%	22.5%	25.7%	14.6%	20.0%
Change 2000-2013	21.6%	7.7%	18.7%	17.4%	23.8%	125.5%
			% Native American/Other			
1990	0.7%	0.6%	0.7%	0.8%	1.3%	0.7%
2000	0.6%	0.6%	0.7%	0.7%	1.4%	1.2%
2013	0.6%	0.7%	0.6%	0.7%	0.2%	0.8%
Change 2000-2013	-10.6%	17.5%	-16.3%	0.6%	-86.1%	-35.7%
			% Two or More Races			
1990	-	-	-	-	-	-
2000	3.3%	3.0%	3.9%	3.2%	5.0%	5.5%
2013	3.5%	3.3%	4.0%	4.0%	5.5%	3.4%
Change 2000-2013	5.8%	9.4%	1.0%	23.9%	9.7%	-38.2%

Table C.2: Change in Selected Business Characteristics from 2000-2013 – Bay Area

	Bay Area	San Francisco	Alameda County	Oakland	Temescal Study Area	KoNo Study Area
			Establishments			
1990-1992	604,654	95,166	121,493	34,754	595	1,358
2000-2002	740,690	114,677	142,966	39,410	581	1,480
2011-2013	1,224,480	180,670	230,438	61,471	832	1,842
Change 2000-2013	65.3%	57.5%	61.2%	56.0%	43.2%	24.5%
			Establishment density per sq. mi.			
1990-1992	87.5	2036.4	164.4	621.8	1744.7	4097.1
2000-2002	107.2	2453.9	193.4	705.1	1703.6	4465.2
2011-2013	177.2	3866.1	311.8	1099.8	2439.6	5557.4
Change 2000-2013	65.3%	57.5%	61.2%	56.0%	43.2%	24.5%
			Employees per establishment			
1990-1992	10.1	10.5	10.6	10.2	6.9	7.6
2000-2002	10.5	10.9	11.2	10.4	7.4	7.8
2011-2013	7.2	8.0	7.8	7.3	6.2	6.8
Change 2000-2013	-31.0%	-26.9%	-30.5%	-29.6%	-16.8%	-13.0%

Appendix D

Detailed Characteristics of Los Angeles Case Study Areas

Table D.1: Change in Selected Demographic Characteristics from 2000-2013 – Los Angeles

	LA County	Hollywood/Vine	Vermont/Sunset
		Population	
1990	8,863,164	15,006	18,805
2000	9,519,338	13,032	18,428
2013	9,893,481	12,409	15,929
Change 2000-2013	+3.9%	-4.8%	-13.6%
		Population Density (per sq. mi.)	
1990	2,183	19,106	23,943
2000	2,344	16,593	23,464
2013	2,438	15,800	20,281
Change 2000-2013	4.0%	-4.8%	-13.6%
		Mean Household Income (2013 $)	
1990	$85,710	$43,863	$51,995
2000	$86,415	$46,678	$44,360
2013	$81,416	$51,696	$47,621
Change 2000-2013	-4.6%	+10.8%	+7.4%

	LA County	Hollywood/Vine	Vermont/Sunset
	% Renting Households		
1990	51.8%	93.8%	89.5%
2000	52.1%	93.6%	91.1%
2013	53.1%	91.0%	91.3%
Change 2000-2013	1.92%	-2.78%	+2.01%
	% Non-Hispanic White		
1990	40.8%	40.7%	35.4%
2000	31.0%	43.6%	32.9%
2013	27.5%	50.9%	42.1%
Change 2000-2013	-11.29%	+16.74%	+27.96%
	% Black		
1990	11.2%	6.8%	4.5%
2000	9.8%	7.6%	3.5%
2013	8.4%	3.7%	3.8%
Change 2000-2013	-14.29%	-51.32%	+8.57%
	% Asian/Pacific Islander		
1990	10.8%	5.3%	17.8%
2000	12.3%	7.9%	15.2%
2013	14.2%	6.4%	16.1%
Change 2000-2013	+15.45%	-18.99%	+5.92%
	% Hispanic		
1990	37.8%	47.7%	43.3%
2000	44.6%	36.9%	41.5%
2013	47.9%	34.6%	37.2%
Change 2000-2013	+7.40%	-6.23%	-10.36%
	% Native American/Other		
1990	21.2%	18.3%	17.8%
2000	24.3%	22.2%	22.3%
2013	20.3%	24.7%	21.2%
Change 2000-2013	-16.46%	+11.26%	-4.93%
	% Two or More Races		
1990	-	-	-
2000	4.9%	6%	10%
2013	3.7%	3.4%	3.3%
Change 2000-2013	-24.49%	-43.33%	-67.00%

