The Evolution of the Los Angeles Metro Rail Station Neighborhoods: Moves, Rents, and Permits

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16. Abstract

The Los Angeles rail transit system is the largest infrastructure investment in the City and County in decades. Transportation investments influence not only the way persons travel, but also the character of neighborhoods and the pattern of building, land use, and land prices. For that reason, rail transit generally and rail transit in Los Angeles have been increasingly caught up in the debate about displacement and gentrification. Do these investments increase housing prices in neighborhoods, forcing out the long-time residents who might most benefit from the new transportation options? This report is the result of a four-year research program that brings new data to bear on this question. It utilizes new data along with existing data sources to establish a fact base that can inform transit, housing, and land use planning in Los Angeles.

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About the Pacific Southwest Region University Transportation Center

The Pacific Southwest Region University Transportation Center (UTC) is the Region 9 University Transportation Center funded under the US Department of Transportation's University Transportation Centers Program. Established in 2016, the Pacific Southwest Region UTC (PSR) is led by the University of Southern California and includes seven partners: Long Beach State University; University of California, Davis; University of California, Irvine; University of California, Los Angeles; University of Hawaii; Northern Arizona University; Pima Community College.

The Pacific Southwest Region UTC conducts an integrated, multidisciplinary program of research, education and technology transfer aimed at *improving the mobility of people and goods throughout the region.* Our program is organized around four themes: 1) technology to address transportation problems and improve mobility; 2) improving mobility for vulnerable populations; 3) Improving resilience and protecting the environment; and 4) managing mobility in high growth areas.

U.S. Department of Transportation (USDOT) Disclaimer

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Disclosure

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The Evolution of the Los Angeles Metro Rail Station Neighborhoods: Moves, Rents, and Permits

Chapter 1: Introduction

The Los Angeles rail transit system is the largest infrastructure investment in the City and County in decades. Transportation investments influence not only the way persons travel, but also the character of neighborhoods and the pattern of building, land use, and land prices. For that reason, rail transit generally and rail transit in Los Angeles have been increasingly caught up in the debate about displacement and gentrification. Do these investments increase housing prices in neighborhoods, forcing out the long-time residents who might most benefit from the new transportation options? This report is the result of a four-year research program that brings new data to bear on this question. It utilizes new data along with existing data sources to establish a fact base that can inform transit, housing, and land use planning in Los Angeles.

In its scope, this report poses and answers several questions:

(1) Do persons move out of rail transit neighborhoods more frequently after rail stations open? [see Chapter 3]
(2) When persons move away from rail, where do they move to and do they preserve or lose their rail transit access? [see Chapter 4]
(3) How does the rail system influence driving and transit ridership among households who live nearby? [see Chapter 5]
(4) What is the pattern of residential rents in Los Angeles rail neighborhoods, and have rents increased more quickly in rail neighborhoods than in comparable non-rail neighborhoods over time? [see Chapter 6]
(5) Do neighborhoods covered by the City of Los Angeles' Rent Stabilization Ordinance show a different pattern of resident moves or of long term rent increases than comparable non-RSO neighborhoods? [see Chapter 7]
(6) Where are new residential units being built in Los Angeles, and is the rail system being leveraged as a location for transit-supportive housing? [see Chapter 8]

The questions fall into two classes. First, what happens in the neighborhoods where Los Angeles Metro rail transit stations open? Transportation, and rail transit in particular, shapes neighborhoods. Second, what are the transportation impacts of Los Angeles' investment in rail transit?

Those questions are purposefully reversed from the usual order. Transportation professionals are adept at measuring transportation impacts – sensibly so – and their inquiries typically start there. Many times, the transportation community does not move on to ask questions about neighborhoods. Yet major transportation investments directly shape neighborhoods, highlighting the importance of first planning for those neighborhood impacts, and then linking to transportation impacts. After examining several questions in isolation, this report concludes with a discussion of housing and transportation policy in Los Angeles, and how those two must be better integrated.

The report proceeds in the following chapters. Chapter 2 describes the background and motivation for the analyses. A key part of this research is the use of comparison control neighborhoods to illuminate what patterns in rail transit neighborhoods might have been had the rail system not been built. This report examines half-mile neighborhoods around each of 93 Los Angeles Metro rail stations. It also examines, for each station, a similar half-mile neighborhood that does not have a rail transit station. The goal, whenever possible, is to compare rail neighborhoods to non-rail neighborhoods. This is not perfect, in part because choosing "control group" neighborhoods that are identical to rail transit station neighborhoods is impossible, and in part because the data needed for this comparison are not always available. But, whenever possible, this research aims to juxtapose what has happened in LA Metro rail neighborhoods to a reasonable comparison group. Chapter 2 also highlights the data sources used, which are described in more detail in the succeeding chapters.

In Chapter 3, a unique data source is used to examine household move patterns from 1993 through 2015. Working with the California Franchise Tax Board (FTB), we gained access to anonymized data from California household income tax records, which allowed for the tracking of household residential location by income over time. These data were matched to rail transit and control area neighborhoods to statistically examine how move-rates varied over time, across rail and non-rail neighborhoods, and by household income. Countywide, 17% of households moved per year; by income, 18% of households earning less than 80% of AMI moved per year, compared to 16% of those earning 80-150% of AMI and 14% of those earning above 150% AMI. Baseline mobility rates in rail and control neighborhoods are higher than county averages for all income groups, especially in neighborhoods along the Red/Purple, Blue, and Expo lines.

It is striking that households throughout Los Angeles move surprisingly this often. To restate, from 2014 to 2015, 17 percent of all households in Los Angeles County moved, and when looking within a half-mile of a rail transit station, 24 percent of all households moved their residence between 2014 and 2015. Some of those moves are certainly by choice, but given how high the overall move rates are, it is likely that many moves are involuntary and reflect housing insecurity. Neighborhoods where approximately one in five persons are moving each year are not places where housing is secure.

How much of these moves can be attributed to the rail system? If households move out of rail station neighborhoods more frequently than from matched control neighborhoods after the station opens, that could indicate that the rail transit system is associated with household displacement – especially when observed for lower income households. Very low income populations (annual household income below 30% AMI) make up 30-40% of both the neighborhoods surrounding rail stations and those in control areas. Rail transit stations are, in some cases, associated with increased "move out" rates. After stations open, in some cases, households move out of the neighborhood more frequently compared to the control neighborhoods. This is particularly so along some of the older parts of the Los Angeles Metro rail system, including the Red/Purple Line.

While the rail transit system may have contributed to increased move rates in some cases, the evidence indicates that the impact of the rail system is small compared to the baseline move rates. The evidence does not support conflating the LA Metro rail system with the housing crisis in Los Angeles. Yes, some neighborhoods along rail lines may be experiencing increased move rates, but had Los Angeles never built a rail system it would still have a large housing security problem. The housing crisis in the City is large and growing, and it cannot be tied solely or even in largest part to the rail transit system.

The analysis of household moves continues in Chapter 4, examining where households move to when they leave Los Angeles rail station neighborhoods. The unique FTB data allow some of the first-ever insights into this question. In 2015, 26 percent of all households who moved away from half-mile rail neighborhoods moved to other rail transit neighborhoods. Conversely, 74 percent of households leaving rail station area residences moved to places without a rail station within a half-mile. Most households move short distances – the typical move distance among households leaving rail station neighborhoods is three and a half-miles, although 28 percent of moving households relocate farther than 10 miles away when leaving a station area. This highlights the fact that many households lose rail transit access when moving away from station areas. As a consequence, the existence of a robust set of transportation options, including bus transit, is essential if these households are to have anything close to a comparable quality of life. While the LA Metro rail system has grown and provides access to many, the city cannot lose sight of the need to provide rapid, convenient, and high frequency transit access in locations throughout the LA Metro service area.

One reason for this is illuminated in Chapter 5. Data indicate that households who live within a half-mile of an LA Metro rail station drive less and take transit more. The differences are large. Comparing households within a half-mile of stations to households elsewhere in the greater Los Angeles metropolitan area, the analysis shows that households living within a half-mile of a station drive forty percent less, and take seven times the number of rail trips and three times the number of bus trips. The transit ridership boost from rail access is largest for low-income households. The rail access boost for households with incomes below $25,000 is 2-2.5 larger for rail trips and 4-5 larger for bus trips than for households earning above $75,000. Bus system planning becomes even more important given the finding that 3/4 of movers from rail station neighborhoods move to places without rail stations nearby.

Chapter 6 looks at rents in Los Angeles rail transit neighborhoods, to put the mobility results above in the context of the rental housing market. How have rents grown over the past two decades? Have rent patterns differed between rail and non-rail neighborhoods? This analysis relies upon a rent dataset constructed by the California Community Foundation, which obtained and analyzed rent data from CoStar Group, Inc., a provider of real estate data for brokers, investors, property managers, and other real estate professionals, collects quarterly data on rents by unit in a large sample of buildings in Los Angeles County.

The data indicate that in LA Metro half-mile rail neighborhoods, rents increased at a 3.7 percent per year rate from 2000 to 2008, dropping to a 2.2 percent per year increase during the Recession years from 2008 to 2013, and then rising to 3.8 percent per year from 2013 through 2018. That increase in rents in rail neighborhoods was faster than in control (non-rail) neighborhoods, but not dramatically so. From 2013 to 2018, asking rents in rail and non-rail neighborhoods with available data increased at the same rate – 3.8 percent per year. Yet in some locations, particularly along the Red/Purple Line, rail station neighborhoods have experienced faster growth in residential rents. The data indicate that rents near Red/Purple Line stations have been rising faster than residential rents in matched control neighborhoods since 2008. That is consistent with the evidence from Chapter 3 that households have moved out of Red/Purple Line areas at higher rates, relative to control households, since the lines opened. The Red/Purple Line – one of the oldest and the highest capacity rail transit lines in Los Angeles – may be a location where rental price pressures are increasing in ways that could be linked to residential displacement.

Chapter 7 examines, admittedly in a preliminary way, how rent control is related to asking rents. Per square foot asking rents from the CoStar dataset employed in Chapter 6 are observed between 2000 and 2019 in two case study areas of Los Angeles County. Both of these areas are located partially within and partially outside the City of Los Angeles' boundary. Within each of these areas, per square foot asking rents are compared across three types of units from 2000 to 2019, based on their eligibility for rent stabilization according to the City of Los Angeles' Rent Stabilization Ordinance (RSO). These three types are RSO units (units in multifamily buildings, within the City boundary, built prior to 1978); non-RSO units (units in multifamily buildings, within the City boundary, built in 1978 and after); and RSO-eligible units (units in multifamily buildings, outside the City boundary, that would be RSO units if within the City because they were built prior to 1978). In the first case study area near Los Angeles' border with Culver City, RSO units have lower rent per square foot levels than non-RSO units and RSO-eligible units. The gap in rents in this area between RSO-eligible and RSO units is $0.70 per square foot for a one-bedroom unit and $2.00 per square foot for a studio. In contrast, in the second case study area near in Los Angeles' Boyle Heights neighborhood and surrounding portions of unincorporated Los Angeles County (East Los Angeles and City Terrace), RSO units have the same rents as non-RSO and RSO-eligible units. Rent gaps between RSO and non-RSO units are small and shrinking to near zero. These two case studies highlight the spectrum of the effect of Los Angeles' RSO on rents: local market conditions may be responsible for the divergence in findings between the two cases.

Chapter 8 examines where new residential units are being built in Los Angeles. From 2013 through early 2019, the City and unincorporated parts of the County of Los Angeles, together, permitted a net of 60,179 new residential units. The net measure subtracts units that were demolished or removed from the housing stock from new construction permits issued. The half-mile areas around LA Metro rail stations account for 24,176 of those units – 40 percent of the total unit change observed in the City and unincorporated County. Of those 24,176 rail units, 17,301 were within a half-mile of one of eleven rail stations which cluster in downtown, Koreatown, and Hollywood. Overall, those three locations with eleven stations are the site of almost thirty percent of all the new residential building in Los Angeles. This focus on building near rail transit stations in the inner core of the region is in part good news, by focusing new residences near dense, climate friendly, transit accessible locations. But that extreme concentration – 70 percent of all near rail residential units since 2013 have been permitted near eleven Los Angeles rail stations – is a missed opportunity. Los Angeles is not doing nearly enough to leverage the rest of the rail system as sites for new housing. This suggests a stronger focus on measures that will allow and incentivize residential building near other stations.

We conclude in Chapter 9 with some thoughts and policy directions. There is no single solution. Localities in Los Angeles County have underbuilt housing, relative to demand, for decades. Increasing supply will require changes to zoning codes and streamlined approvals in addition to incentives that can increase the supply of affordable housing near transit. The early results from the City's Transit-Oriented Communities program are encouraging: over 17,500 units proposed since its enactment in 2017, with 20% of them affordable. Supply expansion should be coupled with a focus on increased support for affordable housing – either by incentivizing or subsidizing those units or providing assistance to low-income households. Such supply and affordability efforts should also be tailored in ways that focus on reducing the already high move-rates in rail transit neighborhoods, allowing residents to stay in place longer and more commonly, and providing more options for low-income households to find secure housing in these neighborhoods.

Overall, the results paint a picture of a housing crisis in the City and the County. A fifth of County residents moved from 2014 to 2015, suggesting in large part a pattern of housing insecurity. Rents have risen near rail and non-rail control neighborhoods at an annual rate of 3.8 percent per year since 2013 – faster than the rate of inflation and faster than wage growth for many occupations. New residential units, as indicated by net changes in building permits, are not even keeping pace with population growth. Rail transit neighborhoods are wonderful opportunities to encourage environmentally friendly travel, but with the exception of eleven stations in downtown, Koreatown, and Hollywood, residential permitting has lagged along the LA Metro rail system.

At the same time, results demonstrate that the rail system did not cause this current housing crisis. Move rates were high before the LA Metro rail system expanded to its current size and remain high, both in neighborhoods near and far from rail stations. New residential unit production has been low, and below estimated demand, across Los Angeles County for decades, well in advance of the introduction of much of the rail system. Apart from a few neighborhoods, building activity has remained low after rail too. Rents have been rising steadily at rates above inflation since 2000, with the exception of the Recession, both near and not near rail stations. Altogether, the evidence suggests that a housing crisis exists in Los Angeles, but not due to the LA Metro system expansion.

That said, the rail system has perhaps heightened the situation in a few neighborhoods. Namely, rent appreciation over time has been quite high along the Red/Purple and Gold Pasadena lines: increasing respectively by 3.0% and 3.3% per year. For neighborhoods with available data, this translates into a median rent increase between 2000 and 2018 of 71% in Red/Purple line neighborhoods and 81% in Gold Pasadena line neighborhoods. Plus, out-move rates have increased across the income distribution along the Red/Purple line after rail stations opened. This may suggest some displacement pressure in these specific neighborhoods.

The discussion of housing and transit focus more clearly on the underlying facts illuminated in this report. While the rail transit system may be associated with increased move-out rates in some neighborhoods, the large levels of housing insecurity in the City and County cannot be attributed in largest part to the rail system. The rail transit system is more a missed opportunity than a source of residential displacement. The Los Angeles region has underbuilt housing for decades, relative to population growth, and that pattern persists even near the bulk of the LA Metro system.

Housing affordability continues to be the major issue throughout the region, as rental prices appreciate at a rapid pace. Housing policy must take a broad, Citywide and Countywide lens, while better leveraging the opportunities near rail stations. Transportation policy must look more broadly than the rail system. Rail station neighborhoods need affordable housing opportunities, and the failure to fully leverage the rail system is a missed opportunity to provide low-driving, transit-oriented residences. Moreover, transportation policy must consider more than just the rail system and the neighborhoods that surround them. Over half of all households that move away from rail move to locations without a rail station within a half-mile. The bus system is an obvious transit solution for those households, and efforts to improve bus service – including dedicated bus lanes and bus rapid transit – must be part of any policy discussion on this issue. Ultimately, policymakers must jointly consider housing and transportation policies to address the housing crisis while providing high-quality sustainable transportation options for Los Angeles residents both near and far from current LA Metro stations.

Chapter 2: Background

Motivation and History of the Project

This report represents the culmination of a four-year research program focused on the effects of the Los Angeles Metro rail system expansion on its surrounding neighborhoods within the City and County of Los Angeles. This research has sought to answer the following general question: Do rail transit investments increase housing prices in neighborhoods, forcing out the long-time residents who might most benefit from the new transportation options? In other words, has the expansion of the LA Metro rail system led to the displacement of low-income residents in neighborhoods near rail stations?

The California Community Foundation (CCF) has been a core supporter of this research and has convened a community advisory board to oversee its progress. The advisory board consists of key community stakeholders in diverse neighborhoods throughout the County. This report builds on several prior reports produced for CCF as part of this program: an analysis of residential moves near Red and Purple Line stations in June 2017, an analysis of the effects of rail stations on neighborhood displacement in Los Angeles County in June 2018, an analysis of where households move from rail station openings in Los Angeles County also in June 2018, and an examination of housing affordability and transit-oriented development in Los Angeles in June 2015.[1] Additionally, part of this research program was also supported by funding from the U.S. and California Departments of Transportation through the National Center for Sustainable Transportation (NCST) at the University of California-Davis and the METRANS Transportation Center at the University of Southern California and California State University, Long Beach. This report also builds on an NCST report from November 2017 on the spatial patterns of residential moves near rail transit.[2]

This report highlights key trends from these prior studies and introduces new data and analyses of rents and building permits. The rest of this chapter describes the study area, methodological framework, income groupings, and data sources used throughout this report.

Study Area

The Los Angeles metropolitan area presents an ideal study area for the potential effect of rail transit expansion on residential displacement. Prior to 1990, Los Angeles had not had any intra-urban rail transit service for decades. Since then, 93 new rail-transit stations (see Appendix Figure 1 for map) have been opened by the Los Angeles County Metropolitan Transportation Authority (LA Metro) and an additional 13 are currently under construction.[3] This buildout amounts to about half of the U.S. spending on new rail transit during this time period.[4] Within LA Metro, 21 percent of its budget between 2005-2040 will go toward rail transit capital and operations expenditures.[5] Regional and local land use

[1] These reports can be requested from the California Community Foundation. Full citations are in the references section in the appendix.

[2] This report can be accessed online at https://ncst.ucdavis.edu/wp-content/uploads/2015/10/NCST_Boarnet_Sustainability-and-Displacement_Final-Report_November-2017.pdf. . Full citation is in the references section in the appendix.

[3] Crenshaw/LAX line (7 new stations), Regional Connector (3 new stations), and the first phase of the Purple Line Extension (3 stations)

[4] L.A. Metro (2009), p.23

[5] L.A. Metro (2009), p.23

plans anticipate that over half of all new housing and employment over the next two to three decades will be within a half-mile of a well-serviced transit corridor, which includes the County's vast bus network in addition to the rail stations.[6]

Los Angeles' new transit stops and transit-oriented land use plans have emerged at the same time as the city and county are experiencing a worsening housing affordability crisis. Home prices and incomes diverge widely: a median income household in 2012 Los Angeles could have afforded a $190,000 home yet home prices averaged $400,000.[7] Renters have not been spared: real rents have increased by more than 20% in real terms between 1990 and 2010, despite slightly decreasing real incomes.[8]

Housing undersupply relatively to demand has been identified as one of the key components of California's affordability crisis.[9] Los Angeles County in particular has only build 20,000 housing units annually from 1980 to 2010, relative to the estimated 55,000 needed to keep up with population growth, in-migration, and household formation.[10] Los Angeles City, making up over 40% of the County, Los Angeles permitted an average of 7,500 housing units annually from 2000-2014, much lower that housing demand.[11] Politicians have reacted and these facts have spurred a mayoral pledge to add 12,500 housing units annually from 2014-2021 in the City of Los Angeles.[12] Since 2014, the City has permitted slightly more than 100,000 units or about 16,500 per year, exceeding the mayoral pledge.[13] However, few of those units were deeded affordable units: in this regard, Los Angeles still struggles relative to goals and RHNA needs.[14] Chapter 8 of this report examines how many new units were produced from 2013 through the first quarter of 2019 and where those units were located.

This report focuses on neighborhood-level trends around LA Metro rail stations. For the purposes of this report, a neighborhood is defined as the persons and structures existing within a one half-mile radius of the location of an LA Metro rail station. A half-mile represents a walking distance of 15-20 minutes and an approximate catchment area for neighborhood-generated light rail ridership and is a size frequently used in considerations of transit planning.[15] Trends are reported at the neighborhood level (essentially at the station level), line level, or whole system level, depending on the purpose of the analysis.

The map in Appendix Figure 1 shows six rail lines: Blue, Expo, Gold, Green, Purple, and Red. This report generally combines Purple and Red into Red/Purple, since these lines mostly run along the same tracks. For certain analyses, the report separates out certain lines into branches, when they opened at significantly different times. This includes separating the Expo line into two parts (Expo 1 from 7th and Metro Center to Culver City opened in 2012 and Expo 2 from Culver City to Downtown Santa Monica opened in 2016) and the Gold line into three parts (Gold Pasadena from Union Station to Sierra Madre Villa opened in 2003, Gold East Los Angeles from Union Station to Atlantic opened in 2009, and Gold

[6] L.A. Metro (2009), SCAG (2012) p.131
[7] LADCP (2013)
[8] Collinson (2011)
[9] Taylor (2015), McKinsey Global Institute (2016)
[10] Taylor (2015)
[11] U.S. HUD (2015).
[12] Logan (2014)
[13] Los Angeles Office of the Mayor (n.d.)
[14] HCD (2018)
[15] Guerra, Cervero, & Tischler (2011)

Foothills from Sierra Madre Villa to APU/Citrus College opened in 2016). This report focuses on opened rail stations providing light-rail and subway service and therefore does not examine rail lines that are in construction but not open as of June 2019 or other transit modes including bus-rapid transit, commuter rail, or bus.

In general, LA Metro rail lines serve neighborhoods with relatively high proportions of low-income households and recent immigrants.[16] As shown in Chapter 5 below, these households tend to be more likely to use transit and drive less, especially when living within 0.5 miles of rail stations. Many LA Metro rail neighborhoods have high population density, well above the average for Los Angeles County, especially along the Red and Purple line and parts of the Blue and Gold lines.[17]

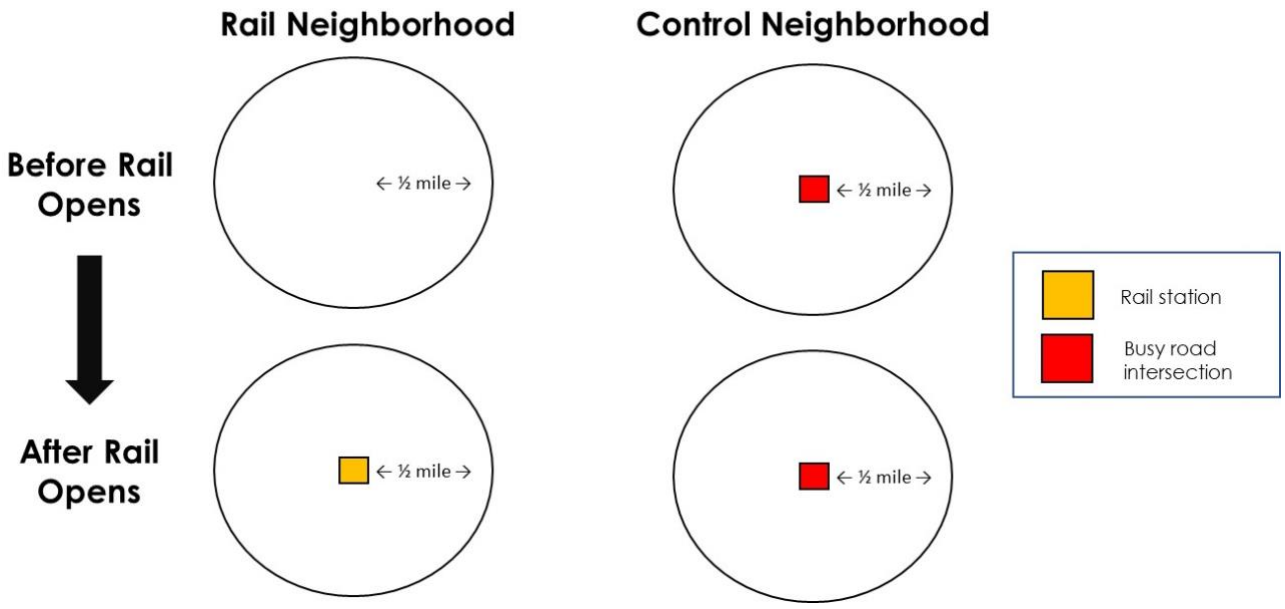
Quasi-experimental Framework and Control Area Selection

The research here aims to assess the relationship between the presence and appearance of rail transit and neighborhood-level residential mobility, asking rents, and residential building activity. One could compare such variables before and after a rail station opens. However, what if a new rail transit corridor or station affects other, more distant parts of the city in the same way? Or, what if mobility rates, rents, or development activity for neighborhoods fluctuate generally, in ways unrelated to the absence or presence of rail transit?

The best way to deal with such potential issues is to run an experiment that randomly places rail stations in some neighborhoods, but not others, and then measure the desired characteristics. Of course, that is impossible, but we can mimic such a research design by carefully choosing comparison (i.e. control) neighborhoods. That approach, called a quasi-experimental framework, compares actual rail station locations with locations that could have received rail stations, but did not, due to political or engineering concerns. If these "control" locations are similar enough to rail station locations, they serve as a counterfactual for the analysis. Researchers can then compare rail station neighborhoods to control neighborhoods before and after rail stations open, as illustrated in Figure 2a. This framework, adopting in this study, has previously been used to study a variety of phenomena including rail station development.[18]

[16] Boarnet et al. (2015)
[17] Boarnet et al. (2015)
[18] For example, Schuetz, J., Giuliano, G., & Shin, E. J. (2018)

Figure 2a. The Quasi-Experimental Framework

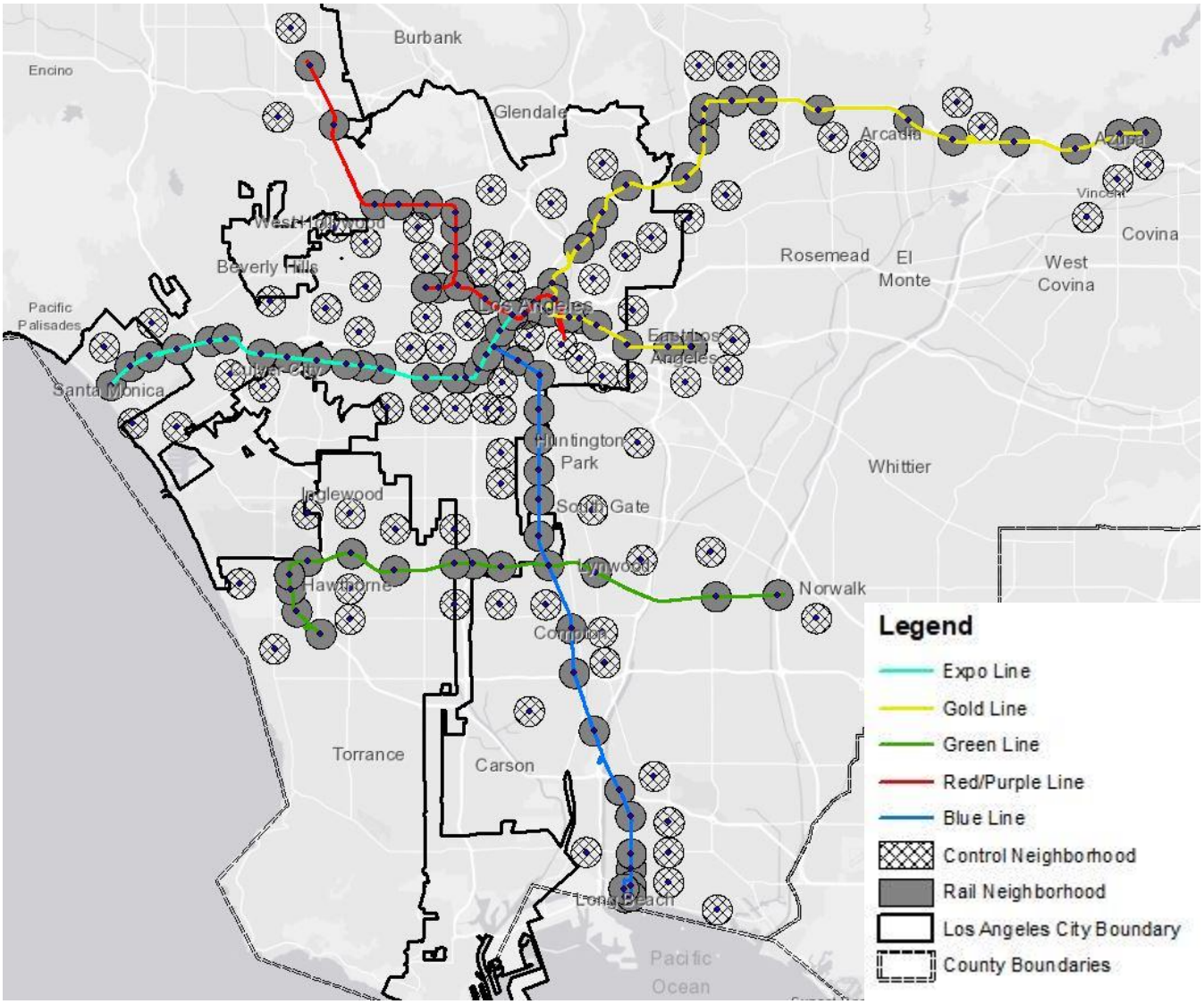


The quasi-experimental used here is implemented by picking a control neighborhood for each of the 93 stations in the LA Metro system, hence 93 matched pairs of station and control neighborhoods. A control neighborhood is defined as a circular neighborhood with a one half-mile radius centered on a major road intersection that is situated 0.5 to 3 miles away from the station area's rail station location (Figure 2a), following previous work on the LA Metro system by Schuetz, Giuliano, and Shin.[19] This distance ensures that the control neighborhood does not spill over into the rail neighborhood, but that the rail development could feasibly affect trends within it. The chosen control neighborhood also has similar sociodemographic characteristics to its paired station area, across income, racial and ethnic identification, housing tenure, and educational status. Figure 2b displays the locations of the rail and control neighborhoods overlaid on the LA Metro system map. For specific control area locations by station, see Appendix Table 2.

Control neighborhoods are quite similar to rail neighborhoods. Table 2c shows a selection of socioeconomic measures by line comparing rail and control neighborhoods within ½ miles of stations or intersections, using California Franchise Tax Board (FTB) data. The selected control neighborhoods have nearly identical proportions of older and younger households, similar shares of low-income households, and relatively close shares of married households and those with dependents. These descriptive comparisons provide confidence in the control selection scheme.

[19] Schuetz, J., Giuliano, G., & Shin, E. J. (2018)

Figure 2b. Map of Rail and Control Neighborhoods along the LA Metro rail system



Source: created by authors using ArcGIS 10.6, with shapefile layers from LA Metro, CalTrans, Esri, HERE, Garmin, OpenStreetMap contributors, and the GIS user community

Most of the remaining chapters in this report use some type of control as a counterfactual for the analysis. Chapter 3 and 4 use the full set of 93 matched rail and control pairs described here to assess the effect of rail station opening on out-move rates and on move destinations. Chapter 6 also uses the rail and control neighborhoods described here to compare rent patterns over time for neighborhoods with enough available data. Chapter 5 uses the same rail neighborhoods in a systemwide analysis of travel behavior and transit usage, but the control group is all households outside of rail neighborhoods. Chapter 7 compares rents using yet another set of controls. It compares rents for units subject Los Angeles City's rail stabilization ordinance (RSO) to those not subject to this ordinance – either those too new to be covered by RSO or those located outside the city boundary.

Table 2c. Comparison of Rail and Control Neighborhoods by Line

Variables	Average number of resident households per year	Share Age > 55	Share Age < 26	Share with >0 dependents	Share Married	Share AMI <30%
Red/Purple Line	80,000	18%	9%	41%	26%	38%
Red/Purple Controls	70,000	20%	9%	41%	28%	33%
Gold Line	65,000	21%	12%	48%	31%	32%
Gold Controls	50,000	16%	14%	52%	34%	32%
Green Line	15,000	17%	19%	62%	33%	34%
Green Controls	50,000	18%	16%	51%	32%	27%
Blue Line	40,000	15%	19%	54%	27%	38%
Blue Controls	55,000	19%	17%	57%	32%	33%
Expo 1 Line	15,000	22%	18%	43%	27%	35%
Expo 1 Controls	30,000	20%	16%	54%	27%	37%

Source: Author calculations of California Franchise Tax Board (FTB) data

Income Groups

The ways that the LA Metro rail system affects households in different income categories is of utmost interest for this research. This report categorizes household incomes relative to the area median income (AMI) for the Los Angeles – Long Beach Metropolitan Statistical Area. Table 2d shows the 2015 values. AMI is determined annually by the U.S. Department of Housing and Urban Development (HUD) (see Appendix Table 3 for AMI values by year). The five categories in Table 2d are used for the mobility and move destination analyses in Chapters 3 and 4, and households are categorized into one of these five categories based on FTB data on annual household income. In contrast, Chapter 5 uses income categories reported in the California Household Travel Survey (CHTS).

Table 2d. Area Median Income in 2015 for the Los Angeles – Long Beach Metropolitan Statistical Area

Year	Area Median Income (AMI)	30% of AMI	50% of AMI	80% of AMI	150% of AMI
2015	$63,500	$19,050	$31,750	$50,800	$95,250

Source: U.S. HUD

Data Sources

This report benefits from access to a variety of data sources, tailored to the specific analysis needs in each chapter. They are listed here and described in greater detail in each of the chapters below.

Chapters 3 and 4 makes use of anonymized California income tax filing records from the California Franchise Tax Board (FTB). This dataset contains over 110 million records for households who filed taxes in Los Angeles County in at least one year between 1993 to 2015. Tax filing location changes from year to year form the basis of the residential mobility and move destination analyses. Annual income reported in the filings enables comparisons across income groups.

Chapter 5 analyzes travel behavior and transit usage from the most recent California Household Travel Survey in 2010-2012. The data provide a daily account of the trips taken by a household including trip distance and transportation mode.

Chapters 6 and 7 examine rent patterns at the neighborhood and unit levels. The California Community Foundation collected and analyzed rent data from 2000 to 2019 from CoStar Group Inc. to form the rent dataset used in these two chapters. CoStar Group, Inc., a provider of real estate data for brokers, investors, property managers, and other real estate professionals, collects quarterly data on rents by unit in a large sample of buildings in Los Angeles County. The data can be analyzed by bedroom type, geographic location, and year built. Rent data include asking rent and asking rent per square foot.

Chapter 8 looks at residential development activity using building permits as a proxy. Publicly available building permit data from 2013 to 2019 is obtained for the City of Los Angeles and for the unincorporated portion of Los Angeles County from their respective open data platforms. The available data cover about half of the population of the County. The number of net new dwelling units is derived from the number of permits for new construction, addition, and renovation minus the number of permits for demolition, times the number of units covered under each permit.

Chapter 3: How Often do Households Move, and Do Households Move out of Rail Station Areas More Frequently?

Key Questions

- How many households move every year in Los Angeles County and near LA Metro rail stations?
- Do persons move out of rail transit neighborhoods more frequently after rail stations open?

Chapter Takeaways

- 17% of Los Angeles County households moved in 2014, a decrease from the 20% that moved in 1994.
- By income group, the highest baseline mobility rates in 2014 were for households with incomes between 30-50% of AMI (18.3%), then 50-80% of AMI (17.8%), less than 30% of AMI (17.0%), 80-150% of AMI (16.4%) and greater than 150% of AMI (14.4%).
- High baseline move rates suggest a high level of housing insecurity Countywide.
- There is no evidence of rail opening-related displacement, except along the Red/Purple Lines, where out-move rates increased by about 1.4 percentage points after stations opened.
- Five years after rail stations open, there is evidence of increased move rates for higher-income households, but not lower-income households, systemwide and along the Gold and Red/Purple Lines.

Data & Methods

Annual move rates are measured using a unique database of tax filers from the California Franchise Tax Board (FTB). FTB data from 1993 to 2015 are used to measure how many households move away from rail neighborhoods from year to year. The analysis is based on households that file taxes in consecutive years and move at least one half-mile. The data are aggregated for neighborhoods near LA Metro rail stations and for matched control neighborhoods. Statistical analyses are used to discern whether rail station openings have changed move rates by income by rail line relative to control, non-rail neighborhoods. Changes in move rates five years after station opening are measured in the same way as well. Impacts of these changes are compared to baseline move rates.

Household mobility is a central feature of U.S. urban life. Moving from one location to another is not inherently good or bad. For an individual household, the event of moving could improve its lifestyle in terms of housing, neighborhood, or employment; it could also lead to decreased health or educational outcomes.[20] Too frequent, unexpected, or involuntary moves have been found to be detrimental to the health and well-being of members of affected households, both immediately after such moves as well as later in the household members' lifetimes.[21] This is especially the case for low-income households and other at-risk populations.

Mobility rates can differ across households for many reasons. As shown in Figure 3a, household tenure may play a large role, with households who rent experiencing higher rates of mobility. Households who rent may be especially exposed to neighborhood change, such as gentrification. Just like households, neighborhoods differ in their mobility levels, due to differences in housing stock and tenure, as well as other sociodemographic characteristics of their residents (e.g., household income). Still, most neighborhoods tend to be stable over time in terms of their sociodemographic composition relative to other neighborhoods,[22] suggesting relatively constant rates of mobility – both mobility moving out ("out-mobility") and mobility moving in ("in-mobility") – for their various sociodemographic sub-populations.

When a neighborhood experiences a change in its desirability and, hence, changes in its housing and rent values, abandonment or gentrification of that neighborhood may occur. In either case, households may move away suddenly in large numbers, resulting in out-mobility rates for particular socio-demographic groups that are substantially higher than their corresponding baseline out-mobility rates – a phenomenon defined here as displacement. Out-mobility rates' exceeding their baseline levels, i.e., displacement, may result in negative impacts for certain sociodemographic groups. This should be especially true for low-income households, who are limited in where else they can move. This last point is a major motivator for this research.

Does the introduction of new rail transit alter a neighborhood to the point of displacement? Stated another way, do persons move out of rail transit neighborhoods more frequently after rail stations open?

Previous studies at the neighborhood level have found mixed results[23] or have significant data and analysis challenges[24], precluding a reliable understanding of rail's effect on out-mobility rates. This research addresses previous limitations by using a unique new data source – state income tax filing records from the California Franchise Tax Board (FTB) – to examine these questions in the LA Metro rail system context.

The FTB data provides tax filer records for Los Angeles County households with the ability to track households over a 23-year time period from 1993 to 2015, amounting to a database of over 100 million records. The data are organized by household and can be analyzed by income group.

[20] Morris, Manley, & Sabel, 2018
[21] Jelleyman & Spencer, 2008; Morris et al., 2018, Goldsmith, Britton, Reese, & Velez, 2017; Cox, Henwood, Rodnyansky, Wenzel, & Rice, 2017
[22] Malone & Redfearn, 2018
[23] Ong, Zuk, Pech, & Chapple, 2017
[24] As summarized in Rayle, 2015, Zuk et al., 2015 and Zuk et al., 2018

Fifty percent of the FTB data records have the residential location of the filer down to the 9-digit zip code – equivalent to one street block[25]; the other half have location narrowed down to the 5-digit or neighborhood level.[26] A household is counted as a 'mover' if it changes location from one year to the next, subject to two conditions: 1) the household files taxes and thus exists in the dataset in both consecutive years, and 2) the household moves a minimum of a half-mile. The first condition ensures that the analyses pick up actual moves and not data dropouts. Reasons for dropping out include incomes dropping below the filing income threshold, moving out of California and not filing any California taxes, and death. The second condition ensures that the analyses track actual moves and not small changes in zip code boundary changes. Together, these conditions exclude about 15% of records. Nevertheless, this analysis provides valuable information on move out rates for at least 85% of County households. Moreover, these 85% of records are representative of incomes across the County.

A key feature of this dataset is the ability to establish a mobility baseline to see what a "usual" move rate is for different neighborhoods and for the County as a whole. This is meaningful descriptive data on its own, and it allows a comparison of any additional moves generated by an event, such as the expansion of the LA Rail system. Previous studies have often not been able to make this comparison to baseline move rates because of a lack of data.

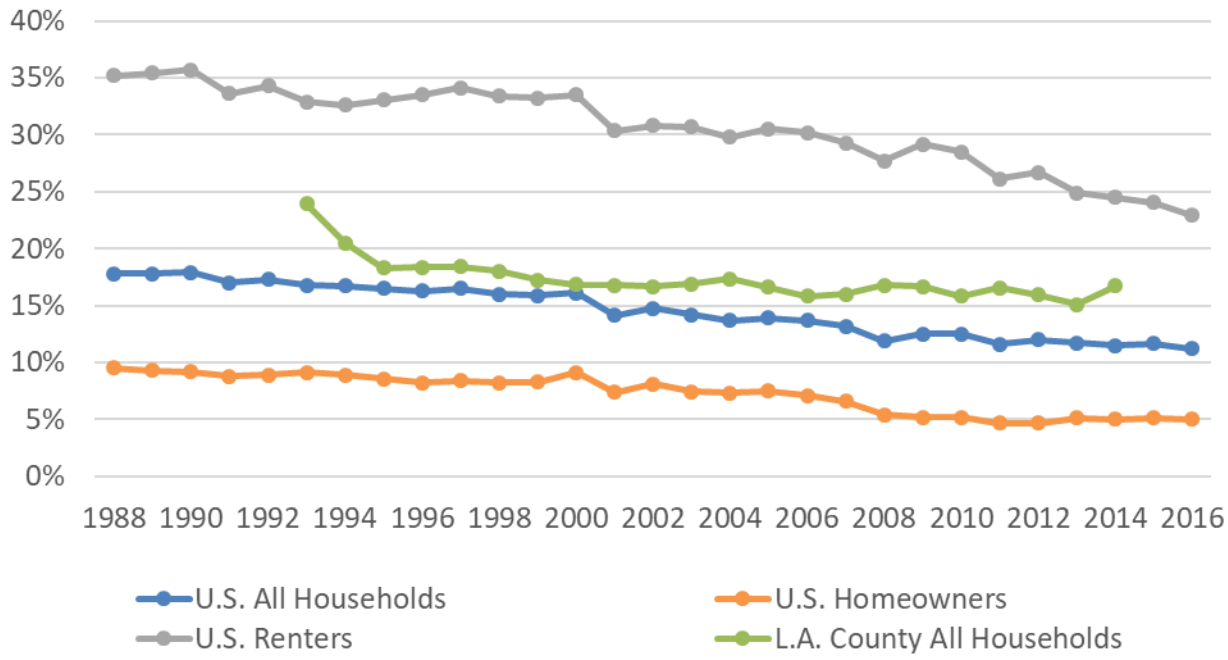
In this report, baseline mobility is defined as the number of filers moving at least a half-mile from one year to the next divided by the total number of filers in the data in both years. The green line in Figure 3a shows this baseline mobility rate using FTB data for Los Angeles County for the available years. The annual baseline mobility rate countywide started at above 20% per year in the mid-1990s and decreased slowly to about 17% in the early 2000s, where it remained in 2014, the last year for which data are available. This means that nearly one in six of all households in Los Angeles County moves in any given year in 2014, down from over one in five in 1994. These figures accord with previous survey-based data for Los Angeles County[27] and for low-income neighborhoods in the U.S.[28]

These Countywide figures are slightly above nationwide move rates reported by the U.S. Current Population Survey (CPS), as shown in the blue line in Figure 3a. The CPS asks an annual sample of 100,000 respondents about their move patterns in the past year, providing a reasonable comparison for the baseline findings from FTB data. The CPS move rate for U.S. renters (33% in 1993, 25% in 2014) is much higher than for homeowners (9% in 1993, 5% in 2014) (Figure 3a). The FTB data does not flag whether filers rent or own their homes. However, Los Angeles County has more renters (55%) than the U.S. average (35%), suggesting one reason why the County baseline move rate is above the national move rate.

[25] The FTB suppressed filers' addresses due to confidentiality reasons, though allowed access to zip code information for this research. Data were only made available for nine-digit zip codes when that 9-digit zip code contained more than 10 households. In all cases, household identities are anonymized.
[26] A negligible less than 0.1% of records have no location information at all. They are excluded from the analysis.
[27] Clark and Ledwith (2006) derived an 18% annual mobility rate for Los Angeles County households using a sample of 2,644 households in 65 neighborhoods observed from 2002-2006.
[28] Coulton, Theodos, and Turner (2012) also found a 19% annual mobility rate in their survey of 10 low-income and changing neighborhoods in metropolitan areas across the United States.

Figure 3a.

Title: Annual Mobility Rate by Housing Tenure for United States, and Aggregate Annual Mobility Rate for Los Angeles County Households



Source: Author calculations on FTB data, US Current Population Survey

How do baseline move rates near LA Metro rail stations compare to the County average? The number of filers in each LA Metro rail neighborhood is computed by counting each filer whose residential location is within a half-mile of a rail station location, based on the center of the 9-digit or 5-digit zip code assigned in the database. A similar aggregation process computes the number of filers in control neighborhoods, based on the location of the control intersection. The rail station and control neighborhood selection is described in Chapter 2.

An out-mover from a rail neighborhood is defined as a filing household who leaves that specific rail station neighborhood by moving at least a half-mile, and that files taxes in both years. A mover for a control neighborhood is calculated in the same way. The out-mobility rate for a neighborhood is the sum of movers in that neighborhood from one year to the next divided by the number of filers in that neighborhood in both years. Because specific stations may have particular idiosyncrasies that may raise or lower move rates in a particular year, this report generally displays results by rail line.

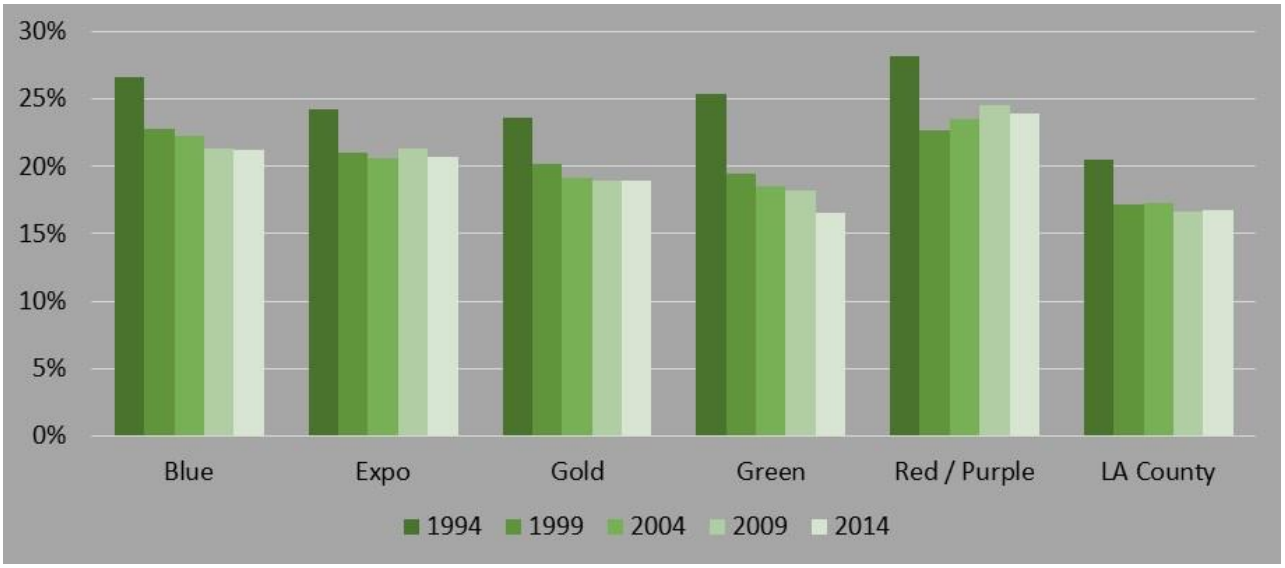
The year-to-year move rates for the LA Metro rail lines are largely consistent with Los Angeles County trends (Figure 3b). The baseline mobility rate for Los Angeles County in 1994 was 20% percent, and in 2014 was 17%. The neighborhoods within a half-mile of Red/Purple Line stations had higher out-move rates (27 percent in 1994, and 24 percent in 2014). Other lines had out-move rates between the County average and Red/Purple line.

Overall, two key results are evident from Figure 3b:

The baseline year-to-year move rates, in Los Angeles County and in rail transit neighborhoods, are high – above 20 percent per year in Red/Purple, Blue, and Expo Line neighborhoods. On average, one in five families in these neighborhoods leave the rail transit area each year – an effect which is not attributable to the rail system, but which is more properly viewed as a baseline effect – particularly so for the years before the lines opened. This suggests a potentially high level of housing insecurity in rail neighborhoods. It is possible also that the high churn may be attributed to rail station opening incorrectly, while in fact, the churn is due to baseline housing insecurity.

The Red/Purple Line – the region's only subway – is the only line where out-movement rates increased over time. This movement, counter to countywide patterns, suggests the possibility that the high capacity subway system may have been associated with development patterns that could have increased out-movement in those neighborhoods.

Figure 3b.
Title: Baseline Annual Out-Move Rate from Half-Mile Station Areas by Rail Line



Source: Author calculations on FTB data

The income information in the FTB dataset enables a comparison of baseline out-mobility from rail neighborhoods across income groups. Table 3c presents the 2014 baseline out-mobility rates by rail line and by income, based on the income categories described in Chapter 2.

In 2014, the baseline move rates for Los Angeles County are higher for lower-income households. In that year, 16-18% of households below 80% of AMI moved, compared to 14 percent of households at 150% of AMI or higher. Higher income households are also more likely to be homeowners, who have lower move rates nationwide (Figure 3a). The higher out-move rates for lower-income households may indicate a higher level of housing insecurity across the County, especially among lower-income renters.

When looking at rail-proximate neighborhoods, there are several patterns by income. First, baseline out-move rates are above average for lower-income households living near Blue, Green, and Expo Line stations. Second, this trend is reversed along the Gold and Red/Purple Lines where the higher income households have above average annual move rates. These diverging trends suggest that different income groups face differing move motivations or pressures in different regions of the city and county. Third, the differences in out-move rates between lowest and highest income groups is not very high in most cases (2-3 percentage points, and 5 percentage points for the Red/Purple). This trend underscores the high overall baseline move rate in rail station neighborhoods, regardless of income, potentially signifying a generally high level of housing insecurity.

The raw move rates shown here (Figure 3b, Table 3c) cannot indicate whether a rail station is associated with displacement. For that, statistical comparisons of move-out rates for rail neighborhoods and similar control neighborhoods. The results of that statistical research are shown below.

Table 3c.
Title: Baseline Out-Move Rate by Income in 2014 by LA Metro Rail Line

	Blue	Expo	Gold	Green	Red / Purple	Los Angeles County
All Incomes	21%	21%	19%	17%	24%	17%
<30% AMI	23%	22%	19%	19%	23%	17%
30-50% AMI	21%	22%	18%	17%	23%	18%
50-80% AMI	20%	21%	19%	14%	24%	18%
80-150% AMI	20%	20%	20%	13%	26%	16%
>150% AMI	21%	19%	21%	17%	28%	14%

Source: Author calculations on FTB data

Do rail station openings cause displacement, i.e., increase the out-move rate above baseline? The quasi-experimental approach described in Chapter 2 compares actual rail station locations with locations that could have received rail stations, but did not, due to political or engineering concerns. Thus, each rail station neighborhood is assigned a matched control neighborhood. The out-move rate is statistically compared over time before and after rail station openings, between rail and control neighborhoods, controlling for year-specific trends and neighborhood-specific trends.[29] A statistically significant finding

[29] The statistical regression equation is: $y_{jt} = a + b*rail_j*open_t + c*year_t + d*neighborhood_j + e_{jt,}$ where y is the out-move rate in year *t* in neighborhood *j*, *a* is the baseline mobility rate, *b* is the estimated impact of rail station opening on out-move rates, *rail* is a binary variable equal to 1 if neighborhood *j* is a rail station neighborhood and 0 if it is a control neighborhood, *open* is a binary variable equal to 1 if rail station *j* is open in year *t*, *year* is a set of binary variables which equal 1 when year = t and 0 otherwise, *neighborhood* is a set of binary variables which equal 1 when neighborhood = j and 0 otherwise, and *e* is an error term for the regression. In total, there are 22 year binary variables (23 years and one omitted for multicollinearity) and 185 neighborhood binary variables (93 stations and 93 control neighborhoods and one omitted for multicollinearity). Regressions are weighted by the

means that out-move rates increased or decreased after rail stations opened in rail station neighborhoods relative to the control group in ways that are unlikely to arise by chance. Statistically significant increased out-move rates may be indicative of displacement.

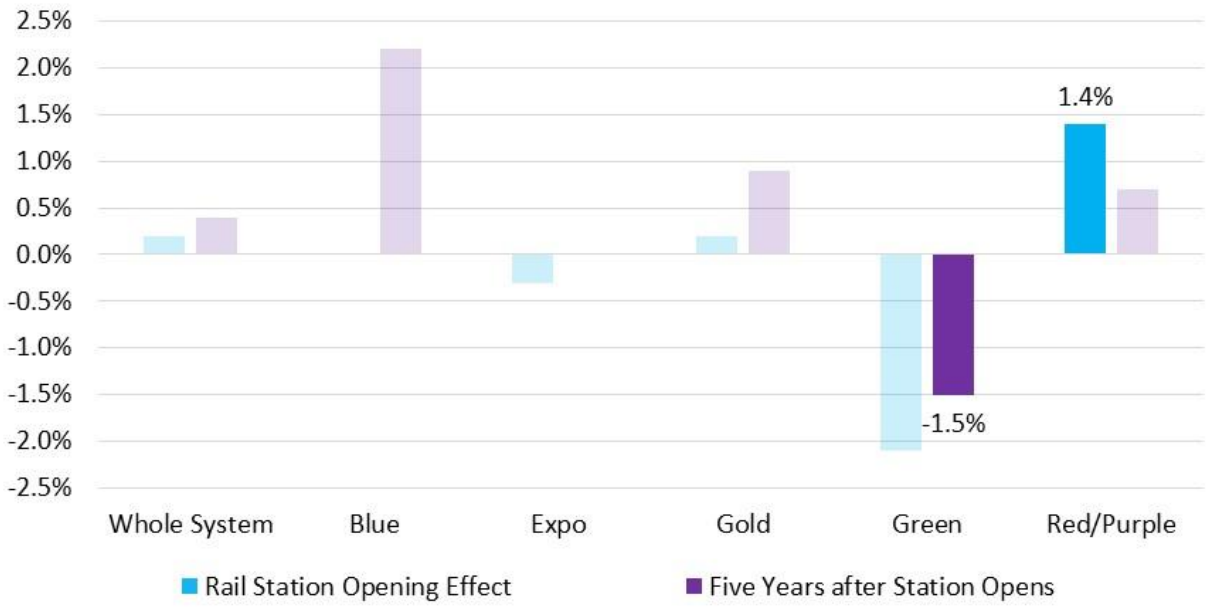
Were there meaningful changes in out-move rates for any rail lines? The estimated rail station effect on households of all incomes is statistically significant only for the Red/Purple line, where out-move rates increased by 1.4 percentage points after rail stations opened compared to control neighborhoods (Figure 3d). No other lines have estimates that differ statistically from zero.

Figure 3d also shows results from the same statistical model, looking at effects of rail stations five years after opening. Out-move rates decreased by 1.5 percentage points along the Green Line five years after rail stations opened compared to control neighborhoods (Figure 3d). No other lines have five-year-after-opening estimates that differ statistically from zero.

The results in Figure 3d herald little evidence of wholesale displacement across the whole income distribution, except for along the Red/Purple line, where out-mobility grew by 1.4 percentage points. Still, this increase is only about 1/20th of the baseline mobility rate along the Red/Purple Line in 2014. This means that the baseline move rate is about 20 times greater than the displacement effect. Nevertheless, cumulated over time, even a 1.1 percentage point increase in annual move rates may accelerate neighborhood turnover and lead to greater instability.

Figure 3d.

Title: Estimated Effect Size of Rail Stations on Out-Move Rates for All Incomes, by Rail Line and Timing, from 1993-2015. ***Data values displayed only for statistically significant results.***



Source: Author calculations on FTB data

baseline population in the neighborhood in each year to control for neighborhood size. Standard errors are clustered by station-control area pair.

Displacement is often a story about income levels, not only the total move rates shown in Figure 3d. Table 3e displays results of the statistical model on rail station opening by income. Results indicate that rail station opening affected out-move rates near Red/Purple Line stations across all but one income group, but there are not statistically significant station-opening effects for other rail lines. Note that the Blue Line is excluded from this analysis because its opening year precedes the beginning of the available FTB data.

The effect on out-move rates along the Red/Purple Lines was strongest for the highest income group, more than double that for all incomes or for the lowest income group (Table 3e). Still, the effect on nearly every income group is a likely indicator of rail-related displacement along the Red/Purple line. As above, note that the displacement effect shown here is about 1/10th to 1/20th of baseline move rates in Red/Purple Line neighborhoods.

Table 3e.
Title: Estimated Effect of Rail Station Opening on Out-Move Rates by Income and Rail Line, from 1993-2015[30]

Rail Station Opening						
	Whole System (N = 3,933)	Blue (N = 851)	Expo (N = 736)	Gold (N = 1,150)	Green (N = 529)	Red / Purple (N = 667)
All Incomes						1.4%**
<30% AMI						1.5%**
30-50% AMI						
50-80% AMI						1.2%**
80-150% AMI						1.3%**
>150% AMI						3.1%**

Source: Author calculations on FTB data

Table 3f shows the results of the same analysis five years after rail stations open, by rail line and by income. Here, the Expo Line is excluded since it had not been open for five years by the latest year of the available FTB data.

Two trends are evident in Table 3f. First, five years after opening, rail stations have a statistically significant effect on higher-income households' out-move rates along the Gold and Red/Purple Lines and for the whole system, increasing move rates by anywhere from 0.8 to 2.9 percentage points. This may indicate the presence of higher-income renter households who move frequently, or the possibility that early gentrifying households move more often, although the data cannot definitively answer that question.

Second, rail stations dampen out-move rates along the Green Line five years after opening by 1.5 to 1.9 percentage points. The Green Line runs in a highway median for most of its path and in an industrial

[30] Asterisks indicate the level of statistical significance of underlying estimates, as follows: * 90% confidence, ** 95% confidence, *** 99% confidence.

zone near Los Angeles International airport for its remainder. Thus, the Green Line's potential to impact the surrounding built environment may be lower than that of other Lines and it has not been as much of a subject to discussions about gentrification. This is perhaps one explanation for why the continued presence of the Green Line has reduced out-move rates by about 1/20th for all incomes and for lower-income households, in contrast to increased out-move rates along all the other lines.

Table 3f.
Title: Estimated Effect of Rail Stations Five Years after Opening on Out-Move Rates by Income and Rail Line, from 1993-2015[31]

Five Years After Opening						
	Whole System (N = 3,933)	**Blue (N = 851)**	**Expo (N = 736)**	**Gold (N = 1,150)**	**Green (N = 529)**	**Red / Purple (N = 667)**
All Incomes					-1.5%*	
<30% AMI					-1.8%**	
30-50% AMI						
50-80% AMI					-1.9%*	0.9%*
80-150% AMI	0.8%*			1.3%*		1.0%***
>150% AMI	1.3%**			1.2%*		2.9%**

Source: Author calculations on FTB data

To summarize, this chapter assessed whether LA Metro rail stations were associated with increased displacement. The analyses above established that baseline mobility rates are high in Los Angeles County (one in six tax filers moves annually) and even higher along LA Metro rail lines (one in five tax filers moves annually). Some of those moves are certainly by choice, but the move rates are high and likely reflect housing insecurity.

Statistical evidence for displacement of low-income households exists only along the Red/Purple Line after rail stations open. In all other cases, either effects are not statistically significant or they are only so for higher-income households.

A county where one in six persons are moving each year is not a county where housing is secure. While the rail transit system may have contributed to increased move rates in some cases, the evidence is that the impact of the rail system is small (at best) compared to baseline move rates. The expansion of the LA Metro rail system should not be conflated with the housing crisis in Los Angeles. Yes, some neighborhoods along rail lines may be experiencing increased move rates, and yes, we are not doing nearly enough to use the rail system as an opportunity for housing (see Chapter 8), but had Los Angeles never built a rail system it would still have a large housing security problem. The housing crisis in the city

[31] Asterisks indicate the level of statistical significance of underlying estimates, as follows: * 90% confidence, ** 95% confidence, *** 99% confidence.

is large and arguably growing, and it cannot be tied solely or even in largest part to the rail transit system.

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- 17% of Los Angeles County households moved in 2014, a decrease from the 20% that moved in 1994.
- By income group, the highest baseline mobility rates in 2014 were for households with incomes between 30-50% of AMI (18.3%), then 50-80% of AMI (17.8%), less than 30% of AMI (17.0%), 80-150% of AMI (16.4%) and greater than 150% of AMI (14.4%).
- High baseline move rates suggest a high level of housing insecurity Countywide.
- There is no evidence of rail opening-related displacement, except along the Red/Purple Lines, where out-move rates increased by about 1.4 percentage points after stations opened.
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[33] Jelleyman & Spencer, 2008; Morris et al., 2018, Goldsmith, Britton, Reese, & Velez, 2017; Cox, Henwood, Rodnyansky, Wenzel, & Rice, 2017
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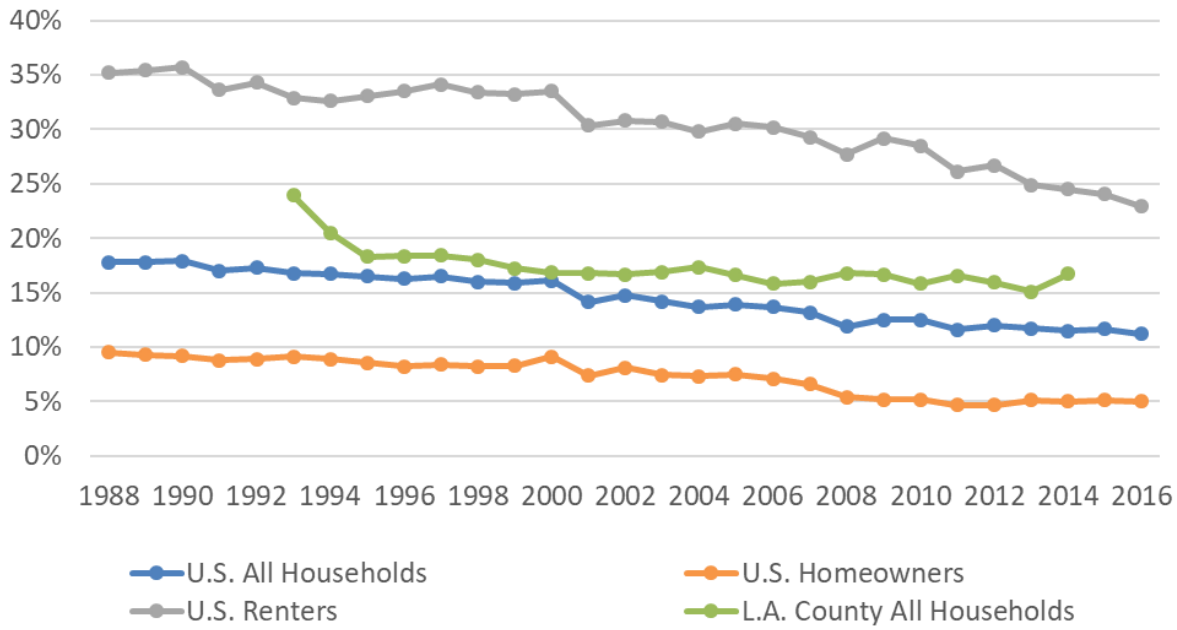
[36] As summarized in Rayle, 2015, Zuk et al., 2015 and Zuk et al., 2018
[37] The FTB suppressed filers' addresses due to confidentiality reasons, though allowed access to zip code information for this research. Data were only made available for nine-digit zip codes when that 9-digit zip code contained more than 10 households. In all cases, household identities are anonymized.
[38] A negligible less than 0.1% of records have no location information at all. They are excluded from the analysis.

In this report, baseline mobility is defined as the number of filers moving at least a half-mile from one year to the next divided by the total number of filers in the data in both years. The green line in Figure 3a shows this baseline mobility rate using FTB data for Los Angeles County for the available years. The annual baseline mobility rate countywide started at above 20% per year in the mid-1990s and decreased slowly to about 17% in the early 2000s, where it remained in 2014, the last year for which data are available. This means that nearly one in six of all households in Los Angeles County moves in any given year in 2014, down from over one in five in 1994. These figures accord with previous survey-based data for Los Angeles County[39] and for low-income neighborhoods in the U.S.[40]

These Countywide figures are slightly above nationwide move rates reported by the U.S. Current Population Survey (CPS), as shown in the blue line in Figure 3a. The CPS asks an annual sample of 100,000 respondents about their move patterns in the past year, providing a reasonable comparison for the baseline findings from FTB data. The CPS move rate for U.S. renters (33% in 1993, 25% in 2014) is much higher than for homeowners (9% in 1993, 5% in 2014) (Figure 3a). The FTB data does not flag whether filers rent or own their homes. However, Los Angeles County has more renters (55%) than the U.S. average (35%), suggesting one reason why the County baseline move rate is above the national move rate.

Figure 3a.
Title: Annual Mobility Rate by Housing Tenure for United States, and Aggregate Annual Mobility Rate for Los Angeles County Households



Source: Author calculations on FTB data, US Current Population Survey

[39] Clark and Ledwith (2006) derived an 18% annual mobility rate for Los Angeles County households using a sample of 2,644 households in 65 neighborhoods observed from 2002-2006.
[40] Coulton, Theodos, and Turner (2012) also found a 19% annual mobility rate in their survey of 10 low-income and changing neighborhoods in metropolitan areas across the United States.

How do baseline move rates near LA Metro rail stations compare to the County average? The number of filers in each LA Metro rail neighborhood is computed by counting each filer whose residential location is within a half-mile of a rail station location, based on the center of the 9-digit or 5-digit zip code assigned in the database. A similar aggregation process computes the number of filers in control neighborhoods, based on the location of the control intersection. The rail station and control neighborhood selection is described in Chapter 2.

An out-mover from a rail neighborhood is defined as a filing household who leaves that specific rail station neighborhood by moving at least a half-mile, and that files taxes in both years. A mover for a control neighborhood is calculated in the same way. The out-mobility rate for a neighborhood is the sum of movers in that neighborhood from one year to the next divided by the number of filers in that neighborhood in both years. Because specific stations may have particular idiosyncrasies that may raise or lower move rates in a particular year, this report generally displays results by rail line.

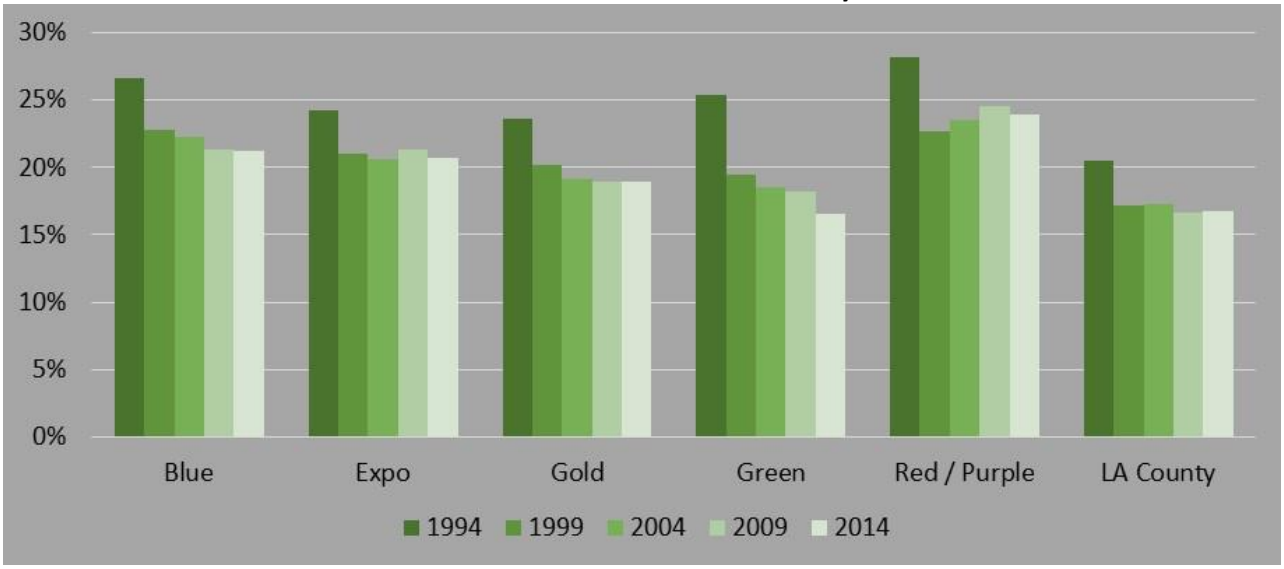
The year-to-year move rates for the LA Metro rail lines are largely consistent with Los Angeles County trends (Figure 3b). The baseline mobility rate for Los Angeles County in 1994 was 20% percent, and in 2014 was 17%. The neighborhoods within a half-mile of Red/Purple Line stations had higher out-move rates (27 percent in 1994, and 24 percent in 2014). Other lines had out-move rates between the County average and Red/Purple line.

Overall, two key results are evident from Figure 3b:

The baseline year-to-year move rates, in Los Angeles County and in rail transit neighborhoods, are high – above 20 percent per year in Red/Purple, Blue, and Expo Line neighborhoods. On average, one in five families in these neighborhoods leave the rail transit area each year – an effect which is not attributable to the rail system, but which is more properly viewed as a baseline effect – particularly so for the years before the lines opened. This suggests a potentially high level of housing insecurity in rail neighborhoods. It is possible also that the high churn may be attributed to rail station opening incorrectly, while in fact, the churn is due to baseline housing insecurity.

The Red/Purple Line – the region's only subway – is the only line where out-movement rates increased over time. This movement, counter to countywide patterns, suggests the possibility that the high capacity subway system may have been associated with development patterns that could have increased out-movement in those neighborhoods.

Figure 3b.
Title: Baseline Annual Out-Move Rate from Half-Mile Station Areas by Rail Line



Source: Author calculations on FTB data

The income information in the FTB dataset enables a comparison of baseline out-mobility from rail neighborhoods across income groups. Table 3c presents the 2014 baseline out-mobility rates by rail line and by income, based on the income categories described in Chapter 2.

In 2014, the baseline move rates for Los Angeles County are higher for lower-income households. In that year, 16-18% of households below 80% of AMI moved, compared to 14 percent of households at 150% of AMI or higher. Higher income households are also more likely to be homeowners, who have lower move rates nationwide (Figure 3a). The higher out-move rates for lower-income households may indicate a higher level of housing insecurity across the County, especially among lower-income renters.

When looking at rail-proximate neighborhoods, there are several patterns by income. First, baseline out-move rates are above average for lower-income households living near Blue, Green, and Expo Line stations. Second, this trend is reversed along the Gold and Red/Purple Lines where the higher income households have above average annual move rates. These diverging trends suggest that different income groups face differing move motivations or pressures in different regions of the city and county. Third, the differences in out-move rates between lowest and highest income groups is not very high in most cases (2-3 percentage points, and 5 percentage points for the Red/Purple). This trend underscores the high overall baseline move rate in rail station neighborhoods, regardless of income, potentially signifying a generally high level of housing insecurity.

The raw move rates shown here (Figure 3b, Table 3c) cannot indicate whether a rail station is associated with displacement. For that, statistical comparisons of move-out rates for rail neighborhoods and similar control neighborhoods. The results of that statistical research are shown below.

Table 3c.
Title: Baseline Out-Move Rate by Income in 2014 by LA Metro Rail Line

	Blue	Expo	Gold	Green	Red / Purple	Los Angeles County
All Incomes	21%	21%	19%	17%	24%	17%
<30% AMI	23%	22%	19%	19%	23%	17%
30-50% AMI	21%	22%	18%	17%	23%	18%
50-80% AMI	20%	21%	19%	14%	24%	18%
80-150% AMI	20%	20%	20%	13%	26%	16%
>150% AMI	21%	19%	21%	17%	28%	14%

Source: Author calculations on FTB data

Do rail station openings cause displacement, i.e., increase the out-move rate above baseline? The quasi-experimental approach described in Chapter 2 compares actual rail station locations with locations that could have received rail stations, but did not, due to political or engineering concerns. Thus, each rail station neighborhood is assigned a matched control neighborhood. The out-move rate is statistically compared over time before and after rail station openings, between rail and control neighborhoods, controlling for year-specific trends and neighborhood-specific trends.[41] A statistically significant finding means that out-move rates increased or decreased after rail stations opened in rail station neighborhoods relative to the control group in ways that are unlikely to arise by chance. Statistically significant increased out-move rates may be indicative of displacement.

Were there meaningful changes in out-move rates for any rail lines? The estimated rail station effect on households of all incomes is statistically significant only for the Red/Purple line, where out-move rates increased by 1.4 percentage points after rail stations opened compared to control neighborhoods (Figure 3d). No other lines have estimates that differ statistically from zero.

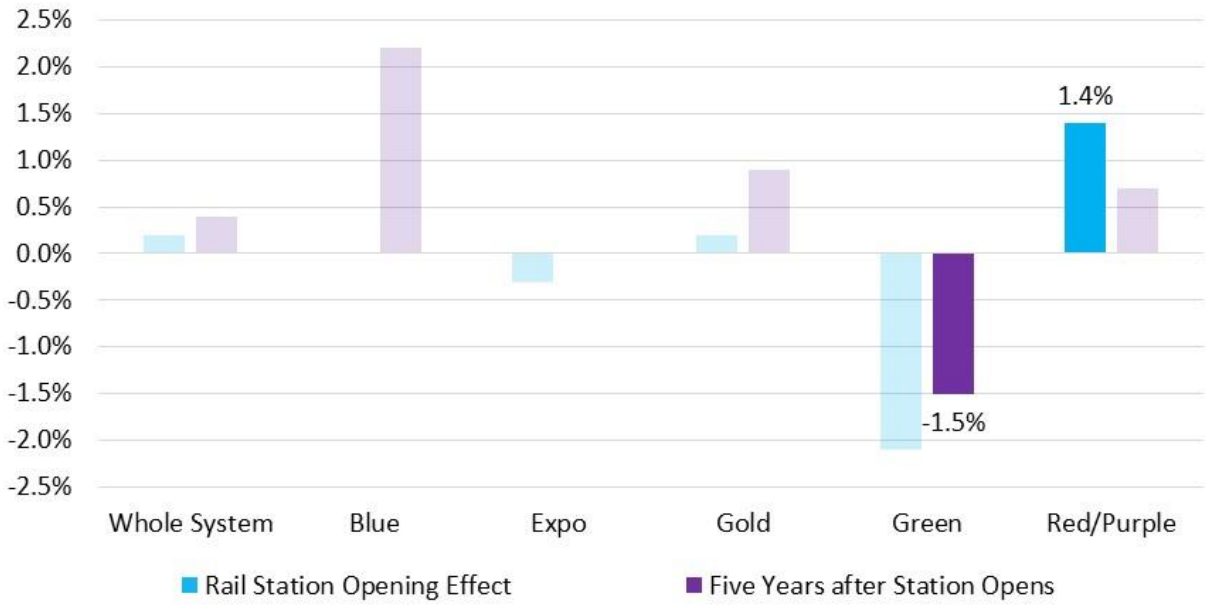
Figure 3d also shows results from the same statistical model, looking at effects of rail stations five years after opening. Out-move rates decreased by 1.5 percentage points along the Green Line five years after rail stations opened compared to control neighborhoods (Figure 3d). No other lines have five-year-after-opening estimates that differ statistically from zero.

The results in Figure 3d herald little evidence of wholesale displacement across the whole income distribution, except for along the Red/Purple line, where out-mobility grew by 1.4 percentage points. Still, this increase is only about 1/20th of the baseline mobility rate along the Red/Purple Line in 2014.

[41] The statistical regression equation is: $y_{jt} = a + b*rail_j*open_t + c*year_t + d*neighborhood_j + e_{jt,}$ where y is the out-move rate in year *t* in neighborhood *j*, *a* is the baseline mobility rate, *b* is the estimated impact of rail station opening on out-move rates, *rail* is a binary variable equal to 1 if neighborhood *j* is a rail station neighborhood and 0 if it is a control neighborhood, *open* is a binary variable equal to 1 if rail station *j* is open in year *t*, *year* is a set of binary variables which equal 1 when year = t and 0 otherwise, *neighborhood* is a set of binary variables which equal 1 when neighborhood = j and 0 otherwise, and *e* is an error term for the regression. In total, there are 22 year binary variables (23 years and one omitted for multicollinearity) and 185 neighborhood binary variables (93 stations and 93 control neighborhoods and one omitted for multicollinearity). Regressions are weighted by the baseline population in the neighborhood in each year to control for neighborhood size. Standard errors are clustered by station-control area pair.

This means that the baseline move rate is about 20 times greater than the displacement effect. Nevertheless, cumulated over time, even a 1.1 percentage point increase in annual move rates may accelerate neighborhood turnover and lead to greater instability.

Figure 3d.
Title: Estimated Effect Size of Rail Stations on Out-Move Rates for All Incomes, by Rail Line and Timing, from 1993-2015. ***Data values displayed only for statistically significant results.***



Source: Author calculations on FTB data

Displacement is often a story about income levels, not only the total move rates shown in Figure 3d. Table 3e displays results of the statistical model on rail station opening by income. Results indicate that rail station opening affected out-move rates near Red/Purple Line stations across all but one income group, but there are not statistically significant station-opening effects for other rail lines. Note that the Blue Line is excluded from this analysis because its opening year precedes the beginning of the available FTB data.

The effect on out-move rates along the Red/Purple Lines was strongest for the highest income group, more than double that for all incomes or for the lowest income group (Table 3e). Still, the effect on nearly every income group is a likely indicator of rail-related displacement along the Red/Purple line. As above, note that the displacement effect shown here is about 1/10th to 1/20th of baseline move rates in Red/Purple Line neighborhoods.

Table 3e.
Title: Estimated Effect of Rail Station Opening on Out-Move Rates by Income and Rail Line, from 1993-2015[42]

Rail Station Opening						
	Whole System (N = 3,933)	Blue (N = 851)	Expo (N = 736)	Gold (N = 1,150)	Green (N = 529)	Red / Purple (N = 667)
All Incomes						1.4%**
<30% AMI						1.5%**
30-50% AMI						
50-80% AMI						1.2%**
80-150% AMI						1.3%**
>150% AMI						3.1%**

Source: Author calculations on FTB data

Table 3f shows the results of the same analysis five years after rail stations open, by rail line and by income. Here, the Expo Line is excluded since it had not been open for five years by the latest year of the available FTB data.

Two trends are evident in Table 3f. First, five years after opening, rail stations have a statistically significant effect on higher-income households' out-move rates along the Gold and Red/Purple Lines and for the whole system, increasing move rates by anywhere from 0.8 to 2.9 percentage points. This may indicate the presence of higher-income renter households who move frequently, or the possibility that early gentrifying households move more often, although the data cannot definitively answer that question.

Second, rail stations dampen out-move rates along the Green Line five years after opening by 1.5 to 1.9 percentage points. The Green Line runs in a highway median for most of its path and in an industrial zone near Los Angeles International airport for its remainder. Thus, the Green Line's potential to impact the surrounding built environment may be lower than that of other Lines and it has not been as much of a subject to discussions about gentrification. This is perhaps one explanation for why the continued presence of the Green Line has reduced out-move rates by about 1/20th for all incomes and for lower-income households, in contrast to increased out-move rates along all the other lines.

[42] Asterisks indicate the level of statistical significance of underlying estimates, as follows: * 90% confidence, ** 95% confidence, *** 99% confidence.

Table 3f.
Title: Estimated Effect of Rail Stations Five Years after Opening on Out-Move Rates by Income and Rail Line, from 1993-2015[43]

Five Years After Opening						
	Whole System (N = 3,933)	**Blue (N = 851)**	**Expo (N = 736)**	**Gold (N = 1,150)**	**Green (N = 529)**	**Red / Purple (N = 667)**
All Incomes					-1.5%*	
<30% AMI					-1.8%**	
30-50% AMI						
50-80% AMI					-1.9%*	0.9%*
80-150% AMI	0.8%*			1.3%*		1.0%***
>150% AMI	1.3%**			1.2%*		2.9%**

Source: Author calculations on FTB data

To summarize, this chapter assessed whether LA Metro rail stations were associated with increased displacement. The analyses above established that baseline mobility rates are high in Los Angeles County (one in six tax filers moves annually) and even higher along LA Metro rail lines (one in five tax filers moves annually). Some of those moves are certainly by choice, but the move rates are high and likely reflect housing insecurity.

Statistical evidence for displacement of low-income households exists only along the Red/Purple Line after rail stations open. In all other cases, either effects are not statistically significant or they are only so for higher-income households.

A county where one in six persons are moving each year is not a county where housing is secure. While the rail transit system may have contributed to increased move rates in some cases, the evidence is that the impact of the rail system is small (at best) compared to baseline move rates. The expansion of the LA Metro rail system should not be conflated with the housing crisis in Los Angeles. Yes, some neighborhoods along rail lines may be experiencing increased move rates, and yes, we are not doing nearly enough to use the rail system as an opportunity for housing (see Chapter 8), but had Los Angeles never built a rail system it would still have a large housing security problem. The housing crisis in the city is large and arguably growing, and it cannot be tied solely or even in largest part to the rail transit system.

[43] Asterisks indicate the level of statistical significance of underlying estimates, as follows: * 90% confidence, ** 95% confidence, *** 99% confidence.

Chapter 4: When Households Move Away from Rail Station Neighborhoods, Where do they Go?

Key Questions

- How often do movers from Rail Station neighborhoods move to other Rail Station neighborhoods?
- How far do movers from Rail Station neighborhoods move?

Chapter Takeaways

- About 26% of movers from Rail Areas move to another Rail Area systemwide, up from 15% in 2000.
- This cross-station move pattern varies by rail line and by income: highest share along Red/Purple and Gold (East LA) Lines and for households with income below 30% AMI and 30-50% AMI.
- Movers from Rail Areas are about 1.5 times more likely to move to another Rail Area than movers from Control Areas, a ratio that has stayed relatively constant since 2000.
- The median move distance for households was 3.5 miles.
- Higher-income households move farther distances than lower-income households.

Data & Methods

Move distance and move frequency between Rail Station neighborhoods are measured using the FTB data (see Chapter 3). Move distance is measured by taking the linear distance between a household's location in one year versus the next year, provided the household files taxes in both years. Locations are given in the FTB data as the centers of either 9-digit or 5-digit zip codes. The move location of households living near rail stations is indicated as near another rail station or not, to obtain the proportion of movers moving to another rail station. As a comparison, the same calculation is done for households living in matched control stations. The analyses are summarized by rail line and by income group.

Given how frequently households move in Los Angeles County, when households leave rail transit station neighborhoods, where do they go? The answer was previously unknown, leaving persons to speculate. Do households move from one rail transit neighborhood to another – possibly preserving their rail transit access – or when households move, do they move far away or to locations without rail access? This analysis again makes use of the California Franchise Tax Board (FTB) data to track household moves over time and space and answer these questions in ways not previously possible.

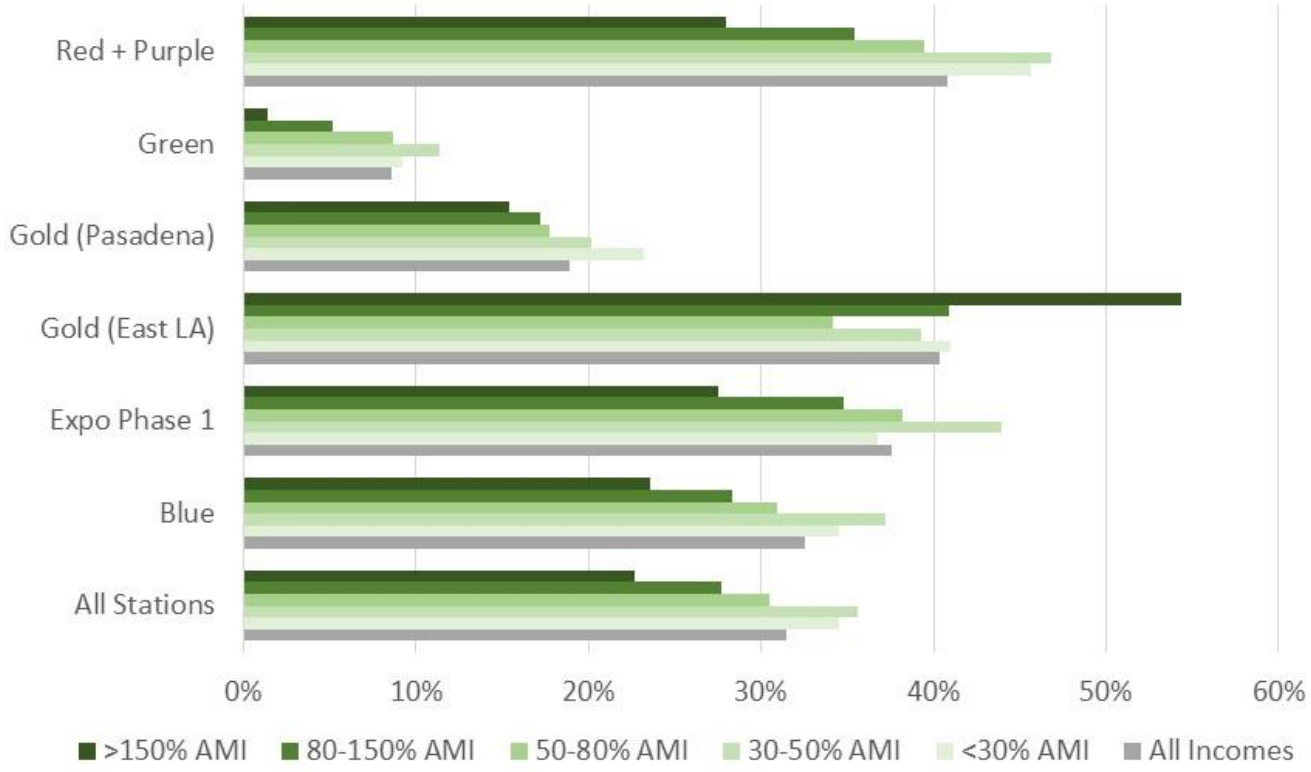
Move destinations are measured by first overlaying household tax filing locations with the locations of LA Metro rail stations. Households are counted as having moved if they changed location from one year to the next with a minimum change in location of a half-mile. The analysis requires that a household files taxes for both consecutive years. The number of movers in each year is split across those who move to another LA Metro rail station and those who do not. The key outcome is the share of movers from rail stations who move to another rail station relative to the total number of movers from that station. To provide an adequate comparison, the same outcome is computed for households living in matched control stations. The analyses are summarized by rail line and by income group

Figure 4a shows information for households who move away from a half-mile rail station neighborhood. In 2015, 32 percent of all households who move away from a rail station neighborhood moved to another station neighborhood. This corresponds to about 11,200 households moving from station to station, out of over 35,000 who moved out of station neighborhoods in 2015. The Red/Purple and Gold East LA Lines had the highest share of households moving to another station area; Green and Gold Pasadena had the lowest share.

Lower income households more commonly move to new station areas when leaving a rail neighborhood. For example, 35 percent of households in the 30-50% of AMI range moved to a rail neighborhood when leaving a different rail neighborhood in 2015, compared to 23 percent for households with incomes above 150% of AMI. This trend by income is similar across most LA Metro rail lines. However, this pattern reverses for moves away from the Gold Line East LA branch. Among households moving away from East LA Gold Line stations, the highest income households are most likely to move to new rail transit stations.

Figure 4a.

Title: Share of Out-Movers Who Relocate to Other Rail Station Neighborhoods by Income Level (2015)



Source: Author calculations on FTB data

Table 4b.

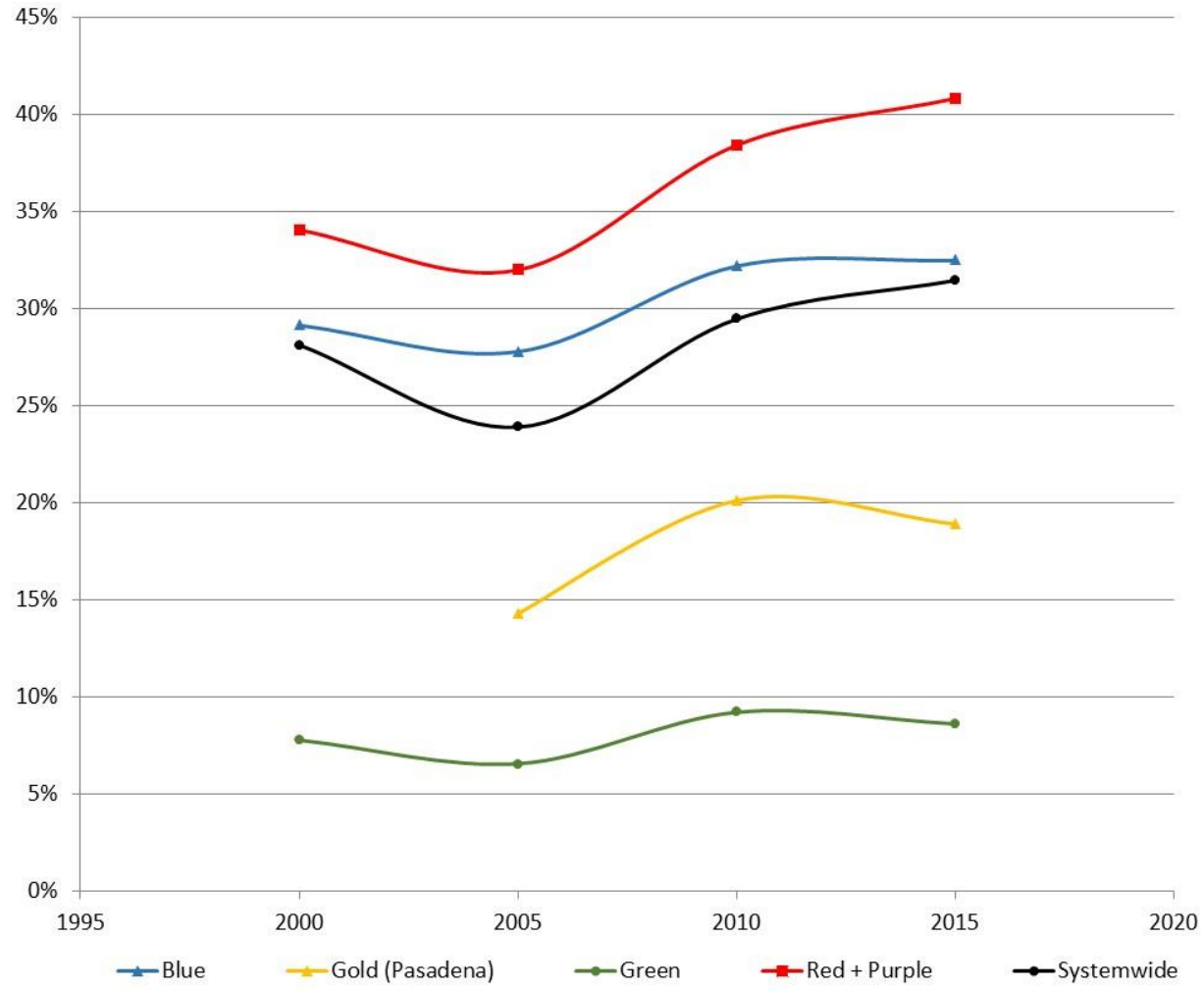
Title: Total Number of Households Filing Taxes in 2015 by Rail Line

LA Metro Rail Line	Number of Households Filing Taxes in 2015	Number of Households in the Data in both 2014 & 2015	Number of Households who Moved in 2015
Blue	82,773	68,517	9,246
Expo Phase 1	34,094	27,756	2,851
Gold East LA	25,867	21,714	1,988
Gold Pasadena	50,251	41,854	6,403
Green	30,457	25,513	3,174
Red / Purple	95,968	80,728	11,549
All Station Areas (open in 2015)	319,410	265,982	35,211

Source: Author calculations on FTB data

How has this trend evolved over time? As the LA rail system has expanded during the past 25 years, the share of households leaving station areas but moving to another station area has increased (Figure 4c). The highest share and largest increase is for the Red/Purple Line: in 2015, 41 percent of all households who left Red/Purple Line station half-mile neighborhoods moved to another LA Metro station neighborhood. The Gold East LA Line is omitted from figure 4c because of insufficient data (it only opened in 2009).

Figure 4c.
Title: Share of Out-Movers Who Relocate to another Rail Station Area over Time (All Incomes)



Source: Author calculations on FTB data

Is this trend limited to households moving from LA Metro rail station neighborhoods or is this a general trend? This analysis compares households who move out of rail station half-mile neighborhoods and the matched half-mile control neighborhoods. The control neighborhoods are used to ascertain the evidence for a general trend.

Table 4d shows the fraction of households who leave rail neighborhoods and move to another rail station neighborhood versus the fraction of households who leave control neighborhoods and move to a

rail station neighborhood in 2015. Twenty-eight percent of all households who moved away from rail neighborhoods moved to another rail neighborhood, compared to seventeen percent in control neighborhoods. This gap was not uniform across all rail lines. While the average gap of about 1.5 times higher "move to rail" rate among households leaving rail versus control neighborhoods occurs among Blue Line and Red/Purple Line station/control pairs, the "move to rail" rate gap for the Gold East LA Line is nearly double this. Conversely, we see no gap for the Green or Gold Pasadena lines.

Table 4d.
Title: Average Share of Out-Movers Who Relocate to another Rail Station Area annually (All Incomes), from Rail Station versus Control Neighborhoods, for the years during which rail line is open

LA Metro Rail Line	Rail Station Neighborhood	Control Neighborhood
Blue	30%	20%
Gold East LA	36%	13%
Gold Pasadena	18%	19%
Green	8%	8%
Red / Purple	36%	23%
All Station Areas (open in 2015)	28%	17%

Source: Author calculations on FTB data

Another way to look at moves is to examine how far households move, referred to as "move distance." Most moves are to nearby locations. The median move distance for households leaving and LA Metro rail station area in 2015 was 3.5 miles (Tables 4e and 4f). Higher income households move further – the median move distance among households with income above 240% of AMI was 5.9 miles, compared to a move median move distance of 2.9 miles among households with income less than 30% of AMI. Again, these data are for households who moved away from LA Metro half-mile station neighborhoods in 2015.

Twenty-eight percent of households who moved away from rail neighborhoods in 2015 moved farther than 10 miles, and fourteen percent moved farther than 25 miles. Among households with incomes above 240% of AMI, about one in five (22 percent) moved farther than 25 miles when leaving LA Metro rail neighborhoods. These move distances could reflect several factors. Possibly lower income households have more limited housing choices and require the affordable units or the transportation access and services that are near stations. Possibly higher income households are seeking more suburban locations. Likely these move distances reflect a complex combination of choices and constraints at all income levels. Regardless, most moves at all income levels are short (median distances in the range of 2.9 to 5.9 miles across the income bands), and in no case does any rail line retain even half of the moving households. Most households, when moving away from LA Metro station areas, move to places without rail transit access.

Tables 4e, 4f.

Title: Median Move Distance, and Proportion of Movers Moving at least 10 miles and at least 25 miles by Income Group and LA Metro Rail Line Among Households Living within a half-mile of an LA Metro Rail Station

Income	Median Move Distance	Proportion of Movers moving > 10 miles	Proportion of Movers moving > 25 miles
<30% of AMI	2.9 miles	24%	12%
30-50% of AMI	3.1 miles	25%	12%
50-80% of AMI	3.9 miles	30%	14%
80-120% of AMI	4.8 miles	35%	18%
120-240% of AMI	5.5 miles	38%	21%
>240% of AMI	5.9 miles	40%	22%
All Incomes	3.5 miles	28%	14%

Source: Author calculations on FTB data

LA Metro Rail Line	Median Move Distance	Proportion of Movers moving > 10 miles	Proportion of Movers moving > 25 miles
Red / Purple	3.8 miles	27%	12%
Gold	3.3 miles	30%	15%
Green	3.6 miles	18%	10%
Blue	2.2 miles	31%	16%
Expo Phase 1	3.4 miles	25%	13%
Whole System	3.5 miles	28%	14%

Source: Author calculations on FTB data

Chapter 5: Transit Trips and Driving among Households Who Live Near Stations

Key Questions

- How does travel behavior differ between households living near rail transit stations versus those not living near rail transit stations?
- How does this vary by income?

Chapter Takeaways

- Near-rail households drive 16 miles less per day, take rail transit at seven times the rate of households living beyond a half-mile of a station, and take three times as many bus trips, all compared to the averages for other households in the greater Los Angeles region.
- Households with annual incomes above $150,000 drive about twice as much (on average) as households with incomes between $25,000 and $35,000 per year, and about four times as much as households with incomes below $25,000 per year.
- Bus travel is most common among households making less than $25,000 per year, while rail transit travel is roughly stable with income up to $75,000 per year.
- The average number of bus trips per day is considerably higher than the average number of rail trips per day for households across income levels and across near-rail and far-from-rail neighborhoods.

Data & Methods

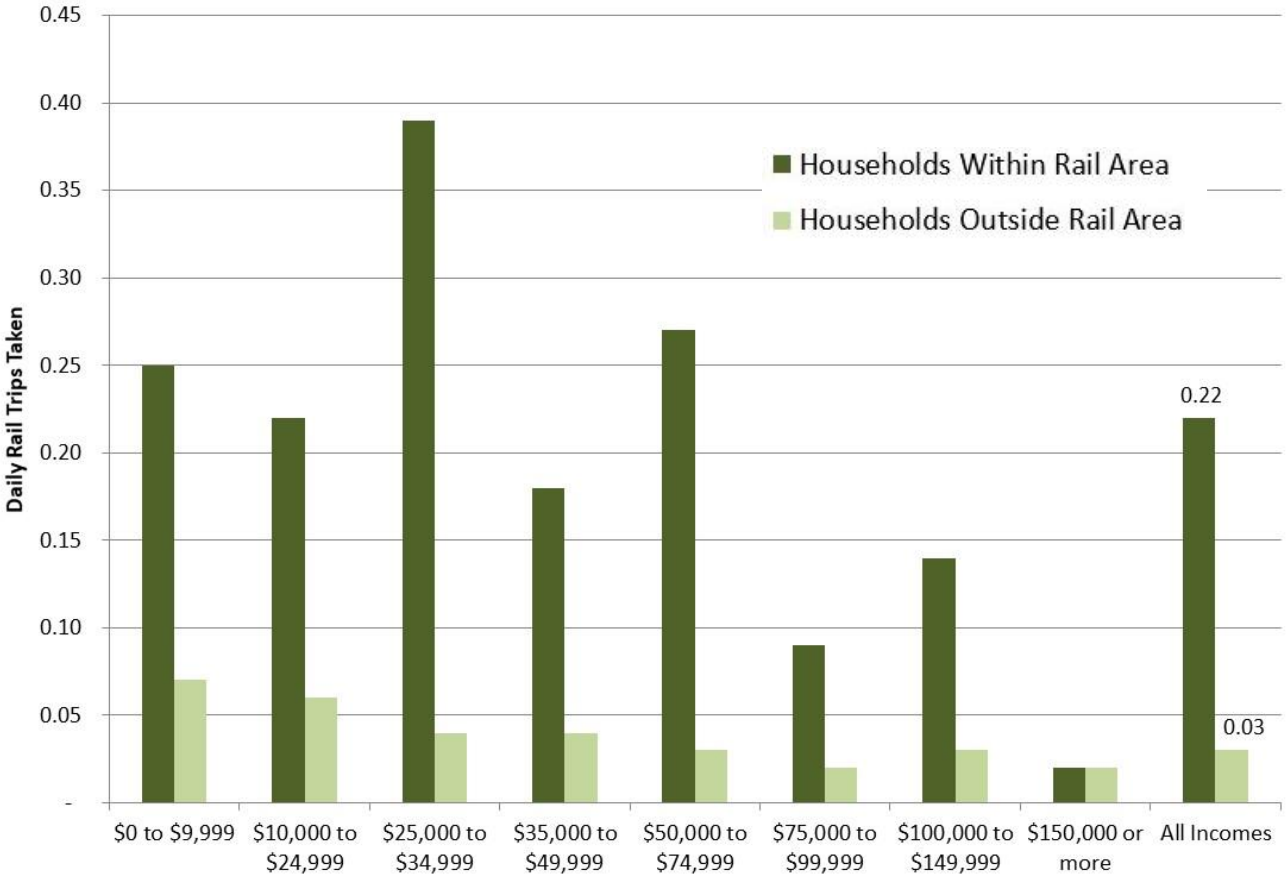
Transit system usage near and far from rail stations is measured using California Household Travel Survey (CHTS) data from 2010-2012. The CHTS surveys households and records daily trip distance and travel mode. The average daily number of rail trips taken, bus trips taken, and vehicle miles traveled is compared for Los Angeles metropolitan areas households living within and outside of a half-mile of LA Metro Rail stations to obtain a near-rail and far-from-rail comparison.

At the time this report was written, the most recent statewide travel survey in California was the 2012 California Household Travel Survey (CHTS).[44] The CHTS representatively surveys households across California, providing information on household driving (vehicle miles driven on the survey day) and rail transit and bus travel (number of trips per household on the survey day). Households were asked to track their travel during the survey day and to report distance and trip mode for each trip. The analysis below uses 14,790 household observations from the 2012 CHTS for the 6-county greater Southern California Association of Governments region, of which 651 households lived within a half-mile of an LA Metro rail transit station (see Appendix Table X for sample sizes by income group).

Comparing households living within and beyond a half-mile of a LA Metro rail transit station, near-rail households drive 16 miles less per day, take rail transit at seven times the rate of households living beyond a half-mile of a station, and take three times as many bus trips. Also notable are the income gaps, whether or not households live near rail. Households with annual incomes above $150,000 drive about twice as much (on average) as households with incomes between $25,000 and $35,000 per year, and about four times as much as households with incomes below $25,000 per year (Figure 5c). Bus travel is most common among households making less than $25,000 per year (Figure 5b), while rail transit travel is roughly stable with income up to $75,000 per year (Figure 5a). Note, though, that the average number of bus trips per day is considerably higher than the average number of rail trips per day for households across income levels and across near-rail and far-from-rail neighborhoods.

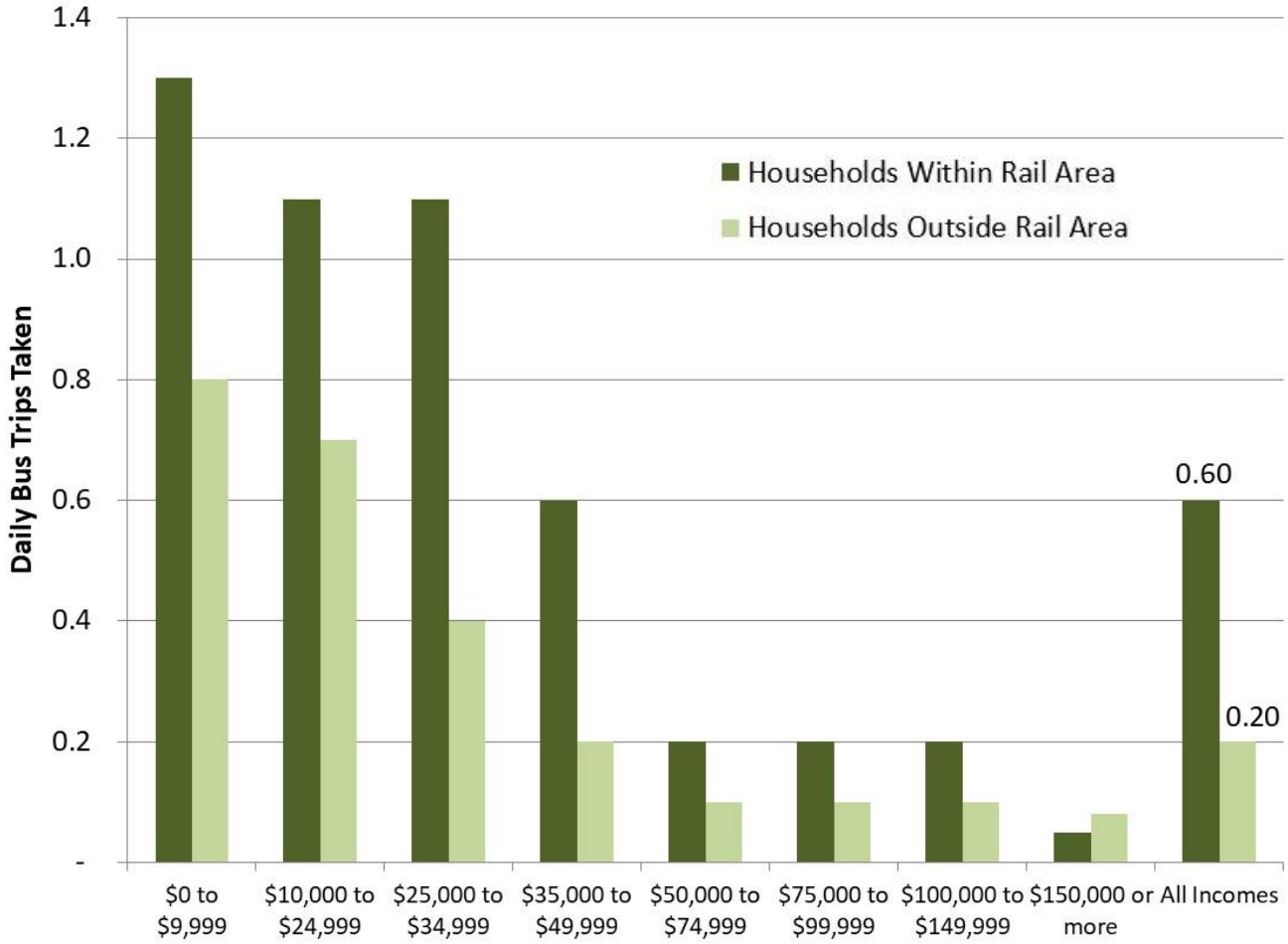
[44] The CHTS is a travel-diary based survey of travel behavior of California households, similar to the National Household Travel Survey (NHTS). The survey was led by the California Department of Transportation (Caltrans) and funded by the California Strategic Growth Council, the California Energy Commission, and eight transportation planning agencies across California. It includes travel information from over 42,000 households across 58 counties in California and three neighboring counties in Nevada. CHTS covered a one-year period between February 1, 2012 and January 31, 2013.

Figure 5a.
Title: Average Daily Rail Trips Taken per Household by Income and Residence near Rail Area in SCAG Region (2010-12)



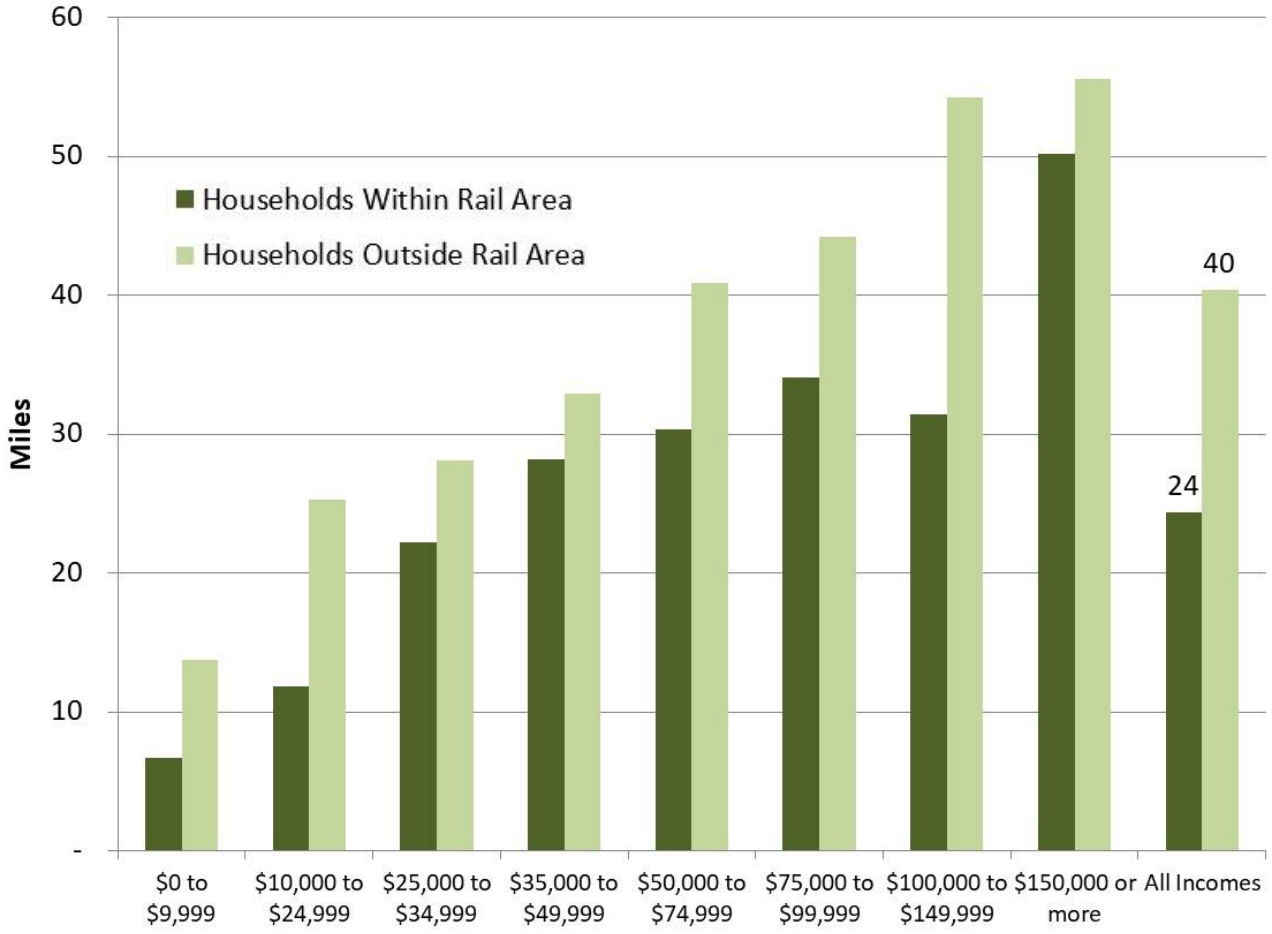
Source: Boarnet et al. (2015) calculations on California Household Travel Survey (CHTS) 2010-2012 data

Figure 5b.
Title: Average Daily Bus Trips Taken per Household by Income and Residence near Rail Area in SCAG Region (2010-12)



Source: Boarnet et al. (2015) calculations on California Household Travel Survey 2010-2012 data

Figure 5c.
Title: Average Daily Vehicle Miles Traveled per Household by Income and Residence near Rail Area in SCAG Region (2010-12)



Source: Boarnet et al. (2015) calculations on California Household Travel Survey 2010-2012 data

Chapter 6: Rent Patterns near Rail Stations

Key Questions

- How have rents changed near LA Metro rail stations from 2000 to 2019?
- How do rent patterns compare between rail and control neighborhoods?

Chapter Takeaways

- Annual rent growth near LA Metro stations has averaged almost 4% before the Great Recession (2000-2008) and again after (2013-2019), while slowing down to 2% during the Recession (2008-2013).
- Rents per square foot have grown faster near rail stations than in matched control areas from 2000-2008 and again from 2008-2013. The growth was equal across rail and control stations from 2013-2019.
- The Red/Purple Line has seen the strongest rent appreciation.
- The average rent gap between rail and control neighborhoods tripled from 2000 to 2018, going from $0.10 to $0.30 per square foot.
- No individual neighborhood has seen annual rent growth consistently above 4%.
- Current anti-gouging policies in Long Beach, Glendale, and Inglewood have maximum rent caps that may be too high to affect all but the most egregious increases, while the temporary policy covering unincorporated Los Angeles County is likely to have some effects.

Data & Methods

Rent data from CoStar Group, Inc., was collected and analyzed by California Community Foundation, forming the dataset for this analysis. CoStar collects rent information quarterly. To provide reliable information, the analyses in this chapter are limited to neighborhood-level averages for rents in locations with at least 20 buildings, with each building having at least 5 rental units. In Los Angeles County, this yields 38 pairs of rail-proximate and control neighborhoods where asking rent level data is available and 26 pairs where asking rent per square foot is available. The analysis considers data from 2000 to 2019 and in three time periods: pre-Recession, Recession, and post-Recession.

Prior studies have shown that providing new rail transit can increase nearby housing prices in a variety of cases and cities, as measured via single family home prices.[45] However, other studies note that this finding depends on location, timing, and analytical model.[46] Very few studies have systematically looked at the effect of rail transit expansion on apartment rents. One of the key reasons for this lack of research is a lack of data on rents over time. This report uses unit rent data acquired from CoStar Group, Inc., a provider of real estate data for brokers, investors, property managers, and other real estate professionals. Rent data from CoStar Group, Inc., was collected and analyzed by California Community Foundation, forming the dataset for this analysis.

CoStar collects data from owners and managers of apartment buildings. These data include the number of bedrooms and the square footage area of units in a building; the asking rent and asking rent per square foot for each unit by number of bedrooms; and the vacancy rate and value of rent concessions for each unit by number of bedrooms.

CoStar tracks properties quarterly over time, with data available from the first quarter (Q1) 2000 to Q1 2019. Once a building is in the CoStar database, it continues to be tracked, with rental data reliably updated every quarter.

To understand how neighborhood level rent patterns in Los Angeles County have evolved, CoStar rent data was collected for each year from 2000 to 2019 for neighborhoods near LA Metro rail stations and matched control neighborhoods. The average rent by unit type was collected for each neighborhood.

CoStar's database of buildings does not include every rental building in Los Angeles County, but includes a large sample of representative buildings across the County. This limited the rent analyses since CoStar is more likely to track rents in larger buildings than smaller buildings and in denser neighborhoods relative to less dense neighborhoods. The analyses below adopt two conditions to deal with these limitations: 1) average neighborhood rent figures include only buildings with at least 5 units, and 2) average neighborhood rent figures are only displayed for neighborhoods with at least twenty such 5+ unit buildings. These conditions reduce the number of neighborhoods with sufficient data to 38 of 93 rail and control neighborhoods for asking rent and 26 of 93 for asking rent per square foot. Nevertheless, these analyses using CoStar provide a first detailed view of the evolution of rents near LA Metro rail stations.

There are two relevant rent measures tracked by CoStar: monthly asking rent and monthly asking rent per square foot. The asking rent is a dollar value familiar to every renter – it is the amount paid to the landlord monthly. The rent per square foot is a figure frequently used by all manners of real estate professionals. Both figures are used in different portions of Chapters 6 and 7. Rent per square foot has the advantage of controlling for the living area of a specific unit, a way to normalize across bedroom types.

[45] Phoenix (Atkinson-Palombo, 2010; Golub, Guhathakurta, & Sollapuram, 2012), Buffalo (Hess and Almeida, 2007), Atlanta (Immergluck, 2009), San Diego (Duncan, 2011), and in multi-city analyses (Higgins & Kanaroglou, 2016; Bartholomew & Ewing, 2011).

[46] Measurements of land and housing price appreciation due to transit were found to be sensitive to station location in the metropolitan area (Dong, 2017), number of years after opening (Pilgram & West, 2017), and specification (Redfearn, 2009).

CoStar tracks rent for six bedroom types: studio, one bedroom, two bedroom, three bedroom, four or more bedrooms, and all bedrooms. The data reliability is best for one bedroom, two bedroom, and studio, because they are collected with more regularity over time, whereas rents for other unit types are reported more intermittently. All bedrooms is a composite average across all bedroom types. Various bedroom definitions are used in different portions of Chapters 6 and 7.

The data time period from 2000 to 2019 encompasses three business cycle periods: Pre-Recession (2000-2008), Recession (2008-2013), and Post-Recession (2013-2019).

Table 6a shows average annual growth rate[47] for rent per square foot for the 26 rail transit neighborhoods, compared to match control (non-rail) neighborhoods, in the three pre-Recession, Recession, and post-Recession time periods. Systemwide, the average growth in rent per square foot in the rail neighborhoods slightly exceeded the rent growth in control neighborhoods in the pre-Recession and Recession time periods, but it has been equal to that of the control neighborhoods in the post-Recession time period.

The Red/Purple Line (half of the 26 station areas with data) shows some signs of rental price pressure, with station neighborhoods exceeding control area rental growth in the Recession and post-Recession time periods. The three stations on the Gold Line branch to Pasadena had rent growth exceeding their control neighborhoods in every time period, from 2000 to 2019. This is consistent with the move-out analysis in Chapter 3. The Red/Purple and Gold Lines had signs of increased move-out rates among resident households, relative to control groups, coincident with and after rail stations opened. While the rent data do not cover all stations, those two lines also show faster rent appreciation relative to their matched control neighborhoods. There is evidence that the LA Metro rail system is associated with faster rental growth rates and increased rates of household moves in station neighborhoods.

Still, the analysis emphasizes that the magnitude of rental growth rates across rail and control neighborhoods in Table 6a are not large. The more dramatic pattern is the time trend. After a period of slow rental growth during the Recession, rents in all rail station neighborhoods (and likely throughout Los Angeles) have increased since 2013. While the rail stations may contribute to that, the more striking pattern is rent growth's relationship with the real estate market, likely reflecting housing shortages and other factors contributing to rent appreciation. This conclusion aligns with the findings presented in Chapter 3. The factors that are leading to housing instability in Los Angeles County are broad, and any effect of the LA Metro rail system is somewhat smaller than the underlying pressure of rent increases, which averaged 3.8 percent per year since 2013 in the 26 stations and matched controls.

[47] The annual average growth rate is the compound annual growth rate (CAGR) calculated between years *t* and *s* as $(rent_t/rent_s)^{(1/(t-s))-1}$

Table 6a.

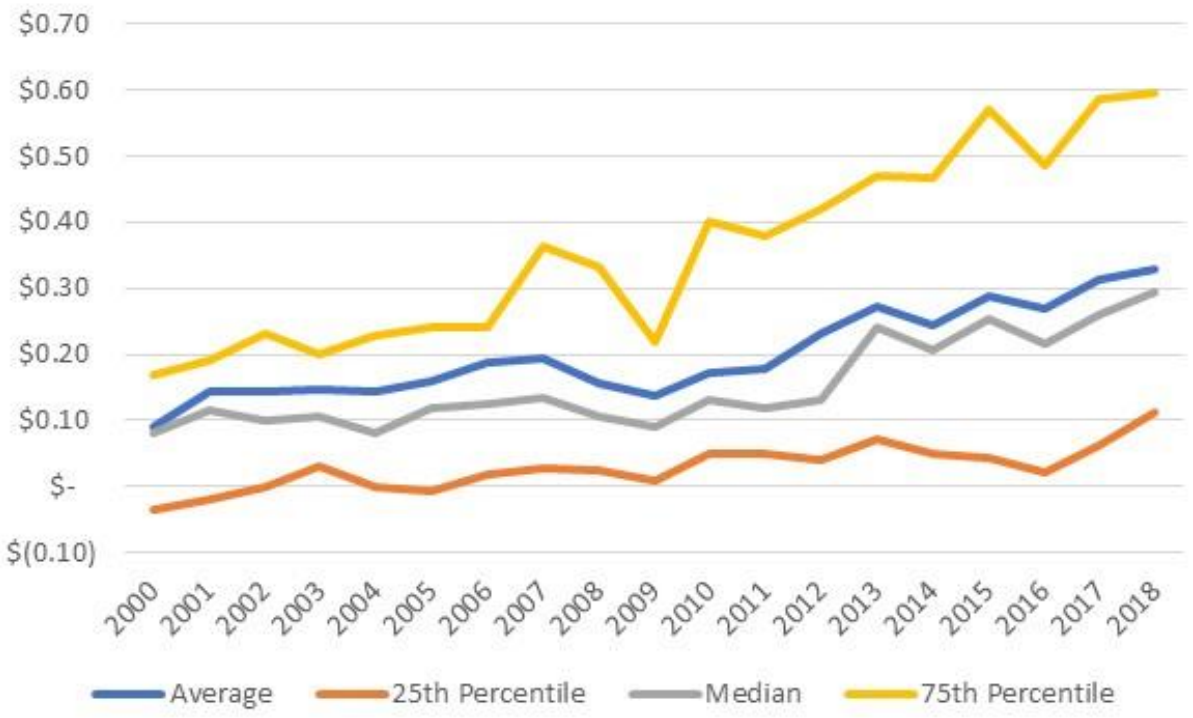
Title: Comparison of Average Annual Growth in Rent per Square Foot between Rail Station and Control neighborhoods, for units across all bedroom types, by 3 time periods, by rail line

Time Period	Pre-Recession (2000-2008)		Recession (2008-2013)		Post-Recession (2013-2019)	
Rail Line	Station	Control	Station	Control	Station	Control
Blue (1 pair)	4.6%	3.0%	1.7%	0.7%	4.8%	2.4%
Expo Phases 1 and 2 (8 pairs)	3.5%	2.9%	3.2%	1.2%	2.0%	2.9%
Gold East LA	Not enough available data					
Gold Pasadena (3 pairs)	3.7%	3.1%	1.3%	0.5%	4.4%	3.7%
Green (1 pair)	3.0%	2.5%	1.7%	0.5%	4.5%	4.2%
Red / Purple (13 pairs)	3.8%	4.0%	1.7%	0.9%	4.7%	4.4%
Systemwide (26 pairs)	3.7%	3.4%	2.2%	1.8%	3.8%	3.8%

Source: Author calculations using CoStar data, restricted to neighborhoods with more than 20 buildings of at least 5 units in CoStar data, number of station-control pairs with data by rail line shown in parentheses.

Figure 6b reports the difference between rent per square foot (*i.e.*, the "rent gap") for units in 26 rail station areas minus the rent per square foot in control neighborhoods. The average rent gap – rail station neighborhoods *minus* similar "non-rail" neighborhoods – is positive, meaning that the rents in an average rail neighborhood are higher than in control neighborhoods. The average rent gap tripled from 2000 to 2018, from $0.09 to $0.32 per square foot per month. For a 1,000 square foot unit, this would represent an increase in the monthly rent differential from $90 to $320. In the neighborhoods in the top quartile of rent gap, the difference between per-square-foot rent, rail stations minus controls, grew from approximately $0.18 to $0.60 from 2000-2018. For a 1,000 square foot unit, this would represent an increase in the monthly rent differential from $180 to $600.

Figure 6b.
Title: Annual Difference in Rent per Square Foot for units in all bedroom types: Rail Area *minus* Control Area



Source: Author calculations using CoStar data

Figure 6c shows rent changes in each neighborhood, with bars for rail neighborhoods and dots for the paired control (non-rail) neighborhood. Rents appreciated from 2000 to 2008 and again from 2013 to 2019; rent increases were much smaller (typically below 2 percent per year) during the Recession years from 2008 to 2013.

Note that, even in the most recent (post-Recession) time period, virtually no neighborhood experienced annual rent increases that averaged more than 4 percent per year. Several cities within Los Angeles County have enacted recent rent control measures that limit rent increases to 5 percent (Inglewood[48]), 7 percent (Glendale[49]), and 10 percent (Long Beach[50]) annually – an amount that is above the average realized rent increases shown in Figure 6c. Those recent rent stabilization measures might smooth rent increases, and avoid large "catch up" rent changes, but they target average annual rates that are well above average rent increases even in strong economic time periods. In contrast, Los Angeles County has recently passed a temporary ordinance covering its unincorporated areas that caps rent increases at 3

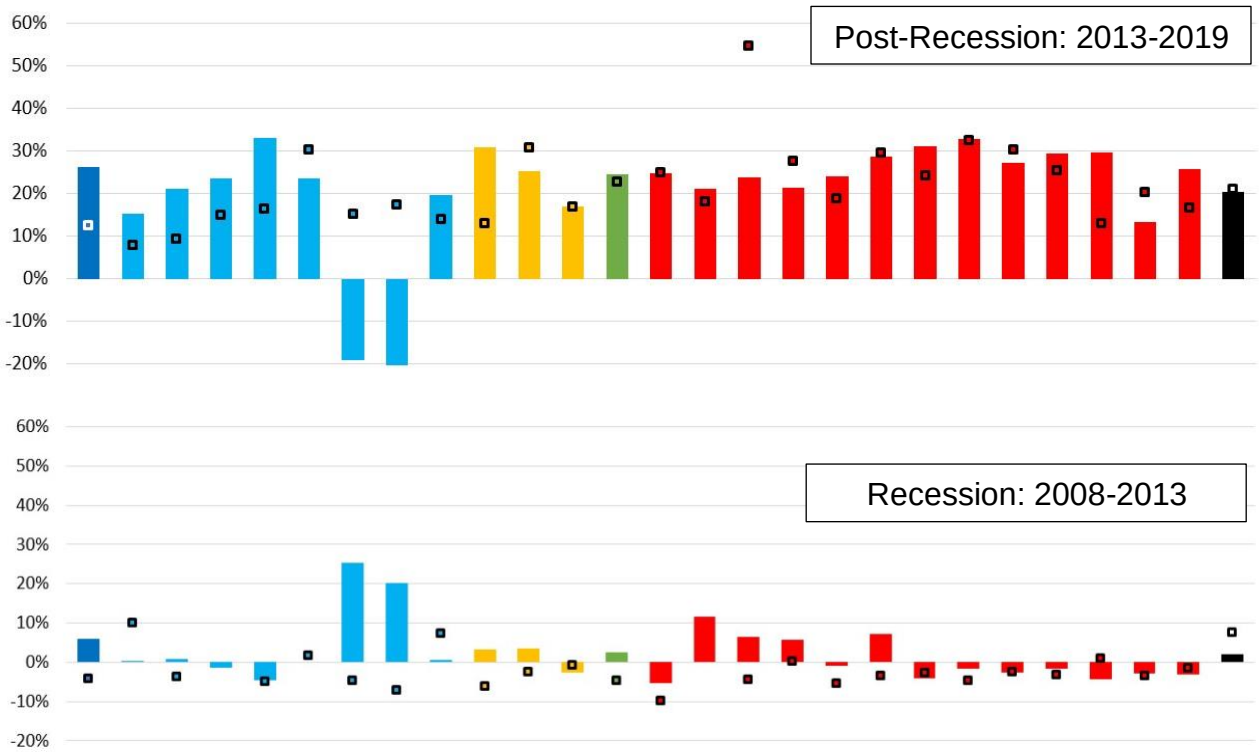
[48] Inglewood Rent Control https://www.kts-law.com/inglewood-rent-control-just-cause-eviction-policies-and-relocation-assistance-program/
[49] Glendale Right to Lease Ordinance https://www.glendaleca.gov/home/showdocument?id=38112
[50] Long Beach Tenant Relocation Assistance Ordinance http://longbeach.legistar.com/View.ashx?M=F&ID=7223356&GUID=15D897AC-3233-4C79-B56F-D5D71E83FFE6

percent annually.[51] That temporary policy sets a ceiling that corresponds to annual average rent changes in several rail-adjacent neighborhoods from 2013-2019, according to Figures 6a and 6b. As such, this Los Angeles County policy has the potential to bind and limit rent increases, while the recent measures in Inglewood, Glendale, and Long Beach may be too slack to influence average rents.

After the conclusion of this research, the State of California passed a law capping rent increases (AB 1482) in the spirit of the measures discussed above.[52] This new law goes into effect on January 1, 2020 and caps annual rent increases at 5 percent plus an allowance for cost of living increases, not to exceed 10 percent per year total. The rent caps in this law do not apply to newer housing units, built within the past 15 years. Based on our analysis in this chapter, the 5 percent plus cost of living ceiling applied by the state's new law (AB 1482) will not likely bind and limit rent increases, similar to the ordinances in Glendale, Long Beach, and Inglewood. Instead, the new law will more likely serve to prevent instances of excessive gouging.

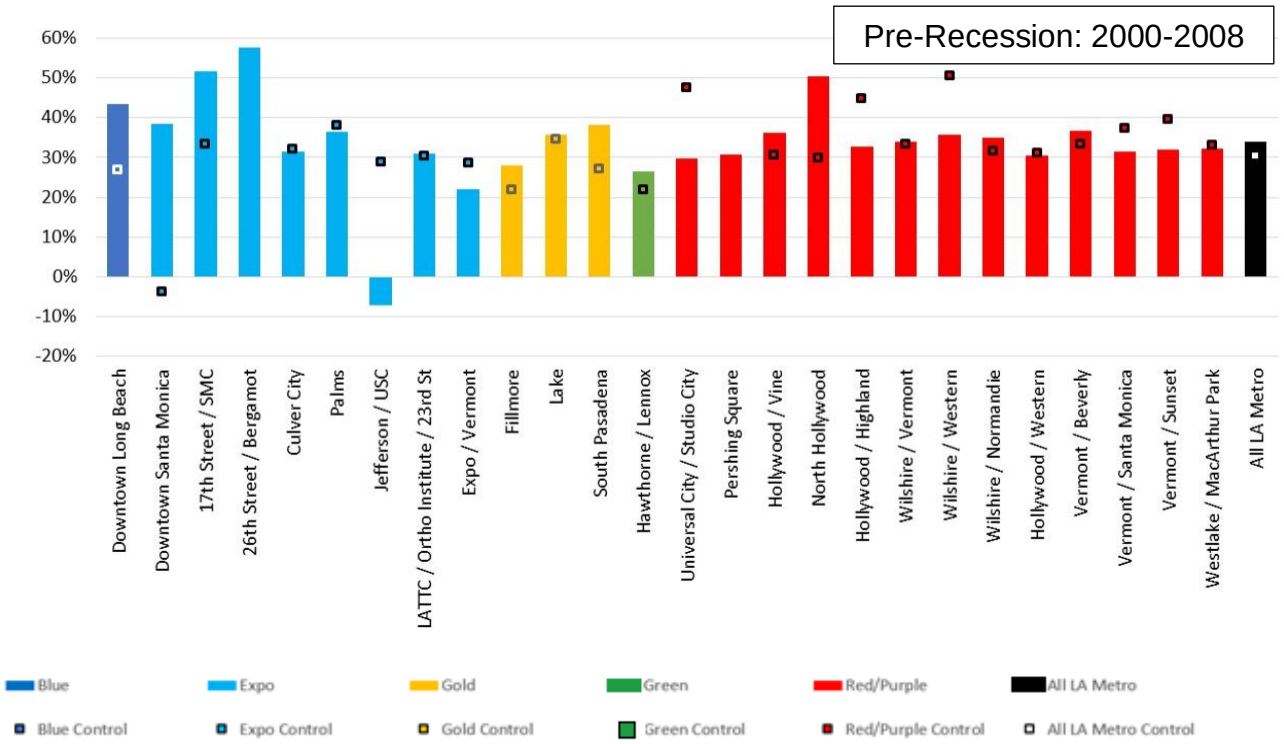
Figure 6c.

Title: Simple Percent Change in Rent per Square Foot in 3 Time Periods



[51] Los Angeles County temporary rent stabilization ordinance http://dcba.lacounty.gov/rentstabilization-ordinance/

[52] California Assembly Bill 1482: Tenant Protection Act of 2019: tenancy: rent caps https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB1482



Source: Author calculations using CoStar data

Chapter 7: Rent Stabilization Policies and Rent Patterns

Key Questions

- How do Rent Stabilization (RSO) policies affect rent levels in neighborhoods near LA Metro rail stations?
- Do RSO policies alter rent growth near LA Metro station areas?

Chapter Takeaways

- In City of Los Angeles zip codes adjacent to Culver City, units eligible under the Rent Stabilization Ordinance (RSO) (multifamily and built pre-1978) appear to have lower rent levels than non-RSO units (post-1978).
- A $0.70 (one-bedroom) and $2.00 (studio) per square foot rent exists gap between RSO-eligible (in Culver City) and RSO units (in the City of Los Angeles near Culver City).
- For multifamily units built before 1978, rent levels are lower in the City of Los Angeles zip codes next to Culver City than in Culver City proper, perhaps indicating the effect of LA City's RSO policy. However, this difference may also be associated with other disparate jurisdictional policies.
- By contrast, rent levels for RSO-eligible units in the Boyle Heights neighborhood of LA City have grown at a higher rate than rent levels for RSO units in City of Los Angeles zip codes adjacent to Culver City.
- The RSO/RSO-eligible rent gap between older (RSO) and newer (non-RSO) units in the City of Los Angeles is small and shrinking in the Boyle Heights area (to the point of becoming negative), but is large and growing in zip codes near Culver City.

Data & Methods

Rent data from CoStar Group, Inc., was collected and analyzed by California Community Foundation, forming the dataset for this analysis. This dataset includes asking rents per square foot from 2000 to Q1 2019 in seven 5-digit zip codes in Los Angeles County: 90016, 90022, 90023, 90033, 90034, 90063, and 90232. The zip codes are located in two geographic areas where the City of Los Angeles, which has a rent stabilization ordinance (RSO), shares a border with Culver City and with unincorporated Los Angeles County (East Los Angeles) which did not have rent stabilization policies at the time of analysis. This setup allows for a comparison of rent levels along two dimensions: 1) City of Los Angeles RSO units versus City of Los Angeles non-RSO units, and 2) City of Los Angeles RSO units versus non-City RSO-eligible units. These comparisons attempt to trace differences in rents due to RSO policies in Los Angeles relative to similar units just outside of Los Angeles or built after units are eligible for RSO policies.

This chapter presents a preliminary case study analysis of how rent control is related to asking rents. Specifically, the effect of the City of Los Angeles' Rent Stabilization Ordinance (RSO) on rents in units covered by this ordinance is examined.53 Generally, units in multi-family buildings built prior to 1978 are covered by the ordinance. Covered units (termed "RSO units" here) are limited to a maximum annual rent increase of 3 percent, provided the tenant does not move out. When tenants move out, landlords can opt to raise rents to whatever level they choose – this is known as vacancy decontrol.

Data limitations have made studying the effects of RSOs on actual rents challenging. This project marks a data breakthrough. The dataset for this analysis is rent data from CoStar Group, Inc. was collected and analyzed by California Community Foundation. The dataset includes asking rent per square foot per unit by bedroom type, quarterly from 2000 to Q1 2019.

These data provide the basis for two types of comparisons: RSO units versus non-RSO units and RSO units versus RSO-eligible units. "Non-RSO units" are defined here as units in multifamily buildings *within* the City of Los Angeles, but built *after* 1978 and thus not covered by RSO. "RSO-eligible units" are defined here as units in multifamily buildings *outside* the City of Los Angeles built *before* 1978. These units are similar to RSO units; had their jurisdictions enacted a rent stabilization policy similar to that in the City of Los Angeles, these units would be covered. Hence they are termed RSO-eligible.

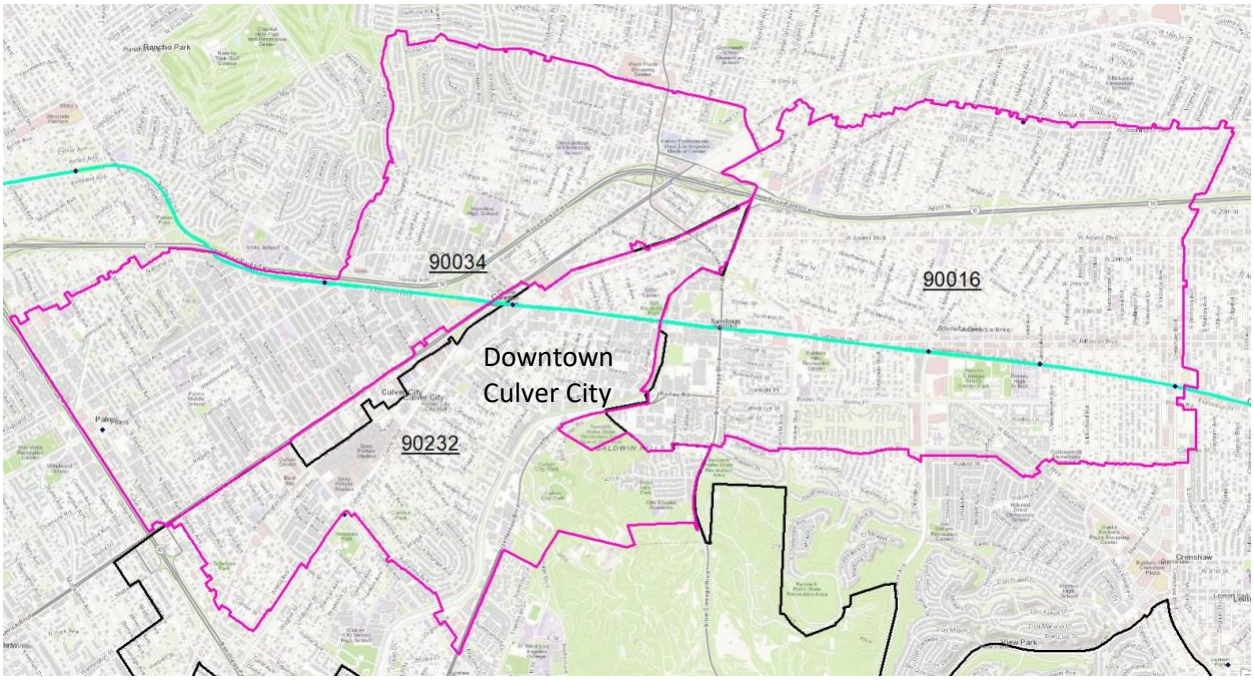
Case Study Areas

Two geographic case study areas are chosen where residential neighborhoods in the City of Los Angeles contain LA Metro rail stations and border similar residential neighborhoods outside of the City boundary.

The first case study area consists of three zip codes located in a cluster around Culver City, with one (90232) located in Culver City and two (90016, 90034) located in the City of Los Angeles (see Figure 7a). Five LA Metro stations are proximate to the Culver City cluster of observations: Culver City (Expo Line), Expo / Crenshaw (Expo Line), Expo / La Brea (Expo Line), Farmdale (Expo Line), and La Cienega / Jefferson (Expo Line). The second case study area consists of four zip codes located in a cluster around the Boyle Heights area of the City of Los Angeles, with one (90022) located east of the City near the East Los Angeles area, and three (90023, 90033, 90063) located in Boyle Heights (see Figure 7b). Eight LA Metro stations are proximate to the Boyle Heights / East Los Angeles cluster of observations: Atlantic (Gold Line), East LA Civic Center (Gold Line), Indiana (Gold Line), Maravilla (Gold Line), Mariachi Plaza (Gold Line), Pico-Aliso (Gold Line), Soto (Gold Line), and Washington Station (Blue Line).

[53] The City of Los Angeles provides an overview of the RSO ordinance here: https://hcidla.lacity.org/RSO-Overview

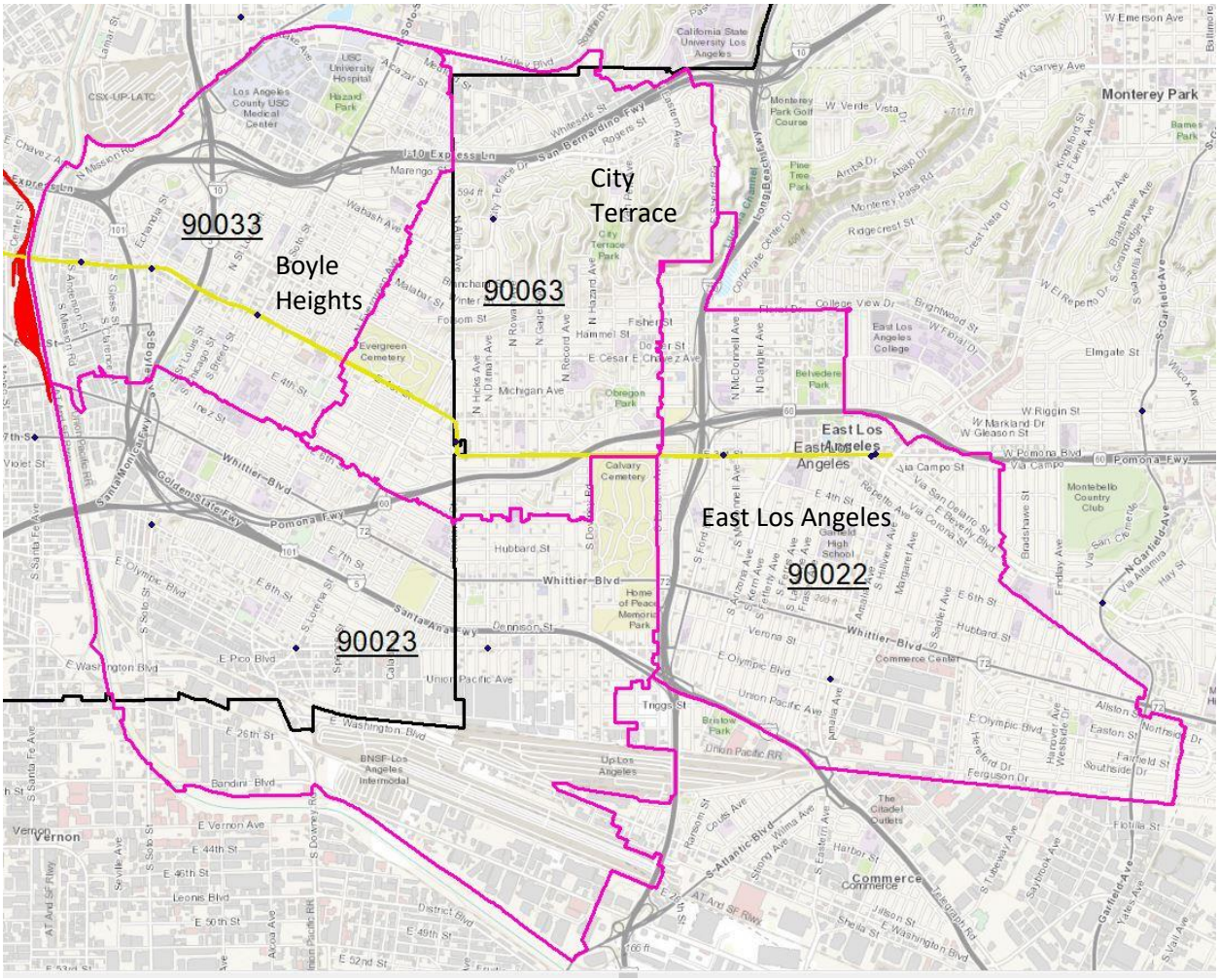
Figure 7a.
Case Study Area Maps: Culver City Cluster (90232, 90016, 90034 zip codes)



Legend

- In-Sample Zip Code Boundary
- Expo Line
- Gold Line
- Green Line
- Red/Purple Line
- Blue Line
- Los Angeles City Boundary
- County Boundaries

Figure 7b.
Case Study Area Maps: Boyle Heights / East Los Angeles Cluster (90022, 90023, 90033, 90063 zip codes)



Rent Analysis

The analysis begins by comparing the historical trends in per square foot asking rents between RSO and non-RSO 1-bedroom units in the two case study areas. Figure 7c shows that RSO 1-bedroom units in the City of Los Angeles adjacent to Culver City have experienced a lower growth rate in per square foot asking rent than non-RSO 1-bedroom units. While the per square foot asking rent for RSO 1-bedroom units increased by 55% from 2000 to 2019 (from $1.45 to $2.24), the per square foot asking rent for non-RSO 1-bedroom units increased by 72% (from $1.54 to $2.65). In contrast, Figure 7d indicates that RSO 1-bedroom units in Boyle Heights have experienced a *higher* growth rate in per square foot asking rent than non-RSO 1-bedroom units from 2000 to 2019, with the two growth rates being 61% (from $0.86 to $1.39) and 29% (from $1.01 to $1.30), respectively. Comparing the RSO unit lines in Figures 7c and 7d, the per square foot asking rent for Boyle Heights RSO units actually grew at a greater rate (51%) than the per square foot asking rent for Culver City-adjacent RSO units (43%).

Next, we turn to comparing RSO and RSO-eligible units. The per square foot asking rent for RSO 1-bedroom units in the Culver City-adjacent parts of Los Angeles has consistently been lower than RSO-eligible 1-bedroom units within Culver City (Figure 7e). Despite that fact, the two groups of units have experienced similar growth rates in per square foot asking rent from 2000 to 2019, of 55% (from $1.45 to $2.24) and 61% (from $1.83 to $2.94), respectively.

Figures 7f and 7g show the difference in per square foot asking rent for RSO and non-RSO units (*i.e.*, the "rent gap") over time and by unit size (*e.g.*, 1-bedroom unit, 2-bedroom unit, etc.) in the two case study areas. In effect, the rent gap shown for 1-bedroom units in Figure 7f is the difference between the two lines in Figure 7c (non-RSO *minus* RSO), while the rent gap shown for 1-bedroom units in Figure 7g is the difference between the two lines in Figure 7d. Figure 7f demonstrates that the rent gap between RSO and non-RSO units in the Culver City-adjacent parts of Los Angeles has consistently grown, albeit slowly from 2000 to 2019 for units of all observable sizes. Conversely, Figure 7g demonstrates that the rent gap between RSO and non-RSO units in the Boyle Heights neighborhood of Los Angeles has consistently decreased from 2000 to 2019 for units of all observable sizes; in fact, since 2015, RSO units have tended to be *more expensive* in per square foot asking rent than non-RSO units in the Boyle Heights neighborhood.

Finally, Figure 7h shows the difference in per square foot asking rent for RSO and RSO-eligible units (also referred to as a "rent gap") over time and by unit size, in the Culver City area. In effect, the rent gap shown for 1-bedroom units in Figure 7h is the difference between the two lines in Figure 7e (RSO-eligible *minus* RSO). Figure 7h demonstrates relatively constant and *positive* rent gaps between RSO and RSO-eligible units over time and by unit size in the Culver City area. There are too few RSO-eligible units observed in the area around East Los Angeles to report RSO and RSO-eligible rent gaps in a similar way for the Boyle Heights / East Los Angeles area.

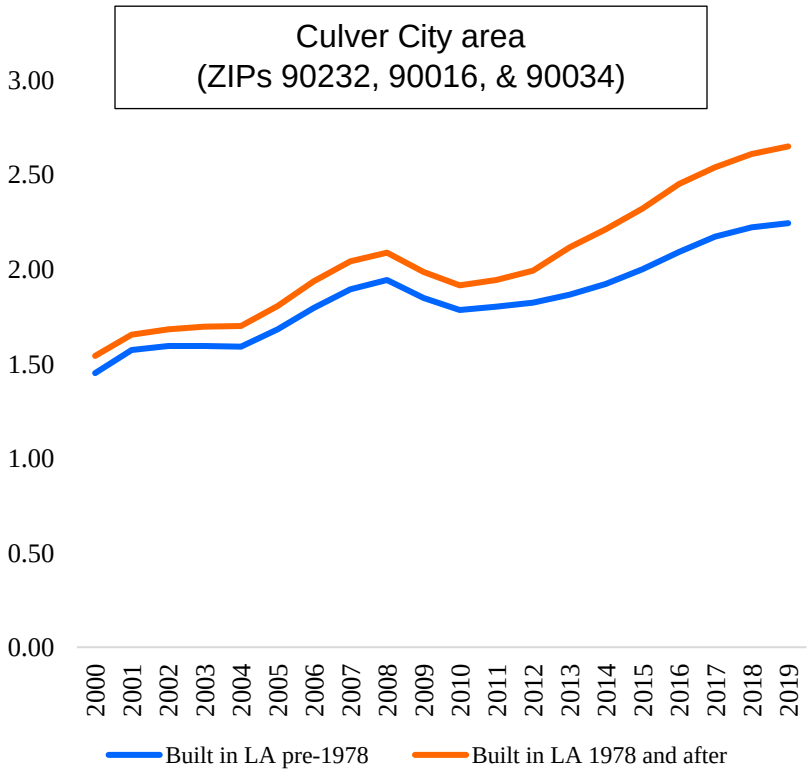
Overall, the descriptive statistics presented in Figures 7c – 7h suggest, but do not definitively prove, disparate levels of effectiveness in RSO implementation across the two geographic areas. RSO units have become increasingly *more affordable* than non-RSO units in the Culver City-adjacent parts of Los Angeles, and their relative affordability has remained constant. In stark contrast, RSO units have become increasingly *less affordable* relative to non-RSO units in Boyle Heights. Furthermore, per square foot asking rents for RSO 1-bedroom units within Boyle Heights have actually grown at a greater rate than per square foot asking rents for RSO 1-bedroom units adjacent to Culver City.

It is important to note that the two geographic study areas have distinct development histories, sociodemographic compositions, and built environments and contexts. They are also experiencing gentrification to differing degrees. It is quite likely that these phenomena, in and of themselves, help explain the evidence presented in this chapter, suggesting that outcomes of RSO implementation may be strongly associated with individual neighborhoods' characteristics. Additional research is necessary to understand whether this is the case.

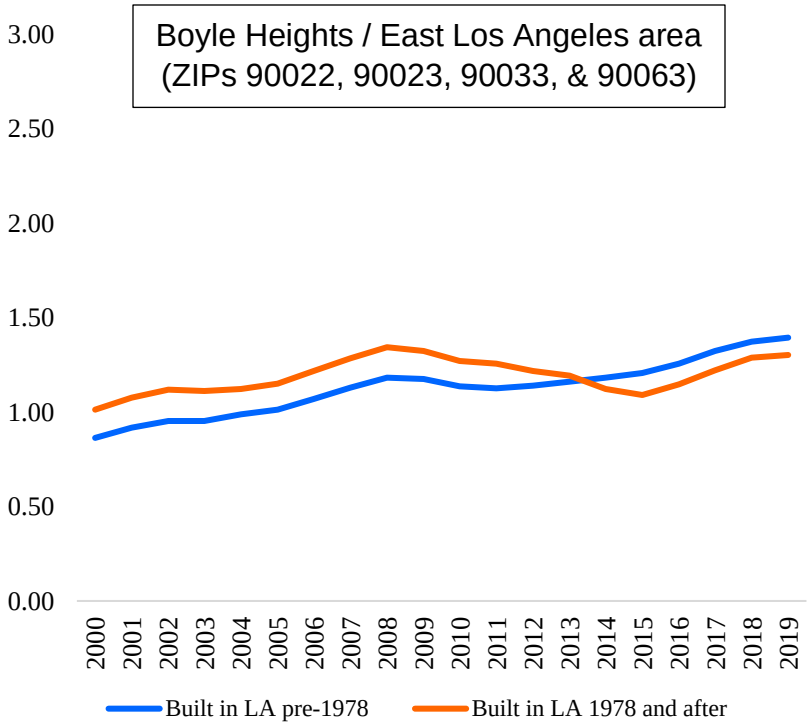
Figures 7c, d.

Monthly Asking Rent per Square Foot ($) for a 1 BD rental unit (2000-2019)

Non-RSO versus RSO, in the City of Los Angeles



Source: Author calculations using CoStar Group, Inc., data
n for buildings in LA pre-1978 is: 356 in year 2000Q1 and 356 in year 2019Q1
n for buildings in LA 1978 and after is: 74 in year 2000Q1 and 86 in year 2019Q1

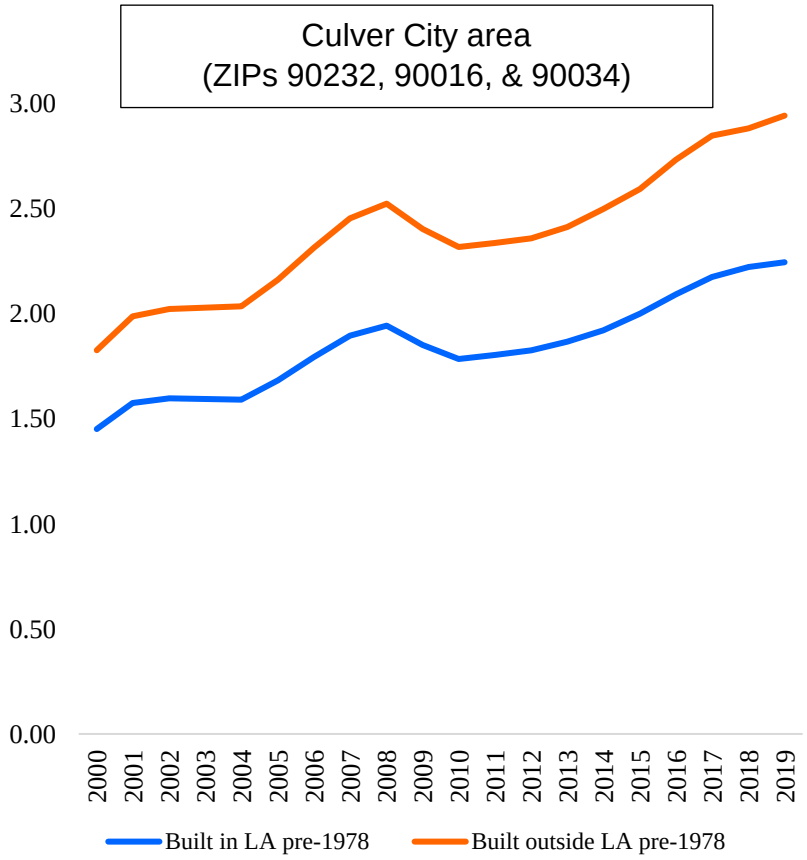


Source: Author calculations using CoStar Group, Inc., data
n for buildings in LA pre-1978 is: 126 in year 2000Q1 and 126 in year 2019Q1
n for buildings in LA 1978 and after is: 12 in year 2000 and 19 in year 2019Q1

Figure 7e.

Monthly Asking Rent per Square Foot ($) for a 1 BD rental unit (2000-2019):

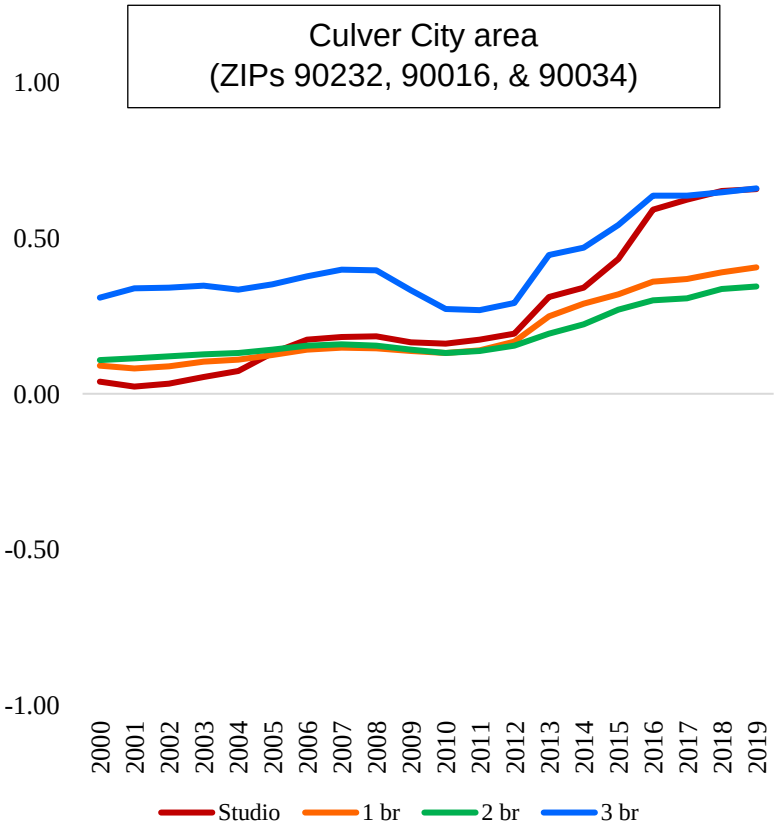
RSO-eligible (*outside* City of Los Angeles) versus RSO (*within* City of Los Angeles)



Source: Author calculations using CoStar Group, Inc., data
n for buildings in LA pre-1978 is: 185 in year 2000Q1 and 186 in year 2019Q1
n for buildings outside LA pre-1978 is: 14 in year 2000Q1 and 14 in year 2019Q1

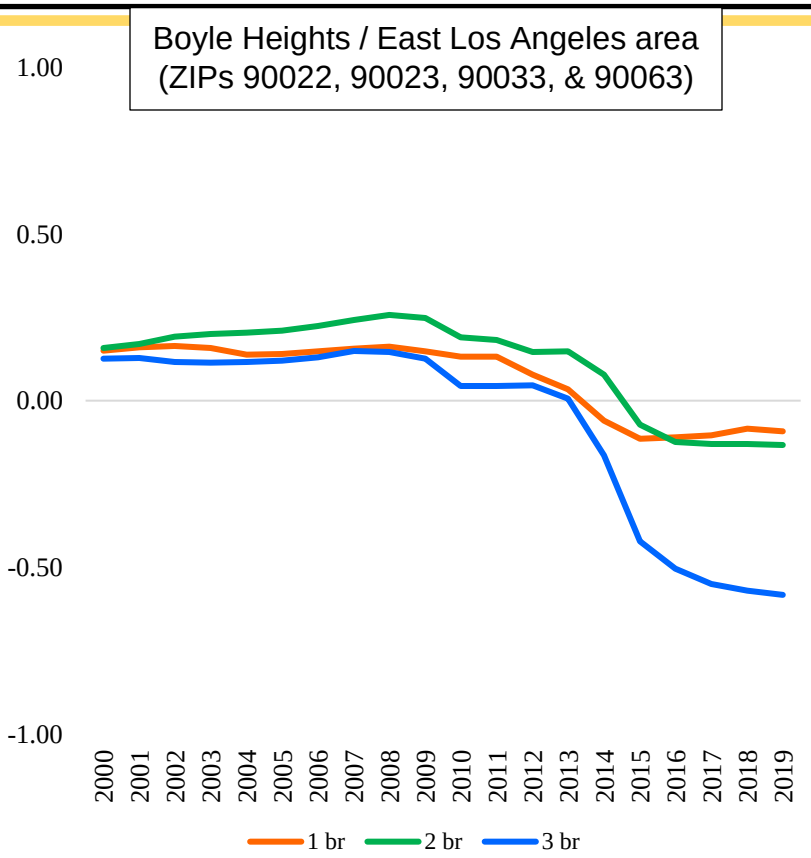
Figures 7f,g.

Gap between Monthly Asking Rent per Square Foot ($) by Bedroom Type rental unit (2000-2019): Non-RSO *minus* RSO in City of Los Angeles



Source: Author calculations using CoStar Group, Inc., data

n for RSO in 2000Q1 is: 82 for studio; 185 for 1 br; 145 for 2 br; and 34 for 3 br
n for RSO in 2019Q1 is: 82 for studio; 185 for 1 br; 145 for 2 br; and 33 for 3 br
n for non-RSO in 2000Q1 is: 16 for studio; 56 for 1 br; 74 for 2 br; and 11 for 3 br
n for non-RSO in 2019Q1 is: 21 for studio; 64 for 1 br; 83 for 2 br; and 13 for 3 br



Note: Studios are excluded in this chart because of insufficient data

Source: Author calculations using CoStar Group, Inc., data

n for RSO in 2000Q1 is: 48 for 1 br; 30 for 2 br; and 9 for 3 br

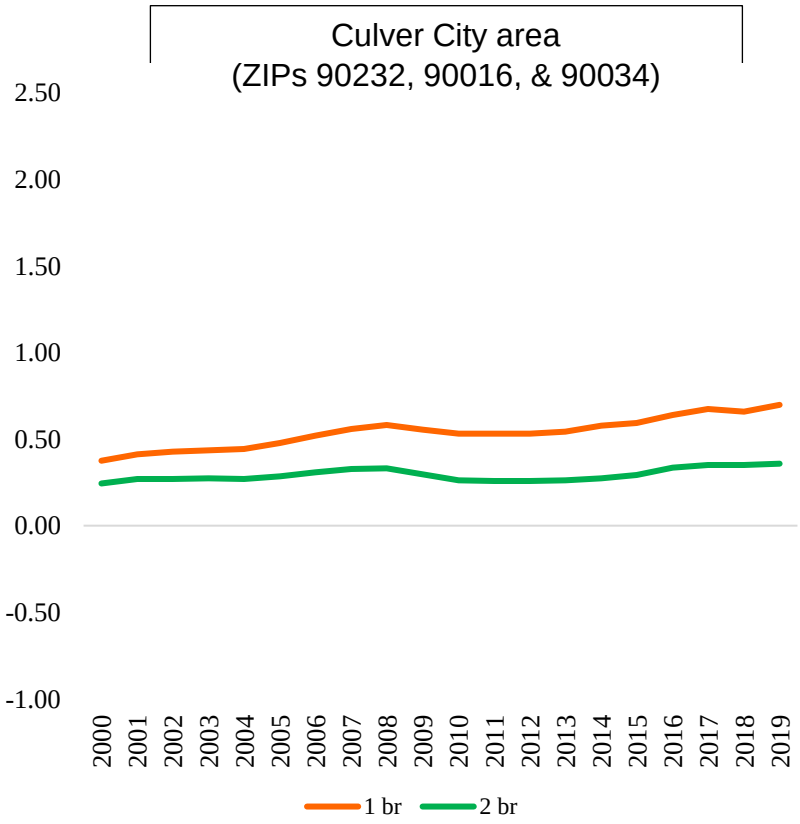
n for RSO in 2019Q1 is: 48 for 1 br; 30 for 2 br; and 9 for 3 br

n for non-RSO in 2000Q1 is: 7 for 1 br; 11 for 2 br; and 5 for 3 br

n for non-RSO in 2019Q1 is: 12 for 1 br; 19 for 2 br; and 12 for 3 br

Figure 7h.

Gap between Monthly Asking Rent per Square Foot ($) by Bedroom Type rental unit (2000-2019): RSO-eligible (*outside* City of Los Angeles) *minus* RSO (*within* City of Los Angeles)



Note: Studios and 3-bedrrom units are excluded in this chart because of insufficient data

Source: Author calculations using CoStar Group, Inc., data

n for RSO in 2000Q1 is: 185 for 1 br; 145 for 2 br
n for RSO in 2019Q1 is: 185 for 1 br; 145 for 2 br
n for RSO-eligible in 2000Q1 is: 14 for 1 br; 12 for 2 br
n for RSO-eligible in 2019Q1 is: 14 for 1 br; 12 for 2 br

Chapter 8: Is New Residential Construction Located Near Rail Stations? Where? And How Much?

Key Questions

- How many new building permits have been issued in City of Los Angeles and unincorporated Los Angeles County?
- Where are building permits being issued relative to LA Metro rail stations?

Chapter Takeaways

- From 2013-2019, 60,179 net new dwelling units were permitted in the City of Los Angeles, and 2,554 in unincorporated Los Angeles County.
- This reflects about 10,350 net new units annually, with data available for 50% of the County.
- About 40% of net new units (24,176) were permitted within a half-mile of LA Metro Rail stations, with data available for about 60% of the LA Metro Rail system.
- The Red, Blue, and Purple Lines saw the most new units, while the Green and Gold saw the least.
- New units near LA Metro Rail stations were permitted at a rate 4.6 times higher than matched Control Areas.
- Eleven stations clustered in 3 neighborhoods (Downtown LA, Koreatown, Hollywood) accounted for 70% of new units along the whole LA Metro rail system from 2013-2019.

Data & Methods

Net new residential dwelling units is measured using building permits issued for new construction, addition and rehabilitation, subtracting permits issued for demolition. The analyses use publicly available data from the City of Los Angeles and the unincorporated portion of Los Angeles County, from 2013-2019. This covers about 50% of the County. Data are not publicly available for other cities in Los Angeles County. The locations of the new units were overlaid on neighborhoods near LA Metro Rail stations to see the pattern of development around the rail system.

Have LA Metro rail stations attracted new building activity? This chapter explores the pattern of residential building permits in the City and County of Los Angeles with a focus on areas near rail stations.

Building permit data from the City and County Open Data platforms were used to characterize the net new dwelling units permitted. The focus here is on the recent, post-Recession time period from 2013 to March 2019, which coincides with data that are publicly available. The Department of Building Services of the City of Los Angeles approves plans and provides building permits within its city boundary, home to about 4 million people (about 40% of the County). Similarly, the Public Works Department of Los Angeles County provides building permits for unincorporated portions of the County, home to about 1 million people (about 10% of the County). Data for other incorporated cities within Los Angeles County are not publicly available through open-data sources.

The analyses below focus on permit types that entail a change in the number of dwelling units, including permits for new buildings, additions to existing buildings, alternations or repairs, or demolitions. Non-demolition building permits with attributed costs below $20,000 are excluded, as a review of permit data indicated such permits are unlikely to be associated with the addition or elimination of a new dwelling unit. Each building permit is geocoded using parcel record geographic coordinates. Building permits are considered within a rail area neighborhood if they are within a half-mile of a LA Metro rail station and within a matched control area if they are within a half-mile of a control intersection.

Figure 8a shows that in the 6.25 years from 2013 to March 2019, City of Los Angeles permitted a net change of 60,179 residential dwelling units – approximately 10,000 per year. Unincorporated parts of Los Angeles County added an additional net 2,111 residential units during that time period, or 350 per year. In total, these figures indicate an average of 10,350 net new units added for an area that covers about half the population of Los Angeles County.

Table 8a.

Title: Change in Dwelling Units (DUs) by Building Permit Type by Year (2013-2019)

All of City of Los Angeles

Year	Change in DUs: New Buildings	Change in DUs: Building Additions	Change in DUs: Alterations/ Repairs	Change in DUs: Demolitions	Change in DUs: Total	Ratio of Created Units to Demolished Units
2013	8,682	107	453	-1,095	8,147	8.4
2014	10,876	252	142	-1,589	9,681	7.1
2015	11,454	153	171	-1,725	10,053	6.8
2016	5,468	141	151	-1,806	3,954	3.2
2017	14,231	545	484	-2,449	12,811	6.2
2018	13,985	843	389	-2,604	12,613	5.8
2019	3,525	-1	58	-662	2,920	5.4
	68,221	**2,040**	**1,848**	**-11,930**	**60,179**	**6.0**

Source: Author calculations using City of Los Angeles open data

All of Unincorporated Los Angeles County

Year	Change in DUs: New Buildings, Additions, and Alterations/Repairs	Change in DUs: Demolitions	Change in DUs: Total	Ratio of Created Units to Demolished Units
2013	1,055	-83	972	12.7
2014	346	-90	256	3.8
2015	196	-48	148	4.1
2016	160	-50	110	3.2
2017	491	-100	391	4.9
2018	306	-72	234	4.3
	2,554	**-443**	**2,111**	**5.8**

Source: Author calculations using Los Angeles County open data

California and Los Angeles County have been underbuilding new units, relative to population growth and household formation, for the past three decades.[54] According to a 2015 California Legislative Analyst Office report, between 1980 and 2010, Los Angeles County had an estimated need of 55,000 new units per year to keep up with population growth.[55] During this time, Los Angeles County actually permitted and built just shy of 20,000 per year during that time period, resulting in a gap of 35,000 units per year. Since 2010, demand for additional units in the County has continued to increase.

Has the building activity in Los Angeles County analyzed here made a dent on decades of underbuilding? In the 50% of the County with available data, about 10,350 new units were built annually from 2013-2019. If the remaining 50% of the County also built as many new units, then the total 20,700 annually is very similar to the amounts built between 1980 and 2010. Under this assumption, the net new building activity has not kept up with need. If the remaining parts of the County built less than assumed, the gap between need and supply is even greater. It is possible that the suburban areas of the County built more than their fair population share. Yet given the analysis of where new units were built along the rail system (Figure 8c and Table 8d below) this is unlikely.

[54] McKinsey Global Institute (2016) "A TOOL KIT TO CLOSE CALIFORNIA'S HOUSING GAP: 3.5 MILLION HOMES BY 2025". https://www.mckinsey.com/featured-insights/urbanization/closing-californias-housing-gap ; Taylor, M. (2015) "California's High Housing Costs. Causes and Consequences". California Legislative Analyst Office.
[55] Taylor, M. (2015) "California's High Housing Costs. Causes and Consequences". California Legislative Analyst Office. Figure 8.

Table 8b.

Title: Change in Dwelling Units (DUs) by LA Metro Rail Line for Station Areas and Control Areas (2013-2019)

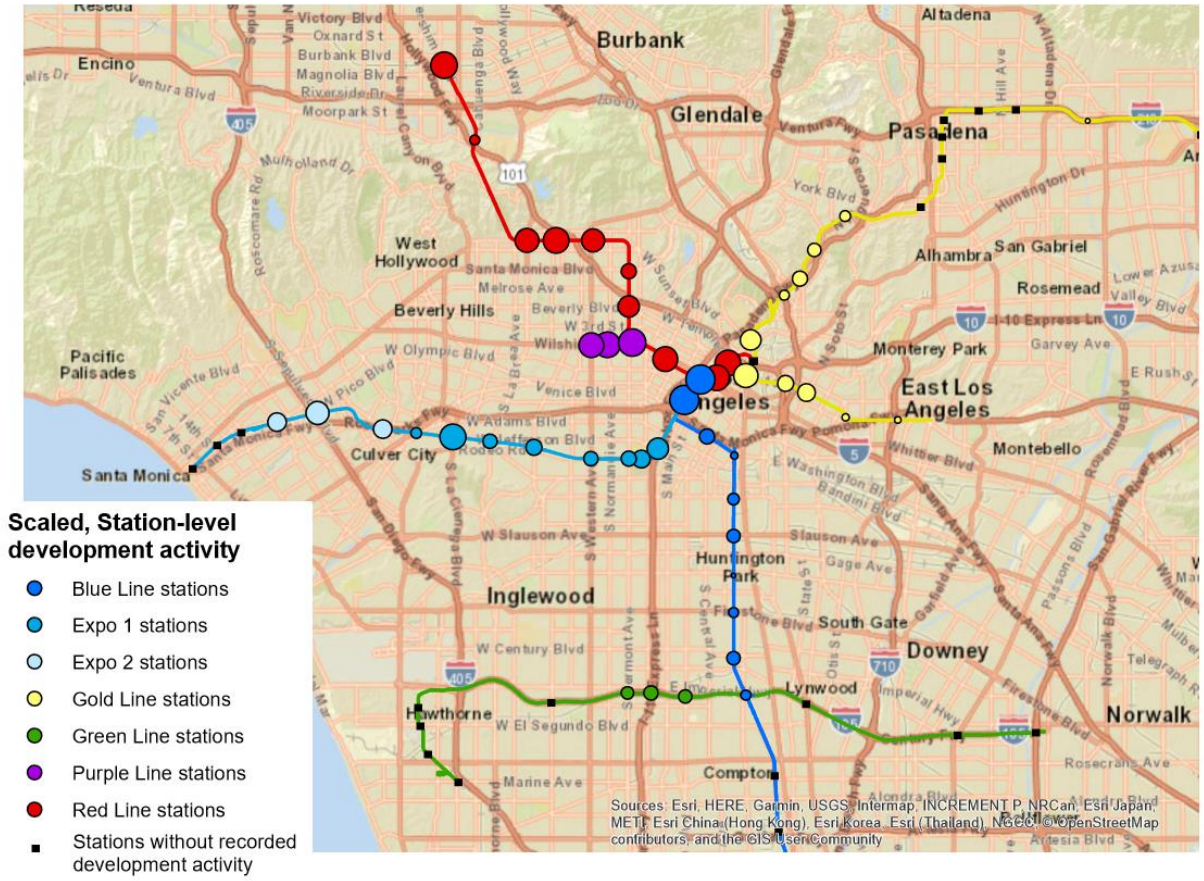
Rail Line	Change in DUs: Station Area	% of Station Areas with Available Permits Data	Change in DUs: Control Areas	% of Control Areas with Available Permits Data	Ratio of Station to Control Areas
Blue	6,846	50%	458	28%	14.9
Expo 1	2,034	90%	735	89%	2.8
Expo 2	993	57%	382	57%	2.6
Gold	1,394	50%	773	50%	1.8
Green	125	31%	-614	23%	*not applicable*
Purple	4,231	100%	781	100%	5.4
Red	8,553	100%	2,702	92%	3.2
Whole System	**24,176**	**60%**	**5,217**	**53%**	**4.6**

Of the approximately 62,000 net new units permitted in the City and unincorporated County since 2013, 24,176 (approximately 40 percent) were within a half-mile of a rail transit station, as shown in Table 8b. (Note that due to data limitations, Table 8b only shows the portion of the LA Metro system that is within the City of Los Angeles or unincorporated Los Angeles County.) The largest number of new units were near the Red/Purple and Blue Lines, and generally the permitting in the station neighborhoods exceeds the level in the matched control neighborhoods. Note that, in some cases, the control neighborhoods are not in the City or County databases and so the comparison, by rail line, will include both station and control areas that have sometimes partial data. The percent of station and control neighborhoods in geographies for which data are available is shown in Table 8b.

Building activity as measured via permits is five times as high within one half-mile of Purple Line stations as in the matched control neighborhoods. Similarly, along the Red and Expo 1 lines, with about 90% of the area covered in the datasets, rail areas had 3.2 and 2.8 times more permits than matched control areas. Even in areas with limited data coverage, the trend still indicates greater permitting activity and net increases in dwelling units near rail stations. This suggests that neighborhoods in the immediate vicinity of LA Metro rail stations are capturing a sizable portion of net new units in the County. But the permitting activity is clustered tightly around a small number of LA Metro rail stations, as the map in Figure 8c and the data in Figure 8d show.

Figure 8c.

Title: Change in Dwelling Units (DUs) by LA Metro Rail Station (2013-2019)



Note: Visual depictions of station areas with identified development activity are logarithmically scaled (base 10) to portray changes in dwelling units within a half-mile of station area from 2013 to 2019. Station areas without identified development activity are depicted using black squares.

Source: Author calculations using City of Los Angeles and Los Angeles County open data

Table 8d.

Title: Neighborhoods near LA Metro Rail Stations with Major Clusters of Permitting Activity

Major Permitting Clusters	Net Change in DUs
Greater Downtown LA (7th and Metro Center, Pico station, Pershing Square, Civic Center / Grand Park, Little Tokyo / Arts District)	10,320
Koreatown (Wilshire / Western, Wilshire / Normandie, Wilshire / Vermont)	4,231
Hollywood (Hollywood / Highland, Hollywood / Vine, Hollywood / Western)	2,750
Rest of System	6,875
Systemwide	24,176

Source: Author calculations using City of Los Angeles and Los Angeles County open data

Per Figure 8c and Table 8d, eleven LA Metro stations, clustered in downtown Los Angeles, Koreatown, and Hollywood, account for 17,301 of the 24,176 net residential building permits issued near LA Metro stations since 2013. While some stations do not have available data (if those stations are outside of both the City of Los Angeles and not within unincorporated County land), the clustering of residential development in three locations is likely not an artifact of missing data. Of the residential building permits available in the data, 70 percent of the new units along the LA Metro system are near eleven stations.

Eight of those eleven stations are on the heavy rail Red/Purple Line, which has the highest capacity and so is a good site for residential development. The other two stations are on the Expo and Gold Lines near downtown. Overall, the pattern of strong clustering suggests success in building residential units in a few locations along the LA Metro system, and considerable missed opportunities elsewhere. The permitting activity along the Expo, Gold, and Blue Lines lags considerably. The Green Line, being in the middle of a freeway, may not be as promising of a location for new residential development.

Chapter 9: Policy Directions

Rents in both rail and non-rail control neighborhoods have grown at average annual rates above 3% since 2013. Low-income households in both rail and control neighborhoods move often – on average, a fifth or more of low-income households in these neighborhoods move each year. Those moves usually do not leverage the opportunities in the growing LA Metro rail system. In 2015, nearly ¾ of movers from a neighborhood within 0.5 miles of a rail station relocated to a neighborhood without nearby (half-mile) rail transit access. Considering that households who live near rail stations drive less and take transit more, these relocations reduce transit access for these moving households and likely increase their driving and consequently their environmental footprint. These results paint a picture of a city with a widespread housing instability crisis, and a rail transit system that is more a large missed opportunity than a root cause of that housing crisis.

For some rail lines – particularly the Red/Purple and the Gold Lines – low-income households move out at higher rates after a rail station opens. But when that effect is statistically significant, the increased "move-out" rate is about one tenth the size of the baseline (no rail system) move-out rate. Low-income move-out rates in many control group (no rail) neighborhoods are similar to the move-out rates in rail neighborhoods.

What is to be done? This chapter discusses policy options, focusing both on policies that can improve housing security throughout Los Angeles City and County and policies that are tailored to rail station neighborhoods. Given the widespread nature of the City's and County's housing crisis, and the unique opportunities near rail stations, policymakers should focus on both kinds of programs. This list is not meant to be exhaustive. Rather, it represents a jumping off point for future discussions about a possible menu of policy actions one might enact to make a dent in the City's and County's housing challenges.

Build more: Building more new housing units in rail station neighborhoods is one way to potentially stem the baseline move churn and enable more existing households to stay in rail-proximate neighborhoods. Evidence in this report suggests that rail neighborhoods accounted for 39 percent of all new residential units permitted since 2013, where data is available. Yet, the lion's share of these new permitted units is clustered in just three neighborhoods (downtown Los Angeles, Hollywood, Koreatown) near 11 rail stations. This leaves out major geographic swaths of Los Angeles City and

County near the remaining 82 LA Metro stations. Building more near rail transit will be an important part of policy solutions, but new residences need to be spread across a wider area.

Build more affordable units in rail station neighborhoods: Low-income households are more likely to use transit for trips to work, school, shopping, seeing family, or attending religious services.[56] As a group, low-income households move most often, but they do not move very far: median move distances are about 3-4 miles for households with incomes below 80% of AMI. Nevertheless, even this distance often puts households away from rail transit access. Building and preserving more housing affordable for households with incomes below 80% of AMI near rail may prevent some of these frequent moves or provide more near-rail locations for low-income moving households.

The City of Los Angeles' Transit Oriented Communities Affordable Housing Incentive Program, passed as part of measure JJJ in 2016, is an example of a program designed to incentivize affordable housing near rail transit.[57] This program allows higher unit density, larger buildings (higher floor area ratio), and/or reduced parking requirements relative to existing zoning in return for including rent-restricted affordable units in near-transit developments. This program is in effect within 0.5 miles of high-frequency transit stations within the City of Los Angeles. Early indications show that this program has been effective at producing new residential units and new affordable units near LA Metro rail, accounting for 17,687 proposed units of which 20% are affordable.[58] Expanding this program or providing other incentives for affordable housing near transit may help increase the provision of affordable units throughout the system.

Increase subsidies for affordable housing: Half of renter households in California are rent burdened, meaning they pay more than 30% of their income toward rent.[59] Nationally, one-third of households who need affordable housing cannot find an affordable home either in the private market or through government assistance.[60] The situation in Los Angeles City and County is likely at least as dire, suggesting a pressing need to expand the housing safety net. This would include increased funds to build more affordable units. Those could come from real estate transfer taxes, parcel taxes, other special assessments, or bond issues. The specifics of those different taxes vary, and we note that endorsing a particular funding source would require more analysis than we have provided here. But Los Angeles greatly needs additional funds to provide both more affordable units and housing assistance to low-income households. Over the past several decades, public resources for affordable housing have dwindled, particularly at the federal level.[61] The problem of housing affordability and security in Los Angeles rail transit neighborhoods cannot be separated from the need to increase funding for affordable housing assistance more broadly.

Improve the transit system away from rail stations: The LA Metro bus system has been losing ridership for the past several years, possibly reflecting slow travel speeds (as busses are increasingly stuck in street traffic) or limited service.62 Because households with incomes below 80% of AMI move often,

[56] Boarnet et al. (2015).
[57] LA DCP (2018). https://planning.lacity.org/ordinances/docs/toc/TOCGuidelines.pdf
[58] LA DCP (n.d.). Housing Progress Reports
[59] Terner Center for Housing Innovation (2018)
[60] Dreier and Bostic (2016)
[61] Schwartz (2013)
[62] Manville, Taylor, and Blumenberg (2018)

transit policy should focus on improving transit access in non-rail neighborhoods. Given the frequency of low-income moves and the fact that three-quarters of such moves are away from rail transit neighborhoods, it is important the L.A. Metro focus on improving transit access throughout the system, including in non-rail neighborhoods.

Slow the pace of rent increases: Rapid increases in rent (housing costs) can be a trigger of moves. Rents per square foot have increased by 3.8% annually since 2013 in the 26 pairs of rail and non-rail control neighborhoods with available data in this report. Pre-recession increases were similarly 3.7% and 3.4% per year in rail and non-rail control neighborhoods, respectively. These rates exceeded the prevailing rates of inflation, meaning that these cost increases likely outstripped annual income increases for many families. Given this basic dynamic, policies that serve to limit rent increases could be helpful.

Rent control is a common approach to constrain rent increases. It does so explicitly, by capping the amount that rents can increase for units located in buildings covered by the policy. But rent control is also controversial. The cap is not applied based on the need of the renter; high income families can be beneficiaries. Also, property owners lose earning potential under a rent control program, which lowers the values of properties and thus lowers the incentive to build new units in rent control jurisdictions. This might be a "glass half full" versus "glass half empty" situation, though. There is research that has argued that rent control regulations reduce the long-run supply of affordable housing and are not well targeted to low-income households, but that rent control may help stabilize housing outcomes for those low-income households who are able to get a controlled unit.63 So rent control may simultaneously impart benefits and costs.

Four cities in Los Angeles County have had policies to curb rent increases throughout the period that rents were analyzed in this report (2000-2019): Los Angeles,64 Santa Monica,65 West Hollywood,66 and Beverly Hills.67 While each city's policy differs, they generally regulate older multifamily rental units – those built prior to 1978 in Los Angeles and prior to 1995 in the other three cities. In 2018 and 2019, allowed rent increases for occupied units are capped at from 2 to 4 percent, depending on the details of the regulation in each city.

This suggests that rent-control policies in Los Angeles, Santa Monica, West Hollywood, Beverly Hills, and now unincorporated Los Angeles County68 can be binding on the current levels of growth, meaning they are possibly effective at slowing rent increases in rail-proximate neighborhoods. Moving forward, we must be mindful of how these restrictions affect long-run supply. Newer rent-cap policies, in the cities of Inglewood, Glendale, and Long Beach, cap rent increases at from 5 to 10 percent per year, as does the recently passed California AB 1482. Those more lax caps allow rent increases that exceed the average

[63] Sturtevant (2018); Diamond, McQuade, and Qian (2018); Diamond, McQuade, and Qian (2019)
[64] Los Angeles City Rent Stabilization Ordinance https://hcidla.lacity.org/tags/rent-stabilization-ordinance
[65] Santa Monica's Rent Control Law and Regulations https://www.smgov.net/Overview.aspx
[66] West Hollywood Rent Stabilization https://www.weho.org/city-government/rent-stabilization-housing
[67] Beverly Hills Rent Stabilization http://www.beverlyhills.org/departments/communitydevelopment/bhrent/
[68] Los Angeles County temporary rent stabilization ordinance http://dcba.lacounty.gov/rentstabilization-ordinance/

rent increases in near-rail Los Angeles neighborhoods even in periods of rapid rent inflation, and thus may not be binding on landlords.69

While we do not rule out carefully tailored rent caps, we caution that the high move rates in both rail and control neighborhoods suggest a widespread housing insecurity issue. In addition to policies that expand supply and affordability, rent caps, if applied, should be tailored more to allow or encourage long-term leases and other forms of long-term rental stability when that is desired by households. Such a focus on long-term housing stability, combined with increased funds for housing assistance, may be more effective at providing housing security – and hence neighborhood stability – than simply capping rents.

Build to the current zoning potential: Building more multifamily units would help ease housing price pressures. According to a 2016 estimate, Los Angeles County has over 5,600 vacant parcels zoned for multifamily use.70 If these were built up to their allowable use, this could add over 32,000 and up to 75,000 units. Some of these parcels are within 0.5 miles of LA Metro rail stations.

In addition, many multifamily parcels with existing buildings have fewer units than allowable by current zoning. In Los Angeles County, 28 percent of multifamily parcels use less than 50 percent of zoned unit capacity, according to a 2016 report.71 If existing structures were added on to or torn down and rebuilt up to the full zoning potential, these parcels could add up to 306,000 units to the County's housing stock. Many of these parcels are within 0.5 miles of LA Metro rail stations. While building within existing zoning cannot alleviate Los Angeles' shortage of housing units relative to demand, we note that there are locations in the city where even the existing, often stringent, zoning allows more housing to be built.

Upzone: In 1960, the City of Los Angeles was zoned for a population capacity of 10 million and had a population of 2.5 million, effectively a 25% zoning utilization rate.72 In 1990, the City had a zoned capacity of 3.9 million persons and a population of 3.5 million, effectively an 88% zoning utilization rate.73 What happened? From 1960 to 1990, neighborhood community plans downzoned the City. In 2010, the zoning utilization rate was 92%: 4 million persons living in a city with zoning capacity of 4.3 million.74

In contrast to this trend in Los Angeles, other U.S. cities have upzoned neighborhoods (New York City) or entire cities (Minneapolis, MN; Portland, OR). These efforts could spur more building activity. Targeted upzoning in rail neighborhoods in the City and County of Los Angeles as well as other jurisdictions, if

[69] Inglewood Rent Control https://www.kts-law.com/inglewood-rent-control-just-cause-eviction-policies-and-relocation-assistance-program/; Glendale Right to Lease Ordinance https://www.glendaleca.gov/home/showdocument?id=38112; Long Beach Tenant Relocation Assistance Ordinance http://longbeach.legistar.com/View.ashx?M=F&ID=7223356&GUID=15D897AC-3233-4C79-B56F-D5D71E83FFE6

[70] McKinsey Global Institute (2016) "A TOOL KIT TO CLOSE CALIFORNIA'S HOUSING GAP: 3.5 MILLION HOMES BY 2025". Pp. 9-11. https://www.mckinsey.com/featured-insights/urbanization/closing-californias-housing-gap

[71] McKinsey Global Institute (2016) "A TOOL KIT TO CLOSE CALIFORNIA'S HOUSING GAP: 3.5 MILLION HOMES BY 2025". Pp. 17-20. https://www.mckinsey.com/featured-insights/urbanization/closing-californias-housing-gap

[72] Morrow, G. (2013). Pp.3.

[73] Morrow, G. (2013). Pp.3.

[74] Morrow, G. (2013). Pp.3.

coupled with increases in affordable housing supply and efforts to help low-income households stay in rail neighborhoods, may reduce the high low-income move rates and reduce housing insecurity.

Short-term Rent Assistance: Households often move because of changes in income or household size.[75] Even small or short-term changes in monthly income can force a household move. Short-term rent assistance may help reduce the baseline move rate and keep households in their neighborhoods.

Currently, short-term rental assistance in Los Angeles County exists in a scattering of government, religious, and non-profit programs.[76] A more formalized Emergency Rental Assistance in the City of Chicago, for example, provides up to $900 in one-time grants to cover one month's rent for those suffering hardship such as job loss, home fire, or illness.[77] A formal city-wide or county-wide micro-loan at low interest rates may be a way to prevent moves sparked by one-time or emergency shortfalls, and reduce baseline mobility rates while increasing housing security in Los Angeles.

Concluding Thoughts: Policies to alleviate housing insecurity and increase affordability near Los Angeles rail transit stations should be informed by the following findings from this research:

Housing insecurity and affordability are city-wide, county-wide, and even statewide problems. Solutions for housing affordability near Los Angeles Metro rail stations should be cognizant of that broader context.

The effect of new rail transit on move rates is marginal at most, with no displacement effect across much of the system and for most income groups. Moreover, these effects are heterogeneous by station, timing, and income group across the LA Metro system.

More than a contributor to the challenges, the rail system represents a missed opportunity to alleviate some of the stresses that currently exist. There are at least two types of opportunities that have been missed. First, large parts of the LA Metro rail system have not seen much recent residential development, which could have helped reduce the existing shortfall in housing units. Second, residents near rail stations drive less and use transit more, and more affordable housing built near these stations could help support more sustainable travel and potentially help stabilize rapidly changing neighborhoods.

There is no single solution. Localities in Los Angeles County have underbuilt housing, relative to demand, for decades. Increasing supply will require changes to zoning codes and streamlined approvals in addition to incentives that can increase the supply of affordable housing near transit. The early results from the City's Transit-Oriented Communities program are encouraging. Supply expansion should be coupled with a focus on increased support for affordable housing – either by incentivizing or subsidizing those units or providing assistance to low-income households. Such supply and affordability efforts should also be tailored in ways that focus on reducing the already high move-rates in rail transit neighborhoods, allowing residents to stay in place longer and more commonly, and providing more options for low-income households to find secure housing in these neighborhoods.

[75] Rodnyansky, S. (2018).
[76] See for example this list of about 30 sources for short term rental assistance https://www.needhelppayingbills.com/html/los_angeles_rental_assistance.html
[77] Chicago Department of Family & Services. https://www.chicago.gov/city/en/depts/fss/provdrs/serv/svcs/how_to_find_rentalassistanceinchicago.html

Now more than ever, transportation and housing policy must be linked in Los Angeles. The fact that from 2013 to 2019 almost 40% of residential building permits in the City of Los Angeles were within 0.5 miles of a rail transit station suggests the importance of rail transit for housing policy in the City and County. Policy responses must be based on an understanding of housing needs throughout Los Angeles City and County, the advantages of near-transit living, and nuanced approaches that address housing insecurity both near and far from rail stations.

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Appendix

Appendix Figure 1. Map of Los Angeles County Metropolitan Transportation Authority Rail and Bus-Rapid Transit Lines

Source: LA Metro https://media.metro.net/documents/8f0fe43e-da3b-4a10-bd8e-4cfd54e30eb3.pdf

Appendix Table 2: Station and Control Neighborhood Locations and Descriptive Statistics by LA Metro Rail Line: Distance, Year Opened, Sample Size, Out-Mobility Rate, System and Station Characteristics

Blue Line Stations								
	Rail Station Name	Control Intersection	Station Opening Year	Miles between Treatment & Control Centroid	Rail Neighborhood		Control Neighborhood	
					Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
1	Anaheim Street	Santa Fe / Pacific Coast Highway	1990	1.6	9,685	21%	1,075	18%
2	Artesia	Long Beach Blvd / Greenleaf	1990	1.1	250	13%	3,097	17%
3	Compton	Compton / Bullis	1990	1.0	2,438	16%	7,070	17%
4	Del Amo	Central / University	1990	2.3	N/A	N/A	4,610	16%
5	Downtown Long Beach	2nd / Livingston	1990	3.1	10,024	28%	2,777	19%
6	5th Street	Cherry / 7th	1990	1.2	929	25%	3,152	32%
7	Florence	Avalon / 79th	1990	1.3	6,099	13%	N/A	N/A
8	Firestone	Firestone / State	1990	1.8	3,306	16%	3,586	21%
9	1st Street	Cherry / 7th	1990	0.0	1,343	23%	N/A	N/A
10	Grand / LATTC	Adams / Normandie	1990	1.8	268	21%	N/A	N/A
11	Pacific Avenue	2nd / Livingston	1990	0.0	1,713	26%	N/A	N/A
12	Pacific Coast Highway	Cherry / Pacific Coast Highway	1990	1.2	2,951	22%	2,709	22%
13	Pico	Vermont / Hoover	1990	0.0	3,713	27%	N/A	N/A
14	San Pedro Street	Jefferson / Avalon / San Pedro	1990	0.9	1,846	19%	3,412	13%
15	Slauson	Miles / Gage	1990	1.3	2,252	27%	1,802	19%
16	7th Street / Metro Center	San Pedro / 8th St	1990	0.0	5,898	23%	N/A	N/A
17	Vernon	Avalon / Vernon	1990	1.3	2,086	19%	9,580	14%
18	Washington	Slauson / Atlantic	1990	4.0	717	18%	6,577	10%
19	Wardlow	Orange / Bixby	1990	1.2	2,116	16%	6,895	17%
20	Willowbrook / Rosa Parks	Wilmington / Stockwell	1990	1.3	2,274	25%	5,911	15%
21	Willow	Willow / Cherry	1990	1.3	6,102	17%	2,591	18%
22	103rd Street / Watts Towers	Century / Avalon	1990	2.1	2,507	20%	3,654	17%
Expo Phase I Line Stations								
	Rail Station Name	Control Intersection	Station Opening Year	Miles between Treatment & Control Centroid	Rail Neighborhood		Control Neighborhood	
					Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
23	Culver City	Culver / Overland	2012	1.3	4,150	20%	2,637	18%
24	Expo / Crenshaw	Vernon / Crenshaw / Leimert	2012	1.3	1,487	16%	1,672	18%
25	Expo Park / USC	Vermont / Vernon	2012	0.0	52	35%	N/A	N/A
26	Expo / Vermont	Vermont / Vernon	2012	1.0	1,863	21%	5,103	13%
27	Expo / Western	Western / Vernon	2012	1.0	4,095	15%	5,103	13%
28	Farmdale	Adams / Arlington	2012	1.7	1,490	12%	7,872	15%
29	Jefferson / USC	Main / Vernon	2012	1.3	4,733	28%	3,139	16%

30	Expo / La Brea / Ethel Bradley	La Brea / Washington	2012	1.2	8,017	16%	2,996	17%
31	La Cienega / Jefferson	Pico / Fairfax	2012	1.8	1,137	14%	2,961	18%
32	LATTC / Ortho Institute / 23rd St	Adams / Normandie	2012	1.5	632	48%	3,391	23%
Expo Phase II Line Stations								
	Rail Station Name	**Control Intersection**	**Station Opening Year**	**Miles between Treatment & Control Centroid**	**Rail Neighborhood**		**Control Neighborhood**	
					Adjusted Baseline Population	**Out-Mobility Rate**	**Adjusted Baseline Population**	**Out-Mobility Rate**
33	Expo / Bundy	Bundy / Wilshire	2016	1.2	1,475	20%	3,457	38%
34	Expo / Sepulveda	Westwood / Santa Monica	2016	0.0	1,203	20%	N/A	N/A
35	Palms	Palms / Sepulveda	2016	1.2	16,027	23%	3,250	29%
36	Downtown Santa Monica	Rose / Pacific	2016	1.5	3,488	24%	1,732	32%
37	17th Street / SMC	Montana / 14th	2016	1.1	914	32%	12,081	17%
38	26th Street / Bergamot	Venice / Lincoln	2016	2.5	7,610	19%	2,163	18%
39	Westwood / Rancho Park	Beverwil / Pico	2016	1.9	5,903	21%	4,937	17%
Gold Line East LA Branch Stations								
	Rail Station Name	**Control Intersection**	**Station Opening Year**	**Miles between Treatment & Control Centroid**	**Rail Neighborhood**		**Control Neighborhood**	
					Adjusted Baseline Population	**Out-Mobility Rate**	**Adjusted Baseline Population**	**Out-Mobility Rate**
40	Atlantic	Garfield / Riggin	2009	1.4	1,772	13%	2,087	11%
41	East LA Civic Center	Beverly / Garfield	2009	1.4	1,516	13%	2,526	17%
42	Indiana	Olympic / Ditman	2009	1.1	4,254	16%	2,748	13%
43	Little Tokyo / Arts District	7th and Santa Fe	2009	1.2	2,740	28%	168	45%
44	Mariachi Plaza / Boyle Heights	Olympic / Lorena	2009	2.1	1,676	19%	3,892	15%
45	Maravilla	Olympic / Atlantic	2009	1.3	1,803	16%	2,151	11%
46	Pico / Aliso	Soto / 8th	2009	1.4	366	20%	1,235	20%
47	Soto	City Terrace / Pomeroy	2009	1.3	7,587	13%	6,376	13%
Gold Line Foothill Extension Stations								
	Rail Station Name	**Control Intersection**	**Station Opening Year**	**Miles between Treatment & Control Centroid**	**Rail Neighborhood**		**Control Neighborhood**	
					Adjusted Baseline Population	**Out-Mobility Rate**	**Adjusted Baseline Population**	**Out-Mobility Rate**
48	Arcadia	Duarte / Baldwin	2016	1.9	895	19%	6,194	18%
49	APU / Citrus College	Baseline Rd / Citrus	2016	1.1	524	28%	2,381	12%
50	Azusa Downtown	Azusa / Gladstone	2016	1.5	1,739	13%	2,778	21%
51	Duarte / City of Hope	Mountain / Huntington	2016	1.2	2,995	18%	636	24%
52	Irwindale	Vincent Ave / Cypress St	2016	2.3	N/A	N/A	1,988	12%
53	Monrovia	Myrtle / Foothill	2016	1.3	1,506	19%	1,923	14%
Gold Line Pasadena Branch Stations								
		Control Intersection			**Rail Neighborhood**		**Control Neighborhood**	

	Rail Station Name		Station Opening Year	Miles between Treatment & Control Centroid	Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
54	Allen	Washington / Allen	2003	1.2	1,666	22%	2,155	13%
55	Chinatown	Sunset / Echo Park	2003	1.5	4,970	21%	2,931	23%
56	Del Mar	California / Allen	2003	2.0	987	35%	539	20%
57	Fillmore	Huntington / Garfield / Atlantic / Los Robles	2003	2.0	1,118	34%	1,572	22%
58	Highland Park	York / Avenue 50	2003	1.1	9,581	17%	3,214	15%
59	Heritage Square	Huntington / Soto	2003	1.3	1,922	16%	990	18%
60	Lake	Lake / Washington	2003	1.2	2,311	24%	5,844	16%
61	Lincoln Heights / Cypress Park	Cypress / Division	2003	1.7	4,827	19%	1,863	12%
62	Memorial Park	Fair Oaks / Washington	2003	1.4	5,635	26%	5,473	15%
63	Sierra Madre Villa	California / Rosemead	2003	1.0	1,361	20%	968	23%
64	South Pasadena	Huntington / Main	2003	1.4	5,871	17%	2,449	17%
65	Southwest Museum	Eastern / Huntington	2003	1.8	1,605	21%	6,847	15%

Green Line Stations

	Rail Station Name	Control Intersection	Station Opening Year	Miles between Treatment & Control Centroid	Rail Neighborhood		Control Neighborhood	
					Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
66	Avalon	Avalon / 135th	1995	1.3	2,588	14%	1,658	17%
67	Aviation / LAX	Hawthorne / El Segundo	1995	1.7	672	31%	17,380	20%
68	Crenshaw	Crenshaw / Century	1995	1.4	998	15%	941	60%
69	Douglas	Rosencrans / Hawthorne	1995	1.8	316	19%	3,137	20%
70	El Segundo	Main / Grand in El Segundo	1995	1.7	N/A	N/A	4,943	16%
71	Harbor Freeway	Vermont / Century	1995	1.3	3,707	17%	3,359	16%
72	Hawthorne / Lennox	La Brea / Arbor Vitae	1995	1.3	2,747	15%	9,541	11%
73	Lakewood Boulevard	Paramount / Stewart and Gray	1995	1.5	2,732	12%	2,682	20%
74	Long Beach Boulevard	Atlantic / Imperial	1995	1.6	7,663	17%	2,992	12%
75	Mariposa	Aviation / Arbor Vitae	1995	2.1	62	11%	386	35%
76	Norwalk	Pioneer / Rosecrans / San Antonio	1995	1.5	1,867	18%	9,174	22%
77	Redondo Beach	Sepulveda / Manhattan Beach Blvd	1995	1.6	186	41%	1,832	18%
78	Vermont / Athens	Vermont / 135th	1995	1.4	1,975	19%	2,248	16%

Purple Line Stations

	Rail Station Name	Control Intersection	Station Opening Year	Miles between Treatment & Control Centroid	Rail Neighborhood		Control Neighborhood	
					Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
79	Wilshire / Normandie	Pico / Western	1996	1.1	4,759	22%	3,712	25%
80	Wilshire / Vermont	Beverly / Rampart	1996	0.9	3,751	30%	5,099	19%
81	Wilshire / Western	Wilshire / La Brea	1996	2.0	17,631	21%	3,234	27%

Red Line Stations								
	Rail Station Name	Control Intersection	Station Opening Year	Miles between Treatment & Control Centroid	Rail Neighborhood		Control Neighborhood	
					Adjusted Baseline Population	Out-Mobility Rate	Adjusted Baseline Population	Out-Mobility Rate
82	Civic Center / Grand Park	1st / 2nd / Lucas / Beverly / Glendale	1993	1.0	1,270	36%	3,783	24%
83	Hollywood / Highland	Fairfax / Santa Monica	2000	1.5	2,269	38%	2,822	34%
84	Hollywood / Vine	Melrose / La Brea	1999	1.7	9,320	26%	1,768	26%
85	Hollywood / Western	Wilton / Santa Monica	1999	0.8	3,329	34%	2,834	25%
86	North Hollywood	Victory / Lankershim / Colfax	2000	1.4	9,681	25%	8,816	19%
87	Pershing Square	San Pedro / 8th St	1993	0.8	2,402	29%	1,500	28%
88	Universal City / Studio City	Ventura / Laurel Canyon	2000	1.9	1,176	41%	8,301	20%
89	Union Station	Main / Griffin	1993	1.5	177	40%	2,658	17%
90	Vermont / Beverly	Western / Beverly	1999	1.0	3,886	33%	14,337	19%
91	Vermont / Santa Monica	Sunset / Silver Lake	1999	1.2	9,574	17%	13,532	20%
92	Vermont / Sunset	Rowena / Hyperion	1999	1.4	2,139	26%	1,907	27%
93	Westlake / MacArthur Park	Venice / Hoover	1993	1.0	9,364	16%	3,652	22%

Source: Author calculations on FTB data

Appendix Table 3. Area Median Income by Year for the Los Angeles – Long Beach Metropolitan Statistical Area

Year	Area Median Income (AMI)	30% of AMI	50% of AMI	80% of AMI	150% of AMI
1993	$42,300	$12,690	$21,150	$33,840	$63,450
1994	$45,200	$13,560	$22,600	$36,160	$67,800
1995	$45,200	$13,560	$22,600	$36,160	$67,800
1996	$46,900	$14,070	$23,450	$37,520	$70,350
1997	$47,800	$14,340	$23,900	$38,240	$71,700
1998	$49,800	$14,940	$24,900	$39,840	$74,700
1999	$51,300	$15,390	$25,650	$41,040	$76,950
2000	$52,100	$15,630	$26,050	$41,680	$78,150
2001	$54,500	$16,350	$27,250	$43,600	$81,750
2002	$55,100	$16,530	$27,550	$44,080	$82,650
2003	$50,300	$15,090	$25,150	$40,240	$75,450
2004	$54,200	$16,260	$27,100	$43,360	$81,300
2005	$54,450	$16,335	$27,225	$43,560	$81,675
2006	$56,200	$16,860	$28,100	$44,960	$84,300
2007	$56,500	$16,950	$28,250	$45,200	$84,750
2008	$59,800	$17,940	$29,900	$47,840	$89,700
2009	$62,100	$18,630	$31,050	$49,680	$93,150
2010	$63,000	$18,900	$31,500	$50,400	$94,500
2011	$64,000	$19,200	$32,000	$51,200	$96,000
2012	$64,800	$19,440	$32,400	$51,840	$97,200
2013	$61,900	$18,570	$30,950	$49,520	$92,850
2014	$61,900	$18,570	$30,950	$49,520	$92,850
2015	$63,500	$19,050	$31,750	$50,800	$95,250

Source: U.S. HUD

Appendix Table 4:

Sample Size and Values for Transit and Auto Use by Households within and outside of Rail Station Neighborhoods

	Income Bracket	$0 to $9,999	$10,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	$75,000 to $99,999	$100,000 to $149,999	$150,000 or more	Total
Avg. Daily VMT per Household	Households within station area (1)	6.7	11.8	22.2	28.2	30.3	34.1	31.4	50.2	**24.4**
	Households outside station area (2)	13.7	25.3	28.1	32.9	40.9	44.2	54.2	55.6	**40.4**
	(1) - (2)	-7	-13.5	-5.9	-4.7	-10.6	-10.1	-22.8	-5.4	**-16**
Avg. Daily Rail Trips per Households	Households within station area (3)	0.25	0.22	0.39	0.18	0.27	0.09	0.14	0.02	**0.22**
	Households outside station area (4)	0.07	0.06	0.04	0.04	0.03	0.02	0.03	0.02	**0.03**
	(3) - (4)	0.18	0.16	0.35	0.14	0.24	0.07	0.11	0	**0.19**
Avg. Daily Bus Trips per Households	Households within station area (5)	1.3	1.1	1.1	0.6	0.2	0.2	0.2	0.05	**0.6**
	Households outside station area (6)	0.8	0.7	0.4	0.2	0.1	0.1	0.1	0.08	**0.2**
	(5) - (6)	0.5	0.4	0.7	0.4	0.1	0.1	0.1	-0.02	**0.4**
Number of Observations	Households within station area	69	138	85	87	103	64	58	47	**651**
	Households outside station area	591	1,721	1,130	1,585	2,456	2,158	2,484	2,014	**14,139**

Source: Boarnet et al. (2016) "Housing Affordability and Transit-Oriented Development in Los Angeles: A Challenge and an Opportunity," a report for the California Community Foundation. Data source is U.S. Department of Energy National Renewable Energy Laboratory (NREL) (2013); California Household Travel Survey (CHTS).