MODULE 3

Negative Effects of Housing Shortages on Housing Well-Being of Local Residents

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Abstract

This research brief addresses the impacts of housing shortages on housing attainments by residents in the nation's 50 largest metro areas, highlighting the four largest metros in California, San Francisco and San Jose in the Bay Area and, in southern California, Los Angeles-Orange County and the Inland Empire (Riverside-San Bernardino). We first address the definition and measurement of housing shortages, surveying the lack of consensus on best approaches, and developing two measures based on the disparity between job growth and housing permits. One addresses the recent 3-year trend and the other the cumulative post-Great Recession annual estimates of housing shortage. Analysis is then conducted through comparison of differences in the 50 largest metro areas in the U.S., bringing special attention to the Los Angeles region and the Bay Area. Emphasis in the report is placed on correlating shortages with the relative rental and ownership affordability of metro areas, and then linking both shortage and affordability to key measures of housing occupancy demand, principally household formation and homeownership attainment. We focus on adults in the entry ages for these housing attainments, comparing the impacts of shortages on metro residents who are white, Black, Hispanic/Latinx, and Asian. We explore major gaps or disparities between these groups. Major emphasis is given to the visualization of these many trends, highlighting the four major California metros so that their conditions can be seen in the context of the other large metros in the U.S.

INTRODUCTION

Housing shortages are now well-recognized as a problem in California. More recently, this has grown to be a problem across most of the larger urban areas in the nation. This report explores how the degree of housing shortage is linked to a number of measures of housing well-being in the California population. Shortages are generally assumed to be detrimental to the housing opportunities available in the state, but how can these negative effects best be quantified? And what are the implications of housing shortages for members of major race and ethnic (Hispanic and non-Hispanic) groups?

The approach taken in this research reported is to compare housing outcomes for residents in the nation's 50 largest metropolitan areas (MSAs), relating these outcomes to the relative housing shortage and level of affordability in each metropolitan area. The two largest metropolitan areas in California are Los Angeles-Anaheim and San Francisco-Oakland, representing the heart of southern and northern California, respectively. These two areas and their neighboring MSAs, San Jose and Riverside-San Bernardino, stand out in the national plots of housing well-being for their unfavorable circumstances, although the Riverside-San Bernardino MSA, widely termed the "Inland Empire," presents some unique advantages.

The first task is to develop a working definition of "housing shortage." We briefly review a number of alternatives used by professional and academic researchers and find little existing consensus. All measures seem inadequate to capture the practical meaning of "shortages" in local housing markets. The method with the widest acceptance computes the relative balance of housing and employment growth, and we settle on a particular formulation of the difference between the rate of new housing production and the rate of employment growth. The formulation relied upon in our study tests well in comparison to alternatives. It also enjoys an intuitive interpretation of measuring how much housing production is failing to keep up with employment growth.

Our next task is to define a set of indicators of aggregate housing well-being that can be compared between metropolitan areas. These are widely viewed as practical measures of per capita housing attainments and cover the broad contours of housing access. The indicators are rates of household formation and homeownership attainment, as well as a set of cost burden measures specific to both renters and homeowners. In order to compare different metros, it is necessary to control for key demographic differences. Accordingly, we also focus on the relevant indicators specific to key age groups, 25 to 34 for household formation, and 35 to 44 for homeownership attainment.[1] We also focus closely on the attainments of specific racial and ethnic groups, comparing the housing gaps of black and Latino groups, or of Asian-descent households, relative to the experiences of white, non-Hispanic, households in the same metropolitan area.

A vast amount of data can be assembled for all these groups in the 50 metro areas, and there are many variations to the various measures of housing attainment, as well as housing shortage. We have worked to winnow down this complexity, while still affording strong visual display of key dimensions compared across the 50 areas. We hope this compromise between detail and summary will prove a good balance and prove accessible to all readers.

DEFINING HOUSING SHORTAGE

Everyone knows a housing shortage when they see it. There are a great many surface indicators of shortage, including rapid rises in rents and sales prices, falling vacancies and time on the market, and number of contracts bid for each opening. More fundamentally, a "shortage" is a disparity between the growth in supply and demand. For our 50-metro analysis we need to measure both these factors.

In practice, the fact of a housing shortage is often inferred from indicators commonly measured in the industry, such as a shorter time on the market, Zillow's average days to pending, fewer months of supply

[1] Some people form households before age 25 and also buy homes before age 35, but we focus on the 10 years after these ages to more fully capture the success of the recent generation of young people. This slightly older age is consistent with recent trends in California and choosing it allows a more even comparison with housing attainments in other parts of the U.S.

(current inventory divided by sales per month), falling vacancy rates, rising jobs-housing ratios, offers received over asking price, or simply a sharp upward trend of house prices. Despite their indicative accuracy, these measures have several deficiencies. Often the measures only apply to for-sale housing, not rentals, or not the market as a whole. Commonly used indicators also resemble outcomes of shortage more than the inputs that create a shortage. We must bear in mind that a housing shortage is often formed by both deficient supply and excess demand, forming two blades of the scissors (Myers, Park and Cho., 2021).[2] If we knew the key ingredients for a shortage, not just indicators of its result, we might have better hope about curing the problem.

Even though housing shortage problems in California have been severe after the Great Recession, this is not just a current issue but also occurred with similar severity in the depression in the 1930s and after World War II. Demographers Philip Hauser and A.J. Jaffe (1947) suggested the need for housing shortage measurement by framing a problem of economic and social reconstruction after the war.[3] They introduced close consideration of the population factor into the assessment of housing needs, arguing that the need for housing units is more accurately indicated by "Family Formation" rather than the rate of population growth itself (which was very low at the time). This "families" perspective remained current through the baby boom years of the 1950s, as featured in Peter Rossi's well-known seminal study, "Why Families Move" (1955).

A recent California wake-up regarding the new crisis of housing shortage was issued in a report by the California Legislative Analyst's Office (2015) that assessed the spiraling price of homes for sale and estimated the number of additional housing units needed to curb cost increases relative to other states in the country.[4] For their modeling, they primarily focused on the differences in housing prices among counties in California. Even though they captured the endogeneity of house prices using a two-stage least square model, they overlooked key demographic and employment inputs, including household formation, homeownership rates and migration.

No consensus has emerged in the last few years about how to define or estimate housing needs in the private market or at any geographic scale. In addition to the LAO price-modeling estimates of shortage, Freddie Mac (2020) estimated housing shortages at the state level as the ratio of forecasted households to occupied housing units and accounting for vacancies.[5] They built their model around the concept of long-run or natural vacancy rates. If any state has a large difference between the estimated and the historical average vacancy rate, the state could be said to experience shortage problems. This study found a need for 3.3 million additional housing units in the nation, increasing their estimate from two years earlier by 800,000 units.

An alternate accounting framework developed at the University of Southern California by Myers, Park, and Li (2018) estimated shortages as the contraction of headship rates since 2000, the reduction of homeownership and diversion into rental competition, and the resulting unmet needs for rental housing. This housing-demographic method was first carried out for the state of California and then repeated at the county level for Los Angeles.[6] Results indicated need for a tripling of the rate of construction prevailing in 2017 and 2018.

A separate set of studies has focused on the balance of employment growth and housing permits for new construction. The National Association of Realtors produces a housing shortage tracker that covers 178 metro areas (2019).[7] The shortage tracker calculates the number of issued building permits relative to the

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[2] Dowell Myers, JungHo Park, and Seongmoon Cho (2021), Housing Shortages and the New Downturn of Residential Mobility in the US, Housing Studies. https://doi.org/10.1080/02673037.2021.1929860

[3] P.M. Hauser and A. J. Jaffe (1947), The Extent of the Housing Shortage. https://www.jstor.org/stable/1190114

[4] California Legislative Analyst's Office (2015), California's High Housing Costs: Causes and Consequences. https://lao.ca.gov/reports/2015/finance/housing-costs/housing-costs.aspx

[5] Freddie Mac (2020), The Housing Supply Shortage: State of the States. http://www.freddiemac.com/research/insight/20200227-the-housing-supply-shortage

[6] Dowell Myers, JungHo Park, and Janet Li (2018) How Much Added Housing is Really Needed in California? And Dowell Myers, JungHo Park, and Eduardo Mendoza (2018) How Much Added Housing is Really Needed in Los Angeles? https://sites.usc.edu/popdynamics/housing/

[7] National Association of Realtors (2019), Housing Shortage Tracker. https://www.nar.realtor/research-and-statistics/housing-statistics/housing-shortage-tracker

number of job increases. Both supply and demand are incorporated in this manner. Most recently, Myers, Park, and Cho (2021) incorporated employment growth and permits for new construction to represent both demand from core urban economic growth and the expansion of supply opportunities. This was the basis for a model that explained how housing shortages were constricting the normal process of residential mobility due to insufficient vacancy generation that would accommodate moves.

SHORTAGE ESTIMATION ADOPTED IN THIS STUDY

In this study we construct a new index of housing shortage that utilizes the widely available data on job growth in urban areas and housing construction permits in those same areas. Our definition of housing shortage is the difference between the rate of employment growth and housing permit increases in a metro area, measured as the percentage growth in employment less the percentage increase in housing. This has a simple interpretation as the degree to which local jobs are growing faster than housing is keeping up. To execute this concept, we compare growth over the last 3 years, 2017 through 2019, or alternatively on a cumulative basis for 8 years from 2012 through 2019, stopping before the pandemic disruption.

Employment growth is measured as the difference between the total employment in 2019 and the total in 2016. The growth rate is calculated as the percentage job increase for the three years between 2016 and 2019 relative to the level of employment in 2016.

Housing growth is measured through a different process, namely by summing the annual number of building permits for the consecutive three years from 2016 to 2018, applying a one-year lag to permits in order for them to represent construction available for occupancy in 2017 through 2019.[8] This summation of building permits is expressed as a percentage growth by dividing by the occupied housing units in 2016.

We then take the difference between the 3-year percentage employment growth and 3-year percentage housing growth, terming this our index of housing shortage. This has the intuitive explanation of measuring how well housing has kept up with the rate of employment growth in the three years before the pandemic. Larger positive numbers for the index formed by employment growth rate minus housing growth rate indicate a larger degree of housing shortage. An alternative version of this index cumulates the annual differences between job and housing growth for 8 successive years from 2012 through 2019. This cumulative shortage measure captures the growing deficits of the post-Great Recession decade.

The National Association of Realtors (NAR) Shortage Tracker has also utilized a definition of shortage based on employment and housing permits, as noted above, but their measure divides job growth by housing growth over the same 3-year period used in our method. They also apply their index to the 50 largest metro areas, with small variations from the sample used in our analysis. Calculations by our method can be compared to NAR's for the 47 metros shared in common in our samples (Appendix). On the surface, a jobs/housing ratio seems meaningful, and that concept is widely used in practice. However, a ratio between two very small numbers can be very large (e.g., 100 jobs added / 20 housing permits = 5) while in a difference calculation between growth rates this disparity could be negligible 0.50% job growth less 0.25% housing growth = 0.25. The entries for Cleveland and Pittsburgh in the Appendix, for example, illustrate the disparities of problem ranking that occur when these alternative methods are applied.

We can compare the two types of measures, the USC method of difference in growth rates for jobs and permits versus NAR's ratio of jobs and permits, by observing how they correlate with a few selected housing outcomes. Correlations of housing shortage with four different measures used later in our analysis are compared in Exhibit 1. The USC difference-based measure correlates much more strongly with every housing outcome than does NAR's ratio-based measure. This provides some validation for the chosen approach in this study.[9]

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[8] We assume a one-year lag for the completion of construction for occupancy, so construction 2017 through 2019 is represented by permits from the years immediately preceding, i.e., 2016 through 2018.

[9] Similar differences between the methods were observed for the several additional outcome measures tested but not summarized here.

Exhibit 1. Comparing Jobs-Housing Shortage Measures with Correlated Housing Outcomes (USC's growth differences versus NAR's jobs-housing ratios)

	USC Measures (% Job Growth minus % Permit Growth) 2017-2019			NAR Measures (Job Creation Divded by Total Permits) 2017-2019		
	Slope Coefficient	Std. Err.	R^2	Slope Coefficient	Std. Err.	R^2
Rental Cost Burden	1.11***	0.36	0.17	0.06	0.72	0.00
Price-To-Income	0.43***	0.11	0.25	0.46*	0.22	0.09
Headship Rate at 25-34	-1.87***	0.36	0.37	-0.96	0.82	0.03
Homeownership at 25-34	-1.37**	0.64	0.09	-1.02	1.22	0.02

Note: Largest 50 MSAs, excluding 3 MSAs for inconsistent definition between USC and NAR* p < 0.05, ** p < 0.01, *** p < 0.001

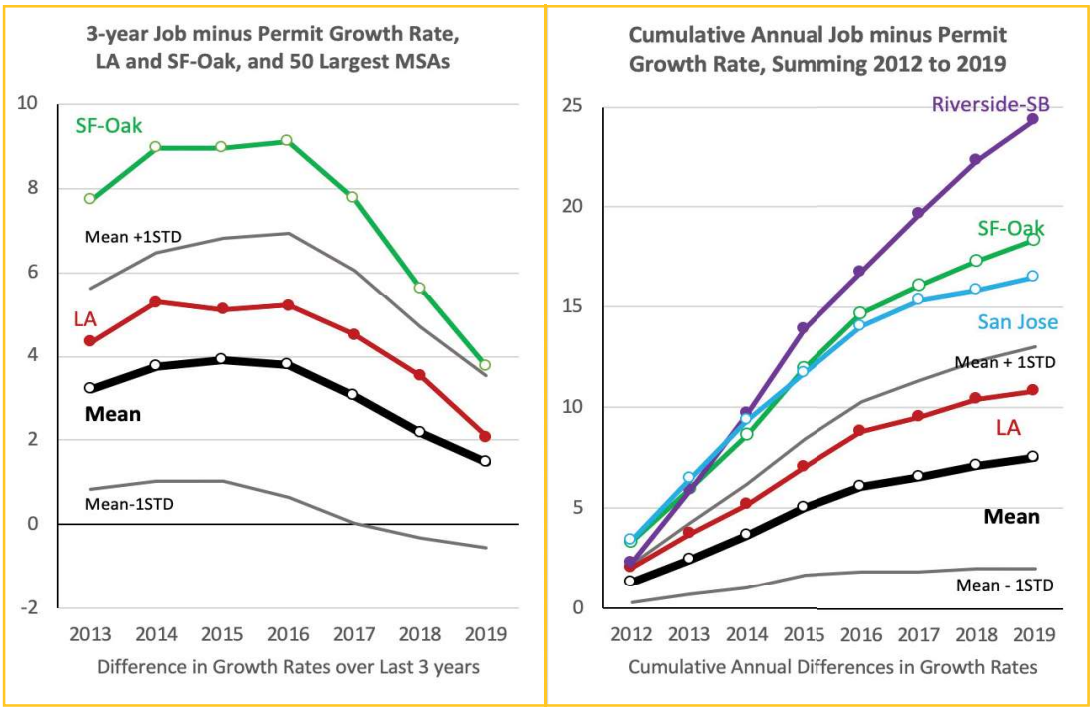
As introduced above, a second variation of our jobs-housing difference in growth rates is also worth considering. In addition to measuring the imbalance in the last 3 years, it may prove useful to measure the cumulative imbalance for the period beginning in 2012, after immediate recovery from the Great Recession. Our second measure cumulates the annual differences in growth rates over an 8-year period from 2012 through 2019. The cumulative alternative gives equal weight to earlier and later years but captures the backlog of unmet demand accrued in earlier years and that is ignored by using solely the recent 3-years. As shown in Exhibit 2, the differential between 3-years' job and housing growth has narrowed in recent years. The 3-year difference in growth rates ending in 2014, 2015, and 2016 was virtually constant in San Francisco-Oakland, Los Angeles-Anaheim, as it was for the mean in our sample of metros. After 2016, however, the differences became progressively smaller, implying that shortages were growing smaller.

The alternative, cumulative measurement of jobs-housing differences provides an index of shortages that assumes past deficits do not disappear unless an overproduction of housing were to occur in later years. In fact, the time series of 3-year measurements reveals that the shortages have continued in recent years but the gaps between job growth and housing growth show smaller deficits being added since 2016, and so the total accumulation of shortage is still growing but more slowly (Exhibit 2, right panel).

The 3-year measure shows somewhat stable dispersion from the mean shortage across 50 metro areas. The standard deviation is from 2 to 3. However, the cumulative measure of the gap between employment and housing growth shows a rapidly widened standard deviation, but when adjusted for the growing mean this range is slowly expanding.[10] As the metro areas experienced different rates of employment and housing growth after the Great Recession, the cumulative measure reflects such a dispersion during the recovery period. This difference contributes to the comparison of short and long time periods. In our study, the cumulative measure appears more strongly correlated with housing outcomes, in general, and is also preferable for theoretical reasons because we believe housing shortages are cumulative and progressively degrade housing outcomes like affordability or household formation.

[10] The standard deviation divided by the mean is known as the coefficient of variation, and in this case, it expands from 0.53 in 2011 to 0.69 in 2016 and 0.73 in 2019.

Exhibit 2. The Extent of Housing Shortage after the Great Recession



Tests of the two alternative shortage measures indicate that the cumulative measure is generally more strongly correlated than the short-term measure for homeowner outcomes, but with little difference among renters. For example, Exhibit 3 shows the correlation between housing affordability and shortage measures. The cumulative shortage measures explain 39% of the variance in homeowner affordability but only 15% of the variance in rental affordability. The short-term measure explains 26% of the variance in homeowner affordability and 17% of the variance in rental affordability.

In both measures, we obtain a positive association between the housing shortages and our adverse measures of affordability (cost burden for renters and price to income ratio for owners). The two measures reveal similar slopes, but they are on different scales and not readily compared (Exhibit 3). Even if the R-squares are similar in some comparisons, we prefer the cumulative to the short-term measure since we assume the housing outcomes such as affordability and homeownership are more a part of an accumulative shortage rather than the result of short-term imbalances of job and housing growth. We also see that the recent 3-year shortage has diminished from what it was in 2016 or earlier so reliance on the recent index may not reflect earlier conditions in all metros.

The four metros marked by color in Exhibit 3 and many of the charts to follow are the two major metros of the Bay Area in northern California (San Francisco-Oakland and San Jose metro areas) and, in southern California, the Los Angeles-Orange County and the Inland Empire (Riverside-San Bernardino) metro areas. LA-Orange has the highest adverse measure of owner affordability, 8.4, which means the median housing price is 8.4 times greater than the median household[11] income in the metro (See panel (a) in Exhibit 3). The Inland Empire has a price multiple of 5.3 which is smaller than the LA-Orange metro area but larger than the average of 3.8. It is notable that San Francisco-Oakland and San Jose metro areas carry similar price multiples of 8.0 and 7.6, respectively, reflecting close similarity unlike the major metros in Southern California. Looking at the panel (b) in Exhibit 3, the rental affordability suggests more severe problems in Southern California compared to the Bay Area.[12] What is striking is that renter households in the Inland Empire carry cost burdens nearly identical to those in LA-Orange, even though the owner affordability in the Inland Empire is relatively moderate compared to the LA-Orange metro.

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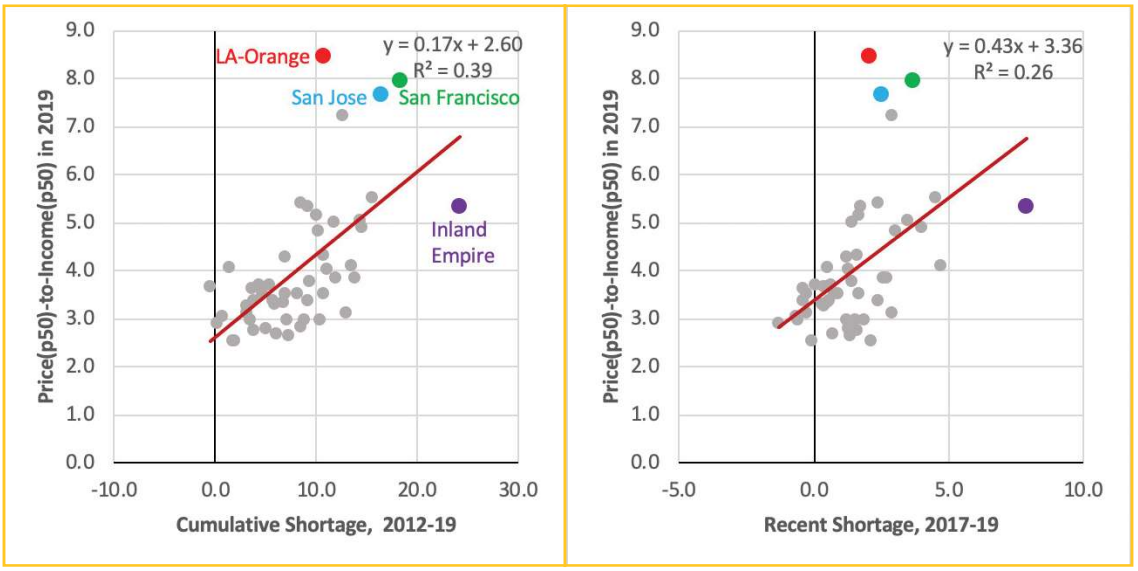
[11]This price-to-income ratio is based on all households, including renters and owners, not just the owners who have successfully purchased a home.

[12] The Bay Area was also flagged in a study of rental affordability for having an incidence of excessive rent burden that is lower than the national average, which was attributed to the higher incomes in SF-Oakland and San Jose that offset the high rents (Myers, Dowell and JungHo Park, 2019 "A Constant Quartile Mismatch Indicator of Changing Rental Affordability in U.S. Metropolitan Areas, 2000 to 2016," *Cityscape: A Journal of Policy Development and Research*.)

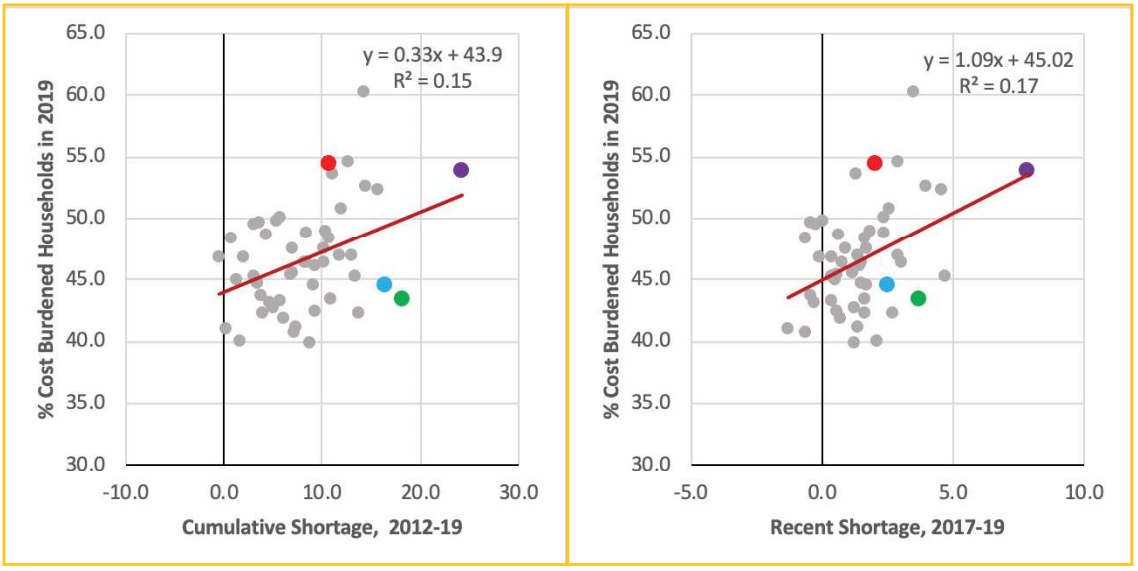
These basic themes of affordability and housing shortage—and the extreme housing conditions of the California metros—are interwoven in many of the topics to be studied in sections that follow, including the racial and ethnic disparities to be identified.

Exhibit 3. Correlation Between Housing Affordability and Shortage Problems, of Recent and Cumulative Period, Among Renters and Homeowners, 50 Largest Metro Areas

(A) Median Price-To-Median Income and Shortage Measures



(B) Rental Excessive Cost Burden and Shortage Measures



SHORTAGES AND HOUSEHOLD FORMATION

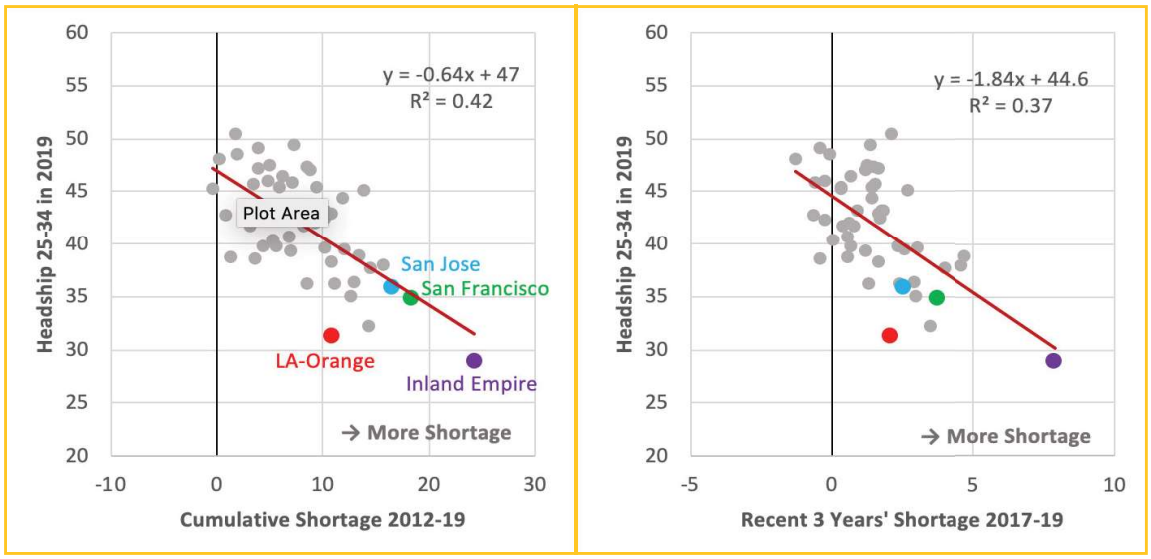
Forming a household is correlated with the opportunities of housing choices. An earlier report in this series (Module 1) identified ages 20 to 34 as the key lifecycle stage when people formed independent households. Household formation in California occurs more from age 25 to 34. If we focus on young adults in this age range, the correlation between household formation and housing shortage is especially strong.[13] The constraints in housing choices would hinder those who want to live independently from their parents. They are more likely to stay in their parents' home or live with siblings or roommates. The more constrained is

the local housing market, the harder it is for them to find a satisfying housing unit when they search for a home. Thus, household formation occurs more slowly and at a lower per capita rate in a constrained market.

The household formation is measured as headship rate at age 25 to 34 which equals the number of households (either owned or rented) headed by individuals ages 25 to 34 divided by the adult population of that age. Thus, a lower headship rate means fewer households are occupied for a given population. The two southern California metros of Los Angeles-Orange and Inland Empire exhibit the lowest rate of headship among the 50 largest metro areas in Exhibit 4. Although the two metros in the Bay Area adhere close to the trend line correlating shortage and household formation, the two metros in Southern California are below the expected level of household formation, given their degrees of housing shortage. Given that household formation reflects successful expression of housing demand, i.e., housing units have been occupied, the low headship rates in metro areas in California indicate unmet needs for housing in years following the Great Recession. This is best reflected in the association between the shortage measures and headship rates, but that might vary by the race and Hispanic origin of young adults (as examined below).

In both the cumulative and recent 3-year measures of shortages, a strong negative association is found with household formation. While the cumulative shortage measure explains 42% of variance in headship rates across the 50 metros, the recent 3-year measure explains 37% of variance in headship rates (See Exhibit 4). In either formulation, the LA-Orange metro has uniquely low household formation in light of its degree of housing shortages.

Exhibit 4. Negative Effects of Shortage on Household Formation at Age 25-34



If we disaggregate the headship rates by racial groups, we display the differences in headship rates among racial groups and how those vary in relation to degree of housing shortages in the different metro areas (See Exhibit 5). Household formation is moderately correlated with the degree of shortage. Among white households, a 10-unit increase in housing shortage equates to a 3.9 percentage point decrease in household headship at age 25-34. However, comparing the slope of the trend lines across the racial groups, we see that the Black and Hispanic households are twice as strongly affected by the shortage problem. Given a 10-unit increase in shortage, headship among Blacks declines by 8.4 percentage points, and then among Hispanics by 7.7 percentage points. Among Asians, however, there is virtually no correlation of housing shortage with their household formation.

Key disparities grow visible through these racial comparisons. Earlier, in Exhibit 4, the LA-Orange metro was found to have uniquely low household formation for its degree of housing shortages. However, that exceptional status does not occur among the white households of Exhibit 5; instead, it is found most prominently among the Hispanic or Latinx households, whose household formation is lower in Los Angeles than any other large metro. (That is closely followed by the other California metros as well.) Headship is not

[13] Household formation is measured specifically as the percentage of people of age 25 to 34 who are designated as the householder or reference person for an independent household occupying separate living quarters in a housing unit. (This is often termed the headship rate.) While this percentage is increasingly high at older ages, analysis in Module 1 shows that the new formation of households actually tails off substantially after age 34.

as exceptionally low among the Black or African-American households, but compared to other metros with similar degrees of shortage, Black headship is far lower than all but one other metro.

A direct way to assess the disparities of households of color is to measure the gap in household formation between white and other groups, comparing this gap to the degree of housing shortage. Does increasing housing shortage expand or reduce racial disparities? Looking at Exhibit 6, even though the explanation power is fairly weak, the Black-white and the Hispanic-white disparities are greater when shortages are greater, and the California metros, save the Inland Empire, have larger disparities for the same degree of shortage in other metros. This is not surprising in light of the previous findings that Black and Hispanic households were twice as strongly affected by shortages as were white households. Again, the lone exception is the Asian residents whose household formation and the disparity with whites bears no relation to the degree of shortages.

The Inland Empire deserves attention for its exceptional performance, providing greater access to household formation than expected based on its degree of housing shortages, and yielding somewhat smaller gaps (2.1 percent points of Black-white and 5.7 percent points of Hispanic-white) compared to the other metros in California. This suggests that the Inland Empire has been a uniquely favorable destination for relocation by Black and Hispanic Californians.

Exhibit 5. Disparate Effects of Shortage on Household Formation by Race and Ethnic Groups at Age 25-34

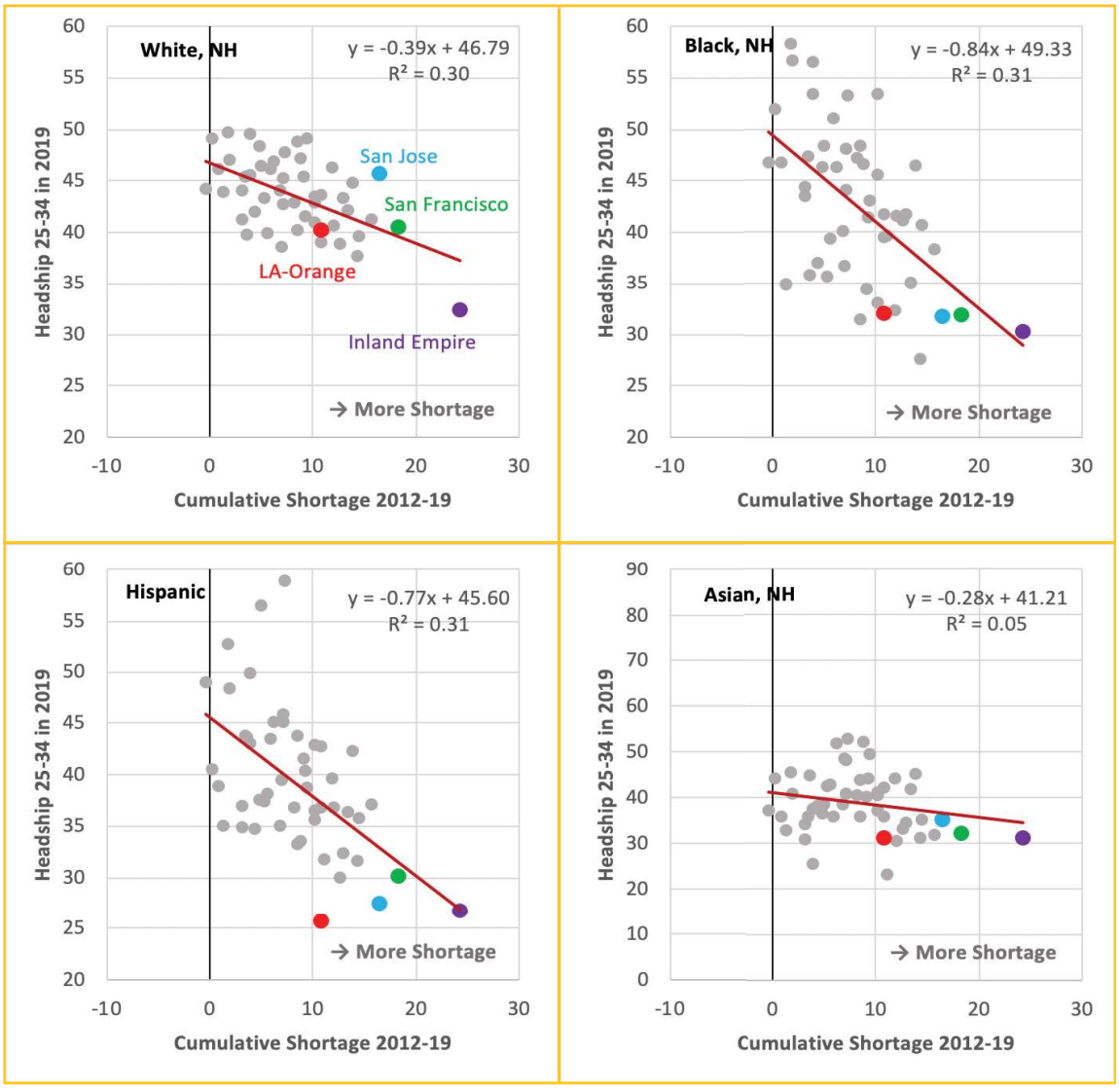
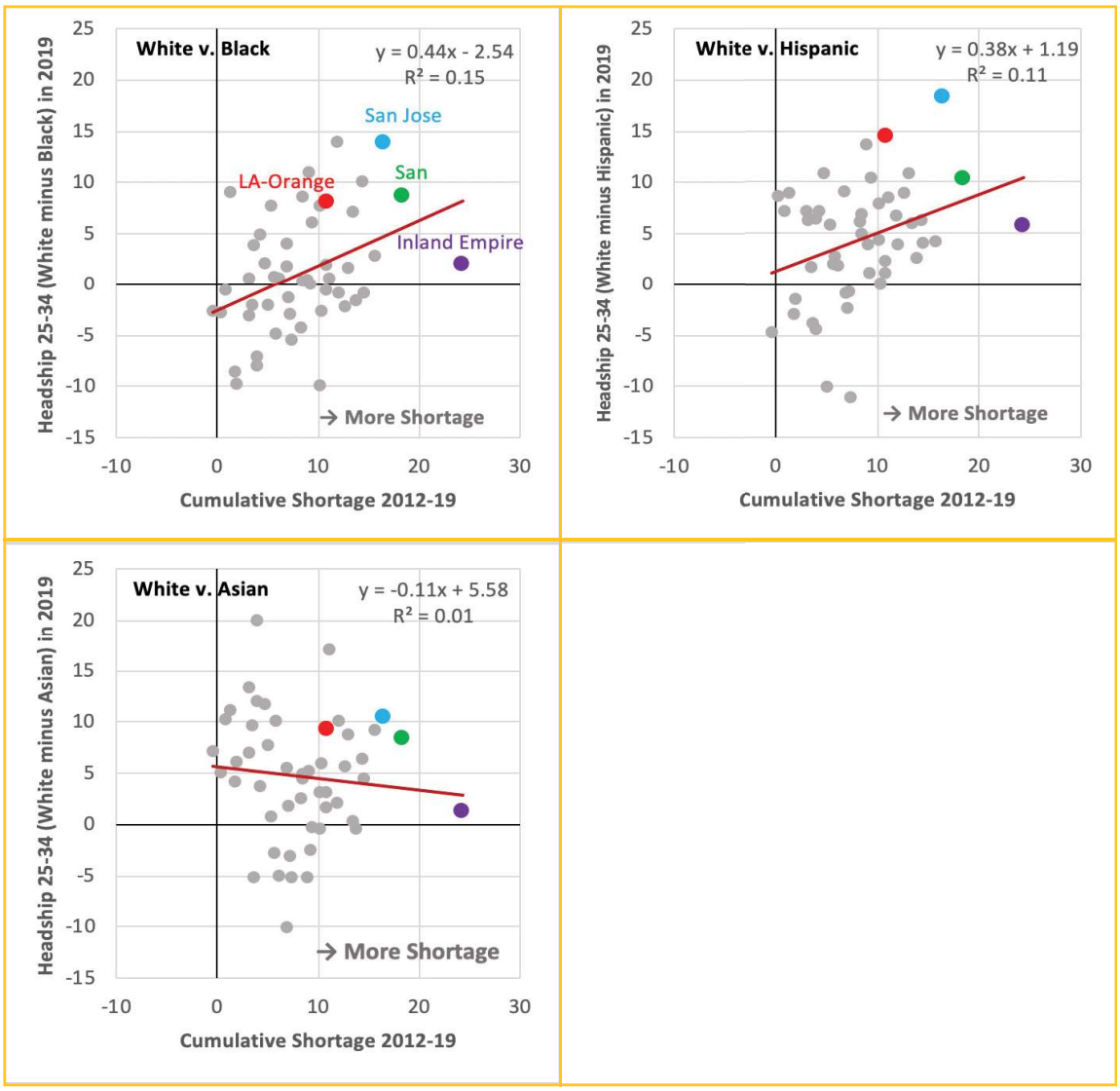


Exhibit 6. Housing Shortage and Gaps Between White and Other Groups' Household Formation at Age 25-34



SHORTAGES, RENTAL AFFORDABILITY AND HOUSEHOLD FORMATION

A principal path by which housing shortages affect residence decisions is via housing affordability. This can be represented as a metro-wide condition affecting other outcomes, or we can alternatively treat cost burden experienced by young households as an outcome measure of housing well-being. We will take care to distinguish these two uses of affordability. The metro-wide condition of rental affordability used in this report is calculated as a percentage of renter households in a metro area who pay 30% or more of their household income for rent. The metro-wide measure reflects the whole rental housing market. Earlier (Exhibit 3) we found that housing shortage problems appear to be closely associated with metro-wide rental affordability.

When examined only for renters ages 25-34, however, the same shortage measures that closely limited household formation, whether cumulative or 3-years, appear not to explain the incidence of rental affordability for young households (Exhibit 7). The shortage measures explain only 6-7% of variation in rental affordability across metropolitan areas. We suspect a different interpretation is required specific to young households: prevalence of high cost-burdens in a metro effectively censors the household formation of young people with alternatives to fall back on, such as parents or roommates. Their household formation is curtailed by high costs, so that the young households that would have carried a high rent burden cease to exist. Among established adults of middle age, often married and with children, household formation is

much less discretionary, so those households exist and can be researched. This censorship or selection bias poses a challenge to consider in our interpretations.

The age specific affordability is the share of renter households at age 25-34 who experience cost burdens by dividing the renter households at age 25-34. The age specific measure reflects the sorting-out result after the household determined to rent a housing unit given their household income. In addition, if young adults changed housing tenure from renting to owning, such high-income tenants are removed from the affordability calculation based on rentals. Thus, the measure of affordability based only in ages 25 to 34 could be biased in two ways, including higher-income renters who have not yet chosen to move into homeownership, while also excluding very low-income young people who have options of living with their parents or roommates. In fact, metropolitan areas' general rental affordability based in all ages is closely correlated with the age 25-34 affordability (r = 0.89), but the age 25-34 affordability rate is a few percentage points lower than the general affordability rate in virtually every metro.

Exhibit 7. Weak Association of Shortage with Rental Affordability at Age 25-34

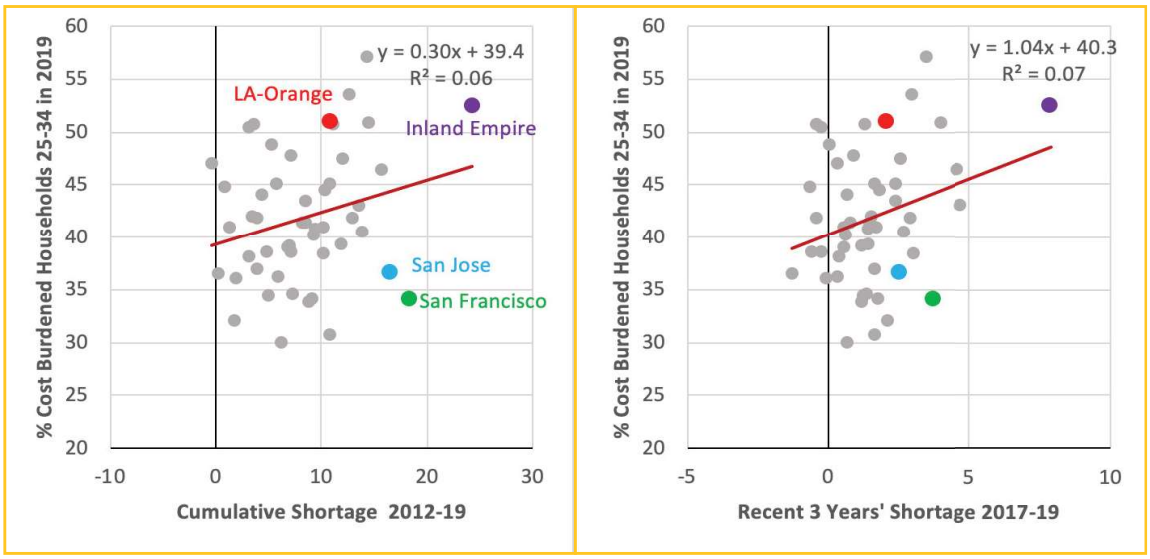
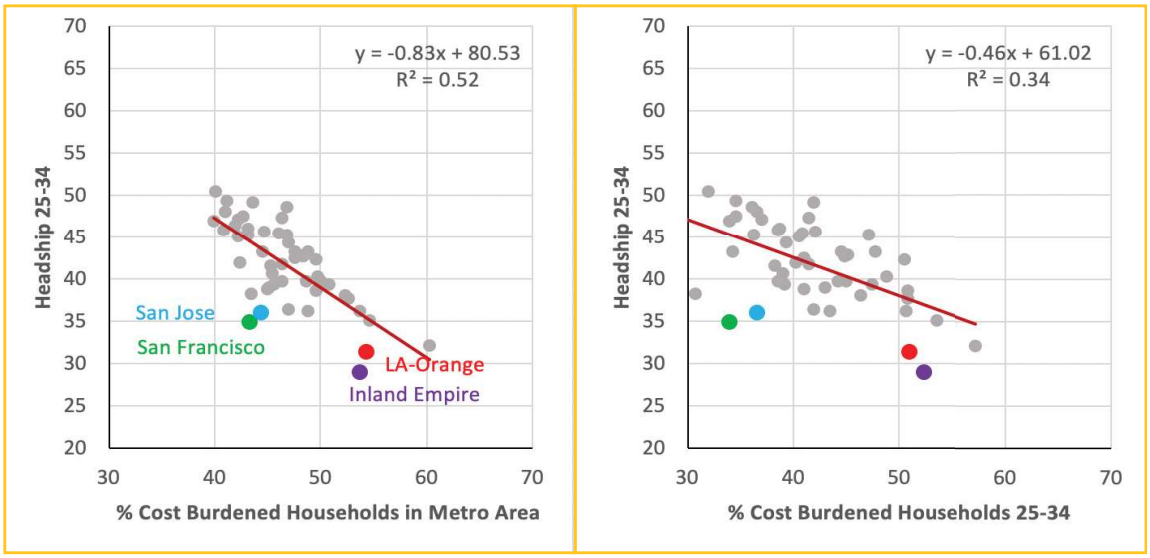


Exhibit 8. Negative Effects of Rental Affordability on Household Formation at Age 25-34, 2019

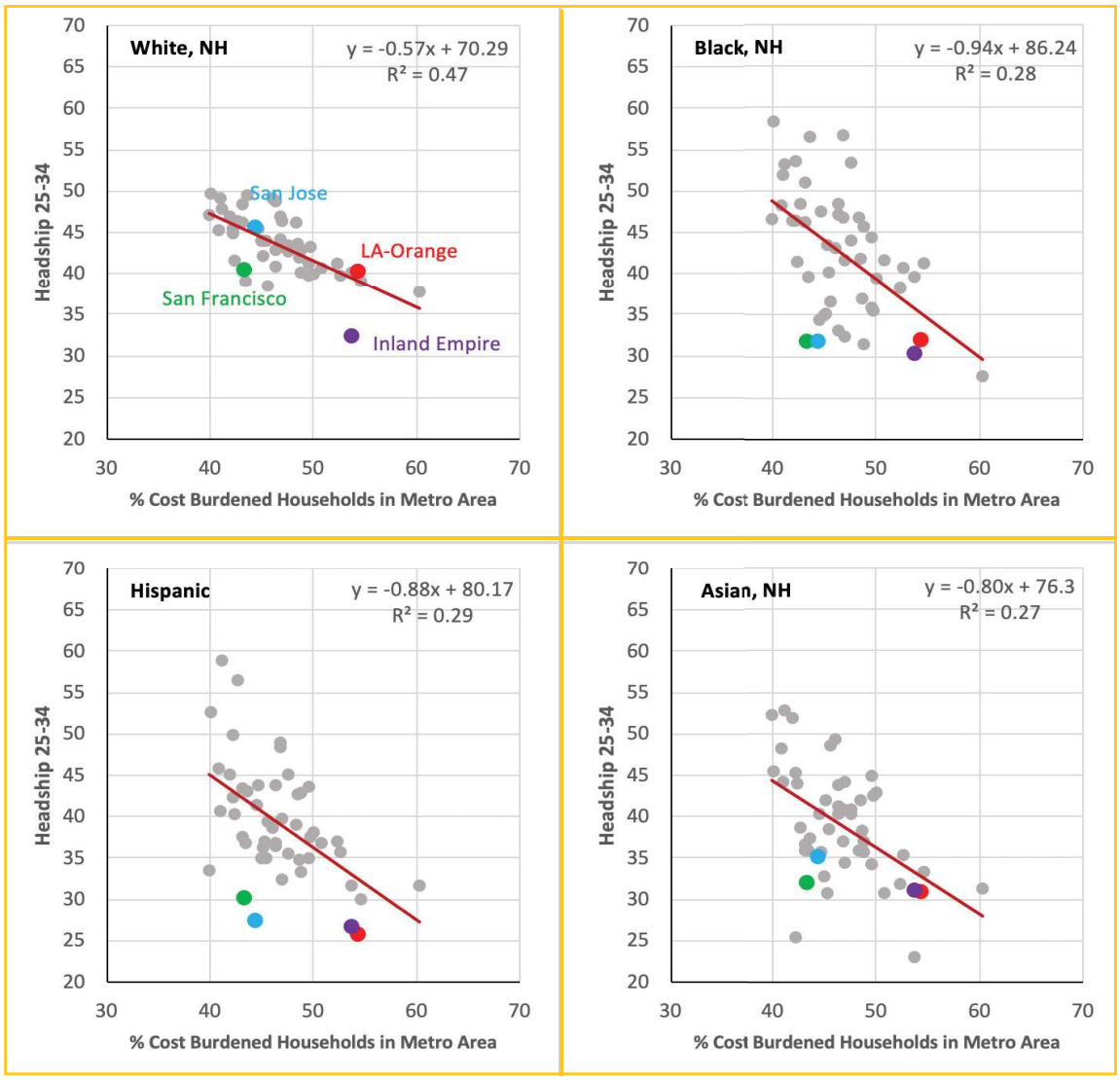


In Exhibit 8 we directly compare household formation of 25–34-year-olds with the two alternative formulations of cost burden. On the left is the association of young household formation with general rental affordability in metros. On the right is the same association but compared to the age-specific affordability measure focused only on ages 25-34. We see that the metro-wide affordability has a stronger correlation with headship rates at 25-34, explaining 52% of variation across the 50 metro areas.

Young adults living in metros where the prevalence of excessive cost burden is 10 percentage points higher have a household formation rate that is 8.3 percentage points lower. However, in the case of affordability measured only with renters of age 25-34, the correlation with household formation explains only 34% of variation. Moreover, the slope of the estimated effect is a 4.6 percentage-point lower rate of household formation given a 10 percentage-point increase in excessive cost burden (barely half that of when compared to all ages affordability). As a final observation about affordability and household formation in Exhibit 8, it is remarkable how much the two metros in Southern California and Bay Area, respectively, cluster together. This is not a random effect but in fact illustrates that these metros are not independent observations but are part of a larger shared region.

The analyses in following sections of rental affordability will continue to describe rental affordability of metro areas by the general, all ages prevalence of excessive cost burden among renters. Disaggregation by race allows us to explore racial differences in the effects of metro area affordability conditions on housing attainments in each group. In every racial group, the metro prevalence of high rental cost burden is negatively associated with their household formation (Exhibit 9). The headship rate of white residents is explained better by affordability than all other groups: with R-squares of 0.47 for white, barely half that for other communities of color (ranging from 0.27 to 0.29). However, looking at the slopes of the effect, household formation in the communities of color varies more strongly by rental affordability. If a metro area experienced a 10 percentage-point increase in the prevalence of cost burdened households, its share of household formations would be lowered as much as 5.7 percent among whites, 9.4 percent among Blacks, 8.8 percent among Hispanics, and 8.0 percent among Asians (Exhibit 9).

Exhibit 9. Disparate Effects by Race and Hispanic Origin of Rental Affordability on Household Formation at Age 25-34, 2019



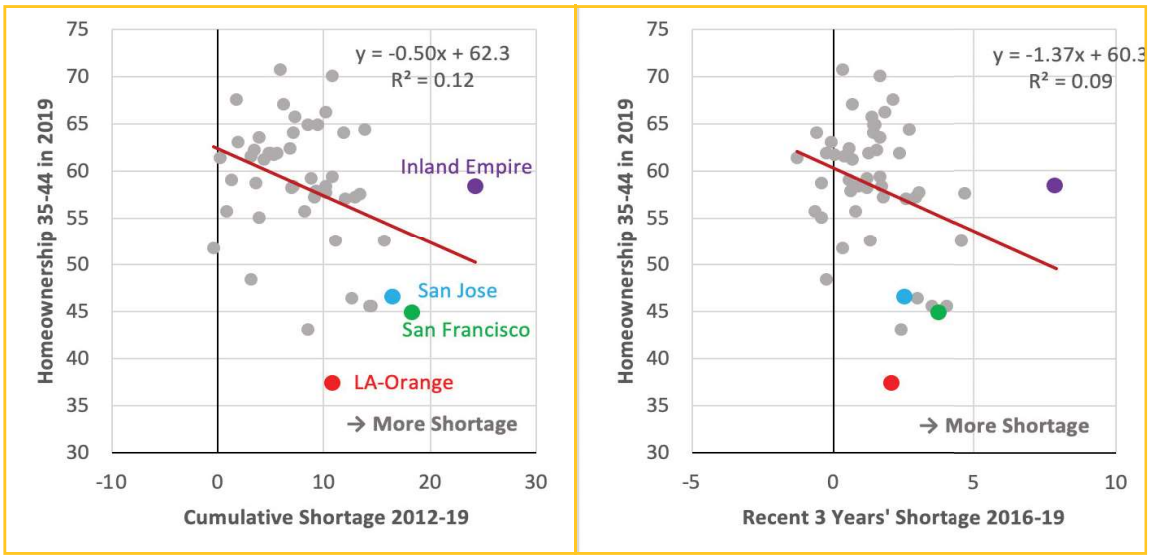
SHORTAGES AND HOMEOWNERSHIP

The second stage in the housing lifecycle after forming a new household, typically in rental housing, is advancing to homeownership. Our earlier report showed that the key age range for making that transition was between 25 and 39. Homeownership attainment in California generally occurs at an age that is 5 years older than in the U.S. in general. Also, in this report, we wish to assess attainments after they have been completed, so we selected the age range of 35 to 44 as the best time to assess recent attainments.

Different factors are important in explaining homeownership achievement than household formation. Personal factors are important such as marriage, income, length of education, credit access, and access to own or parental wealth (Lee et al 2020). However, our focus in this report is on metro-level factors of housing shortages and affordability. Unlike in the case of household formation, the shortage measure does not explain very well the homeownership rate at age 35-44. Owning a home is more likely to be the next step after forming a household from the lifecycle perspective. And the newly formed households are more likely to rent a home rather than buying a home, after which shortages may not play as much importance. A weaker correlation between the homeownership rate and shortage measures reflects such mechanisms. Nonetheless, shortage problems should still negatively affect the homeownership rate at age 35-44.

Comparing our short and long-term measures of housing shortages, we expect that the long-term process of home buying and of long durations in the home after purchase should make the cumulative measure of shortages more salient. In Exhibit 10, it is apparent that the cumulative, 8-year shortage measure contributes a greater explanation of variation (albeit still weak) across metros in the homeownership rate than does the 3-year measure. In fact, the latter has many more metros with negative shortages in the last 3 years and the great majority of metros are bunched in the lower range of shortage. With regard to the 3-year measure, the four major California metros stand as scattered outliers, varying far more greatly among themselves than the variation among the rest of the metros. In contrast, the cumulative measure of shortage offers a somewhat more continuous distribution and its time scale is more in line with the long-term nature of owner-occupancy. We will apply this cumulative measure of shortage throughout the remaining analyses.

Exhibit 10. Negative Effects of Shortage on Homeownership at Age 35-44



A comparison of the disparate effects of shortages on homeownership among different race and Hispanic groups is supplied in Exhibit 11. A strong and surprising finding emerges in that the group with the strongest negative association between homeownership and shortages is the white residents in the 50 metro areas. For this one group, shortages explain 31% of the variation in homeownership at age 35-44 across the metros, whereas for the others the variation explained is nil. Among whites, a 10-unit increase in shortage equates to a 9.5 percentage point lower homeownership rate. No such relationship can be divined in the case of the other groups.

Interestingly, the Inland Empire stands out for all groups, but especially Black and Hispanic, for its high homeownership rate despite its high shortages (Exhibit 11). Moreover, the Inland Empire stands out also for having the smallest racial gaps in homeownership for Black and Hispanic households, when compared to whites in Exhibit 12.

The shortage measure shows clear correlations with the racial gaps in homeownership rates. However, the direction of the correlation might seem counterintuitive: the greater the shortages the narrower is the gap between whites and other groups. The plausible mechanism behind this finding is not that shortages make Blacks and Hispanics better home buyers; rather the explanation is that shortages damage the prospects of white homeowners much more than anyone else. Accordingly the gap with whites narrows and shortages worsen. In fact, among Asians, the greater the shortages are, the higher their homeownership rate rises above that of whites. The Asian-white gap in homeownership shows a reverse gap, which means Asian households have a higher homeownership rate compared to white households when shortages worsen.

Exhibit 11. Disparate Effects by Race and Hispanic Origin of Shortage on Homeownership at Age 35-44

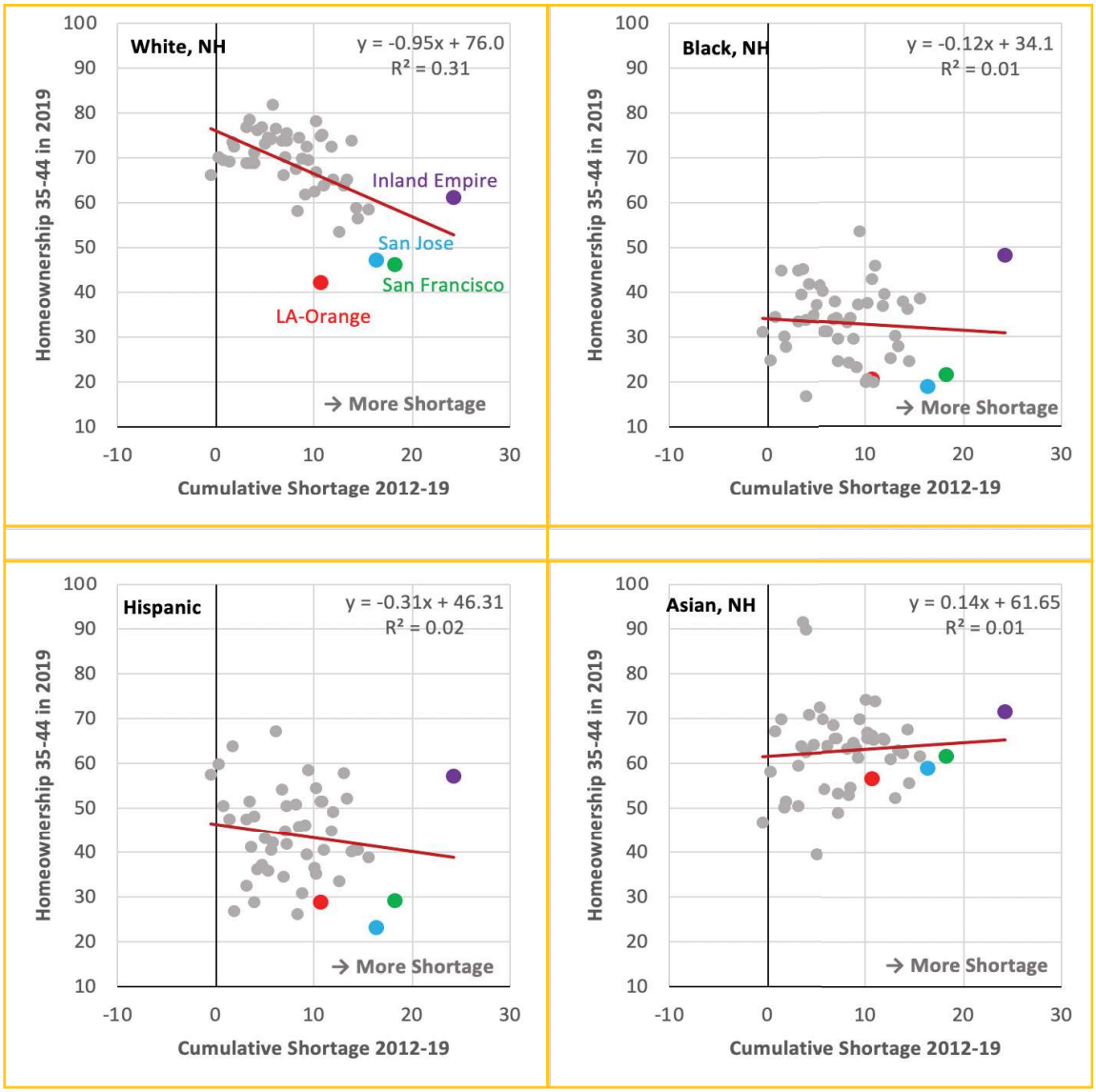
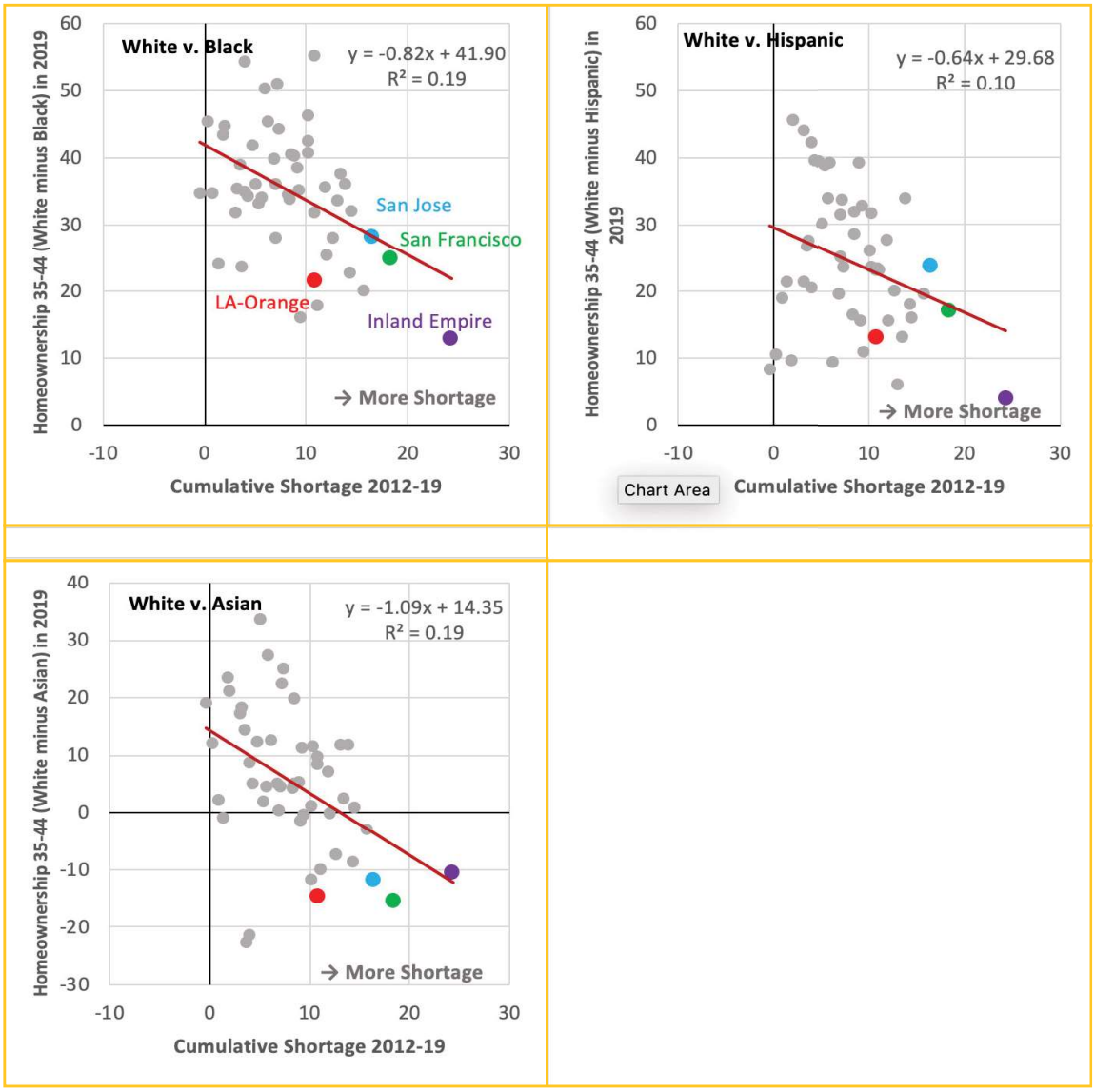


Exhibit 12. Housing Shortage and Gaps Between White and Other Groups' Homeownership at Age 35-44

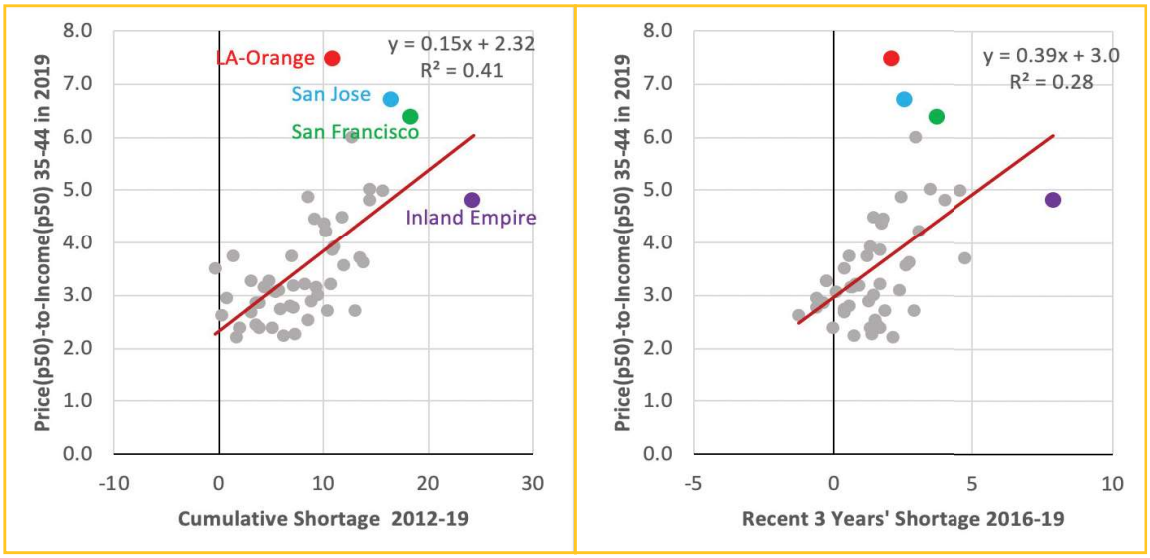


SHORTAGES, AFFORDABILITY, AND HOMEOWNERSHIP RATES

The shortage problem is directly correlated with homeowner affordability. The larger is the cumulative shortage, the more severe is homeowner affordability. Affordability for homeowners is measured by a version of "price multiples," the ratio of median house price in a metro to the median household income, for this purpose including both owners' and renters' incomes. The higher the price multiple, the less affordable a metro is for homebuyers. In this analysis we make use of an age specific affordability measure, which we found shows a stronger correlation with the homeownership rate. Thus we form the price multiples as the ratio of the median value of all owner-occupied homes to the median incomes of households age 35-44.

We compare associations with affordability of both our long and short-term measures of shortage (Exhibit 13). As anticipated, the stronger association is with the cumulative shortage measure, which explains 41% of variation in affordability across the 50 metros (as opposed to 28% variance explained by the short-term measure of shortage). This reflects that home prices ratchet upward over time, building on prior gains spurred by shortages in earlier years. The LA-Orange metro is worst off for homeowner affordability compared to all other metros, including SF-Oakland and San Jose, even though its cumulative shortages are somewhat less. That is likely because higher median incomes in the Bay Area metros help restrain the resulting price multiples.

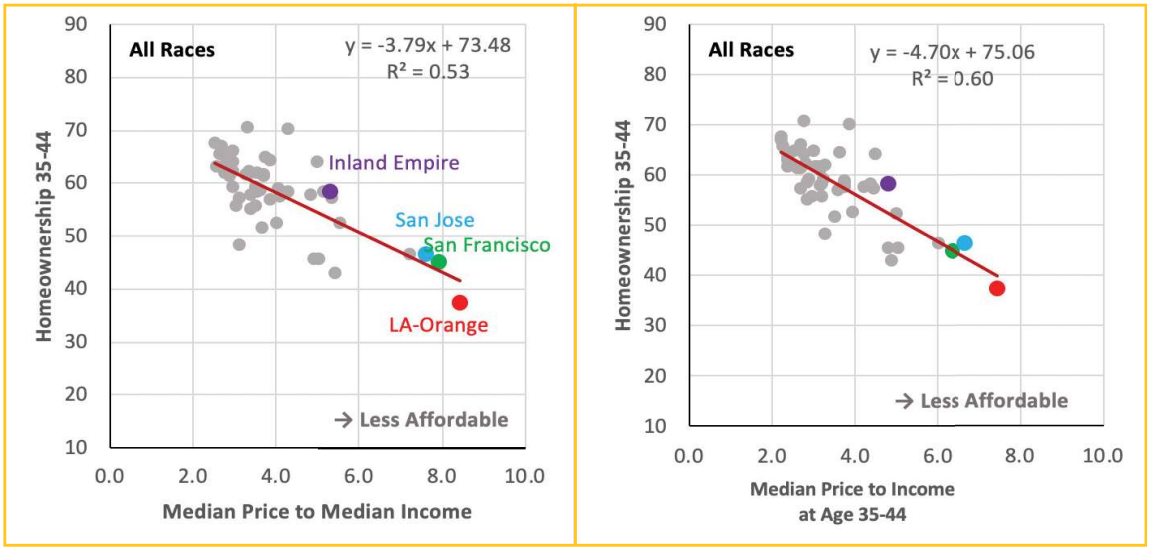
Exhibit 13. Negative Effects of Shortage on Homeowner Affordability at Age 35-44, Under Two Alternative Measures of Housing Shortage



Metropolitan affordability of homeownership then produces strong correlations with homeownership rates (the percentage of households that are owners rather than renters), especially at younger ages. Among older homeowners, many acquired their homes decades earlier, when housing was much more affordable, and the current price multiples are an asset to them, not a hindrance. In the case of young adults, however, not only have they had less time to save for a downpayment and build their credit history, but they are also striving to break into the homeownership market in a time of much higher price multiples than faced by earlier generations. Our target age group for comparing homeownership rates is not the impossible dream of adults in their 20s but rather the reasonable expectations for achieving homeownership by age 35 to 44.

A sharp downward probability of attaining homeownership is found when the median price is higher compared to incomes (Exhibit 14). Each additional price multiple reduces the homeownership rate by either 3.8 or 4.7 percentage points, and the California metros are all perfectly lined up along the trend line, with LA-Orange leading this unfortunate downward parade. Two alternatives are tested that differ in what income is used to form the price multiples, that of all households in a metro or specifically focused on incomes of 35-to-44 year-olds. When the age-specific alternative is employed, the statistical fit is slightly improved and a stronger downturn in homeownership rates results. The general purpose, all-ages, price multiple measure may understate the effects on young households, yet it is still preferable for the reason that it maintains a commonality between older and younger homeowners. We also use the same general measure of metro affordability to compare race and Hispanic groups next.

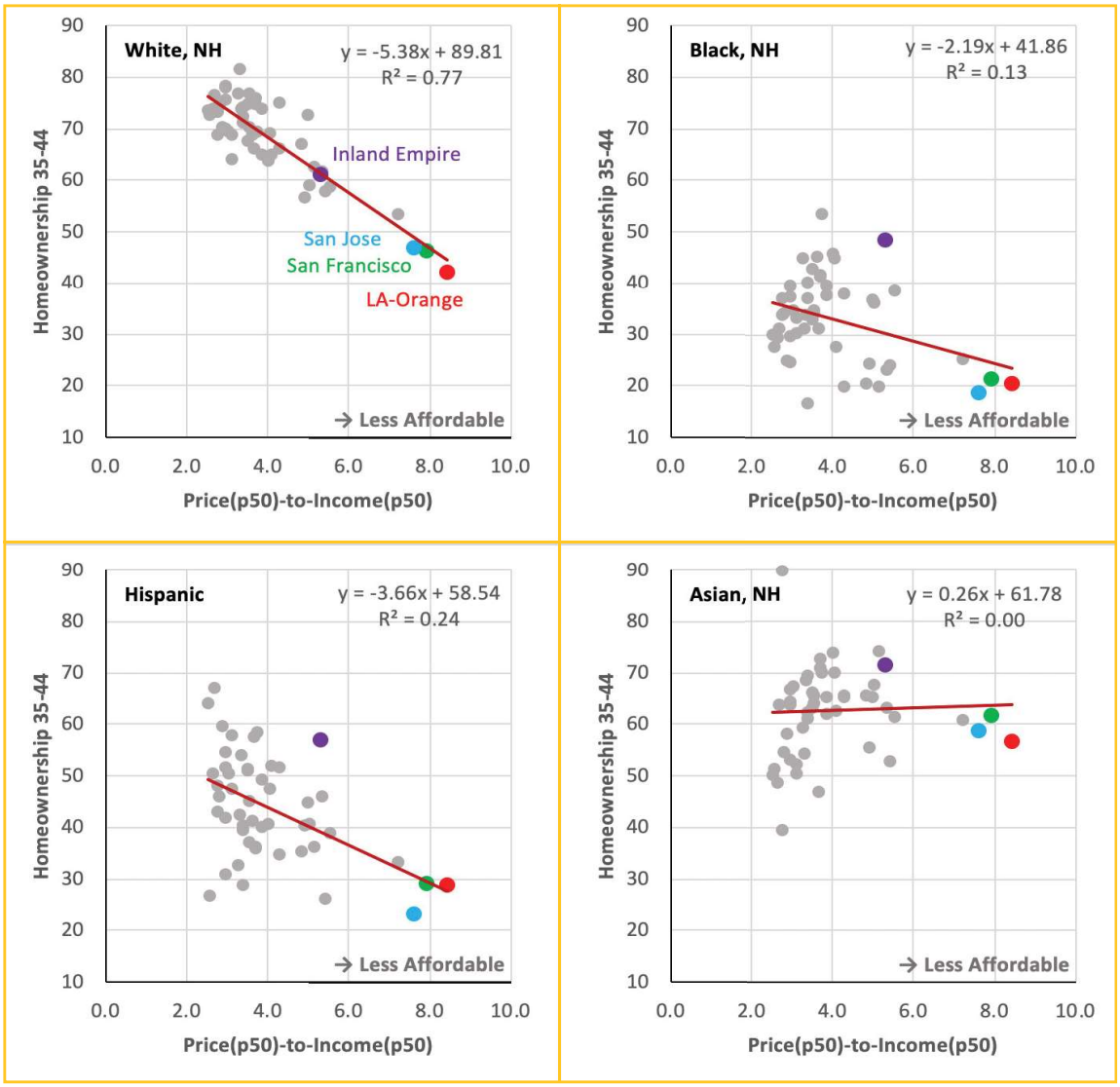
Exhibit 14. Negative Effects of Affordability on Homeownership at Age 35-44



Disparate effects of metro homeownership affordability are found when an identical analysis is separately carried out for each of our four major race and Hispanic groups. What is striking is that homeownership for white households exhibits the strongest relationship to affordability—sharply negative—and with a very high R-square representing 77% of variance explained across the 50 metros by the metro price multiple for owned homes. The next highest explanation (24%) is found for Hispanic or Latinx homeownership, followed by Black (13%). Asian homeownership bears 0 correlation with homeownership affordability. The Inland Empire provides the one bright spot once again, exhibiting strikingly higher homeownership rates for all groups compared to other high-priced metros. The high achievements for Black and Hispanic or Latinx homeowners are extremely noteworthy.

It is puzzling why white homeowners ages 35-44 are so strongly affected by higher price multiples, while others are not. The key may be that white homeownership is so high (rates above 60%) in more than 40 metros and price multiples in those metros also are relatively low (less than 4.0) in more than 30 metros. Thus, in comparison, there is a steep drop-off in homeownership rates for whites in the Bay Area and in LA-Orange. Among Black and Hispanic households the homeownership rate in other metros is not nearly as high, so the drop-off cannot be as steep. Among Asian households, their homeownership rates are very high in California, higher than whites. As many other metros have lower homeownership for Asians as have higher homeownership for Asians, so there is no trend amongs Asians.

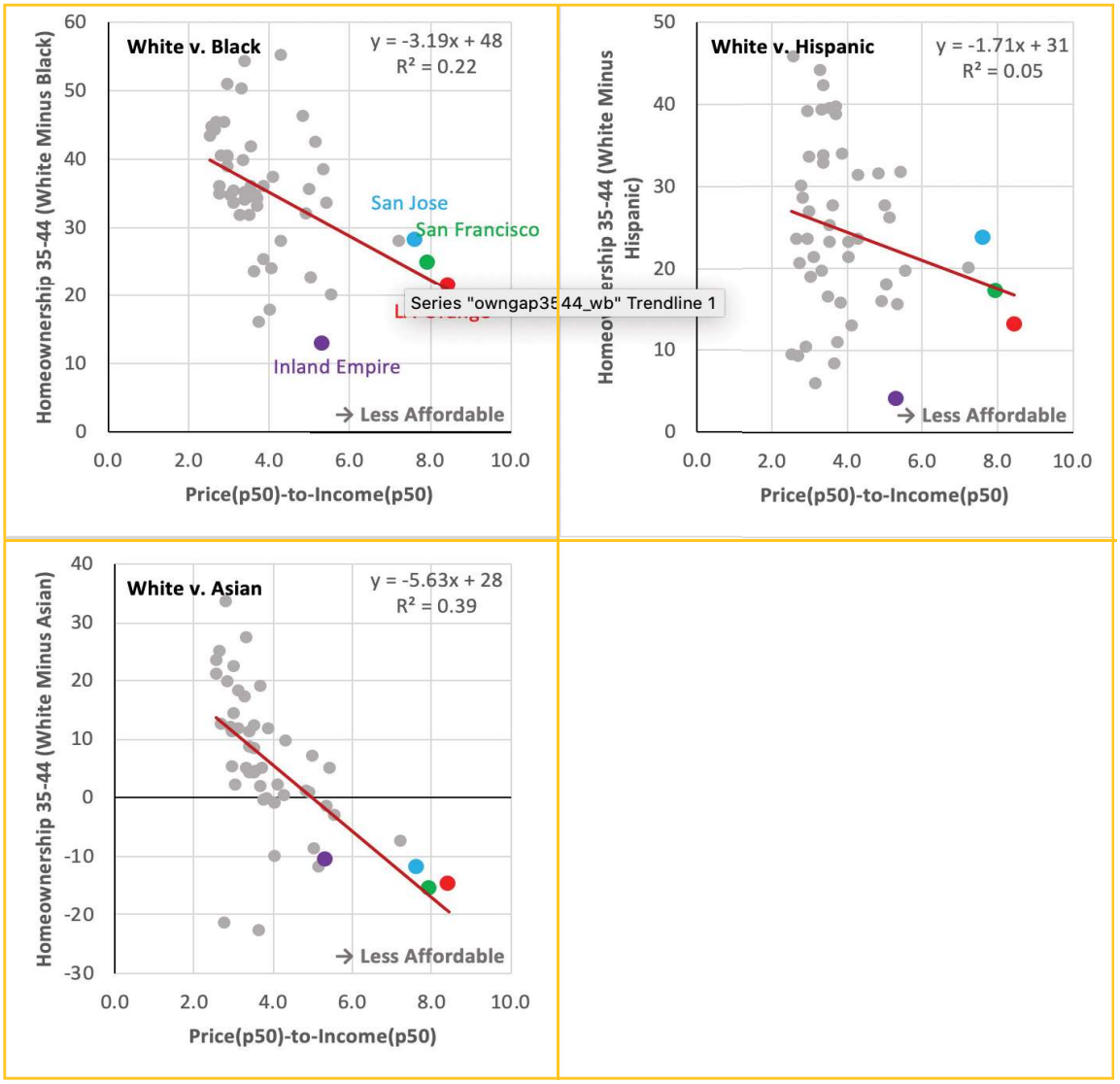
Exhibit 15. Disparate Effects by Race and Hispanic Origin of Affordability on Homeownership at Age 35-44, 2019



As in previous sections, we can directly calculate the gap between white homeownership rates and that of other major groups, measuring this gap relative to the affordability of different metros (Exhibit 16). In general, the gap is much reduced when prices are higher, mainly because white homeownership plunges more than other groups when price multiples are greater. As a result, among Black homeowners in LA-Orange, the gap with whites is smaller than in every other metro save 4. The homeownership gap in LA-Orange for Hispanic or Latininx households is smaller than in all but 8 metros. However, among Asians, the gap in LA-Orange is actually an increase in homeownership above whites that is greater than all but 3 other metros.

Finally, it deserves underscoring that the leading metro among the 50 largest in regard to equality of homeownership rates for Black and Hispanic/Latinx households, relative to whites, is the Inland Empire. While we saw above in Exhibit 15 that the white homeownership rate of 61.0% in the Inland Empire was more than 15 percentage points above that in LA-Orange or the Bay Area, Black and Hispanic/Latinx homeownership rates were nearly 30 percentage points higher in the Inland Empire than in those major California metros. Thus greater equality was found in the Inland Empire.

Exhibit 16. Affordability and Reduced Gaps Between White and Other Groups' Homeownership at Age 35-44, 2019



CONCLUSION

Comparison of California's large metropolitan areas to the 50 largest in the U.S. yields useful perspective on how housing shortages depress the housing well-being of California residents. Housing production in this state lags well behind employment growth. Although the annual gap has been smaller in recent years, the deep shortages of production for several years after the Great Recession have accumulated a permanent deficit in the housing stock. The direct impact of shortages is to provide too few housing opportunities for the growing economy. The indirect impact is to escalate rents and house prices through competitive bidding for the limited supply, creating a massive affordability problem. Those not making the cut for entry into this rationed supply are forced to double up, go homeless, or simply leave the area.

This study has examined these effects on all households and separately for renters and homeowners, focusing on the younger adults who are trying to establish their housing careers (and who are also the new workers in the growing economy). We also examined differences with regard to impacts of shortage and affordability between home seekers in the four major ethno-racial groups of white, Black, Hispanic/Latinx, and Asian and Pacific Islanders.

Household formation from the resident population was much reduced in metros that had greater shortages (Exhibit 4), especially for Black and Hispanic households (Exhibit 5). The gap between white and other groups' household formation was especially great in the LA, San Francisco, and San Jose metros, and was much smaller than otherwise expected in the Inland Empire (Exhibit 6).

Price to income ratios in metro areas among young homeowners are driven far higher when shortages are greater (Exhibit 13) and that is associated with markedly lower homeownership rates, with LA, San Francisco and San Jose metros the worst (Exhibit 14). Surprisingly, these effects are much more severe among white households than others (Exhibit 15), in part because homeownership is so much higher in other metros for whites. The Inland Empire is a welcome exception with its much lower cost burden and an even higher homeownership rate than would be expected, especially for Black and Hispanic households. In fact, the homeownership gap between white and Black people or Hispanics is the lowest of all 50 metros. The broad Asian group holds homeownership rates with a white gap that is actually negative in all four of the largest California metros, i.e., Asian rates are 10-15 percentage points higher than for whites. [14]

In broadest strokes, we find that shortages and affordability problems depress housing well-being for all groups of young Californians. While the white group may be least affected by limitations placed on household formation, it is most affected by the limitations on homeownership. The Inland Empire is the one major metro where all groups fare most equally, and where Black and Hispanic households achieve homeownership at rates near the highest in all 50 of the nation's largest metros. This may be because the Inland Empire provides a refuge for households seeking affordable homeownership otherwise denied in coastal metros.

APPENDIX. RANKING TABLE OF USC SHORTAGE MEASURE AND NAR HOUSING SHORTAGE TRACKER, 50 MSA

MSA ID	NAME	%Job Growth 17-19 (a)	%Permit Growth 17-19	USC Shortage Measure 17-19 (a)-(b)	NAR Shortage Tracker (2019)	Rank by USC Shortage Measure	Rank by NAR Shortage Tracker
35620	New York-Newark-Jersey City, NY-NJ-PA	4.38	1.98	2.40	2.24	13	10
31080	Los Angeles-Long Beach-Anaheim, CA	4.22	2.14	2.08	2.59	16	6
16980	Chicago-Naperville-Elgin, IL-IN-WI	2.23	1.69	0.54	1.28	37	34
19100	Dallas-Fort Worth-Arlington, TX	8.03	7.25	0.77	1.56	33	26

[14] As discussed in Report 2, the Asian and Pacific Islander group is very broad, with diverse levels of economic achievement, especially for some of the smaller nationality groups.

MSA ID	NAME	%Job Growth 17-19 (a)	%Permit Growth 17-19	USC Shortage Measure 17-19 (a)-(b)	NAR Shortage Tracker (2019)	Rank by USC Shortage Measure	Rank by NAR Shortage Tracker
26420	Houston-The Woodlands-Sugar Land, TX	5.60	6.26	-0.65	1.20	49	36
47900	Washington-Arlington-Alexandria, DC-VA-MD-WV	4.10	3.56	0.54	1.69	38	21
37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	4.08	1.72	2.36	1.98	14	15
33100	Miami-Fort Lauderdale-West Palm Beach, FL	5.42	1.95	3.47	1.75	6	18
12060	Atlanta-Sandy Springs-Roswell, GA	6.94	5.27	1.67	1.70	20	20
38060	Phoenix-Mesa-Scottsdale, AZ	10.13	5.43	4.70	2.13	2	13
14460	Boston-Cambridge-Newton, MA-NH	5.32	2.29	3.02	.	7	
41860	San Francisco-Oakland-Hayward, CA	6.67	2.93	3.74	2.94	5	2
40140	Riverside-San Bernardino-Ontario, CA	10.76	2.86	7.89	2.85	1	3
19820	Detroit-Warren-Dearborn, MI	3.35	1.50	1.84	2.24	17	11
42660	Seattle-Tacoma-Bellevue, WA	7.25	5.52	1.73	1.70	18	19
33460	Minneapolis-St. Paul-Bloomington, MN-WI	3.71	3.36	0.35	0.89	41	46
41740	San Diego-Carlsbad, CA	5.72	2.78	2.94	2.61	8	5
45300	Tampa-St. Petersburg-Clearwater, FL	6.97	4.42	2.55	1.46	11	29
19740	Denver-Aurora-Lakewood, CO	7.23	5.83	1.40	1.66	26	22
41180	St. Louis, MO-IL	2.67	1.98	0.69	0.90	34	44
12580	Baltimore-Columbia-Towson, MD	3.03	2.36	0.67	1.59	35	25
16740	Charlotte-Concord-Gastonia, NC-SC	7.67	7.07	0.60	1.13	36	38
36740	Orlando-Kissimmee-Sanford, FL	9.81	8.51	1.30	1.46	28	28
38900	Portland-Vancouver-Hillsboro, OR-WA	6.70	5.01	1.69	1.46	19	30
41700	San Antonio-New Braunfels, TX	5.98	3.10	2.88	1.81	9	17
40900	Sacramento--Roseville--Arden-Arcade, CA	7.56	3.00	4.55	2.52	3	7
38300	Pittsburgh, PA	2.64	0.52	2.12	6.55	15	1
12420	Austin-Round Rock, TX	11.69	10.27	1.42	1.38	25	31
29820	Las Vegas-Henderson-Paradise, NV	9.22	5.22	4.00	2.06	4	14
28140	Kansas City, MO-KS	2.30	3.57	-1.27	0.90	50	43
17140	Cincinnati, OH-KY-IN	3.60	2.23	1.37	1.65	27	23
34980	Nashville-Davidson--Murfreesboro--Franklin, TN	10.08	7.38	2.70	1.52	10	27
26900	Indianapolis-Carmel-Anderson, IN	4.68	3.20	1.48	1.35	24	32
17460	Cleveland-Elyria, OH	2.33	1.07	1.27	2.32	29	9
18140	Columbus, OH	4.66	3.45	1.21	1.59	30	24
41940	San Jose-Sunnyvale-Santa Clara, CA	6.16	3.63	2.54	2.66	12	4
47260	Virginia Beach-Norfolk-Newport News, VA-NC	3.27	2.92	0.35	1.21	40	35
39300	Providence-Warwick, RI-MA	2.22	1.02	1.20	.	31	.
33340	Milwaukee-Waukesha-West Allis, WI	1.29	1.72	-0.42	1.15	47	37
27260	Jacksonville, FL	8.34	7.46	0.88	1.31	32	33
36420	Oklahoma City, OK	4.98	3.35	1.63	1.91	21	16
39580	Raleigh, NC	8.46	8.74	-0.27	0.99	45	40
40060	Richmond, VA	3.81	3.75	0.06	1.06	42	39
41620	Salt Lake City, UT	7.80	6.18	1.62	2.16	22	12
31140	Louisville/Jefferson County, KY-IN	2.70	3.31	-0.61	0.84	48	47
35380	New Orleans-Metairie, LA	1.60	2.00	-0.41	0.97	46	41
32820	Memphis, TN-MS-AR	2.52	2.77	-0.25	0.94	44	42
25540	Hartford-West Hartford-East Hartford, CT	1.48	1.10	0.38	.	39	.
13820	Birmingham-Hoover, AL	3.68	2.16	1.52	2.35	23	8
15380	Buffalo-Cheektowaga-Niagara Falls, NY	1.03	1.09	-0.06	0.89	43	45

OUTLINE OF EXHIBITS

A. **Introduction** (includes some references to the other modules)

B. **Defining and Measuring Shortage**
- B1. Text Discuss alternative reports
- B2. Text Summarize our data sources (details in Appendix)

- Ex 1 Comparing Jobs-Housing Shortage Measures with Correlated Housing Outcomes (USC growth differences versus NAR jobs-housing ratios)
- Ex 2 Extent of Shortages after the Great Recession (Recent 3 years or Cumulative)
- Ex 3 Correlation between Housing Affordability and Housing Shortages of Short and Long Duration, Among Renters and Homeowners

C. **Shortages and Household Formation**
- Ex 4 Negative Effects of Shortage on Household Formation at Age 25-34
- Ex 5 Disparate Effects of Shortage on Household Formation by Race and Ethnic Groups at Age 25-34
- Ex 6 Housing Shortage and Gaps Between White and Other Groups' Household Formation at Age 25-34

D **Shortages, Rental Affordability and Household Formation**
- Ex 7 Negative Effects of Shortage on Rental Affordability at Age 25-34
- Ex 8 Negative Effects of Rental Affordability on Household Formation at Age 25-34
- Ex 9 Disparate Effects by Race and Hispanic Origin of Rental Affordability on Household Formation at Age 25-34

E. **Shortages and Homeownership**
- Ex 10 Negative Effects of Shortage on Homeownership at Age 35-44
- Ex 11 Disparate Effects by Race and Hispanic Origin of Shortage on Homeownership at Age 35-44
- Ex 12 Housing Shortage and Gaps Between White and Other Groups' Homeownership at Age 35-44

F. **Shortages, Affordability, and Homeownership**
- Ex 13 Negative Effects of Shortage on Homeowner Affordability at Age 35-44
- Ex 14 Negative Effects of Affordability on Homeownership at Age 35-44
- Ex 15 Disparate Effects by Race and Hispanic Origin of Affordability on Homeownership at Age 35-44
- Ex 16 Affordability and Reduced Gaps Between White and Other Groups' Homeownership at Age 35-44, 2019

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