Source: Tabulated by authors from 1990 and 2000 decennial census, and 2009-2013 5-year ACS. Station area characteristics are block group data, area weighted for ½-mile radius from the station. Hispanics may be of any race.

Table D.2: Change in Selected Business Characteristics from 2000-2013 – Los Angeles

	L.A. County	City of L.A.	Hollywood/Vine Study Area	Vermont/Sunset Study Area
		Establishments		
1990-1992	365,976	85,460	1,534	757
2000-2002	460,706	116,166	1,732	943
2011-2013	813,047	191,140	2,461	1,464
Change 2000-2013	76.48%	64.54%	42.08%	55.28%
		Establishment density per sq. mi.		
1990-1992	90.2	182.3	1953.1	963.4
2000-2002	113.5	247.9	2205.7	1200.7
2011-2013	200.4	407.8	3133.9	1864.4
Change 2000-2013	76.48%	64.54%	42.08%	55.28%
		Employees per establishment		
1990-1992	11.5	14.3	12.8	18.6
2000-2002	10.0	10.7	10.2	17.9
2011-2013	6.0	6.6	7.1	11.6
Change 2000-2013	-39.90%	-38.14%	-30.03%	-35.11%

Appendix E:

Case Study Interview Tool

Instructions

1. Wear university gear
2. Introduce yourself
    a. If manager/owner does not agree to interview, move on to next business
    b. If manager/owner agrees to interview:
        i. Read informed consent
        ii. Provide copy of informed consent
        iii. Administer interview
3. Give thanks to interviewee
4. Record interview information AFTER conducting interview (below)

To be completed after interview

Interviewer Name:
Date of Interview:_____
Time Interview Began: ___:____AM / PM (circle one)

Type of Business: □ Standalone □ Strip mall
Ethnic (non-anglo) (describe):_____
'Trendy' (describe):_____
Adjacent to: □ Vacant □ For Rent □ For Sale □ □ Eviction
Comments here:

Guide for interview to be administered to business establishment manager or owner. Interview is not to be recorded.

1. How long has your business been at this location?
2. Have you noticed changes in the types of businesses that are located in your neighborhood in recent years? Please describe them.
3. Have you noticed changes in the kind of customer who shops here in recent years? If so, have you changed the types of products/services that you offer?
4. In recent years, have you noticed changes in the number of pedestrians/bicyclists in the area?
5. Have you noticed changes in the transport mode by which customers access your business?
6. Do you know your rent per sq. ft.? How many years is your lease? Has your rent changed in recent years?
7. Have you ever considered relocating and if so, why?
8. Do we know of neighborhood businesses that have closed down or relocated? Why did they?
9. Have you noticed changes in the amount of vehicle traffic or parking congestion in recent years?
10. What do you think might be causing these changes? Do you have any thoughts as to what the contributing factors are?
11. Have you witnessed or heard of any crashes near your business that involved pedestrians or people on bikes? What happened?
12. Are there any changes in the neighborhood that you think have changed safety for people on bikes or walking?

Appendix F

Case Study Observation Tool

Observation checklist to be completed for the following intersections:

_____ _____ _____
Intersection #1 Intersection #2 Intersection #3

Observer Name:
Date of Observation:_____ Day of Week of Observation: _____
Time of Observation: ___:____AM / PM (circle one)
Comments here:

Business establishment counts to be completed for commercial corridors in the following census tracts: _____ _____
Tract #1 Tract #2

Establishment Type	Count in Tract 1	Count in Tract 2
Standalone establishments		
Strip mall establishments		
Ethnic businesses (non-anglo)		
Chain stores		
Vacant		
For sale		
For rent		
Eviction notice		
Trendy stores (boutique, out of place, high end, etc.)		

Observer Name:
Date of Observation:_____
Comments here: