INSTITUTE OF GOVERNMENTAL STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

CCRL Changing Cities Research Lab

URBAN DISPLACEMENT PROJECT
UNIVERSITY OF CALIFORNIA BERKELEY

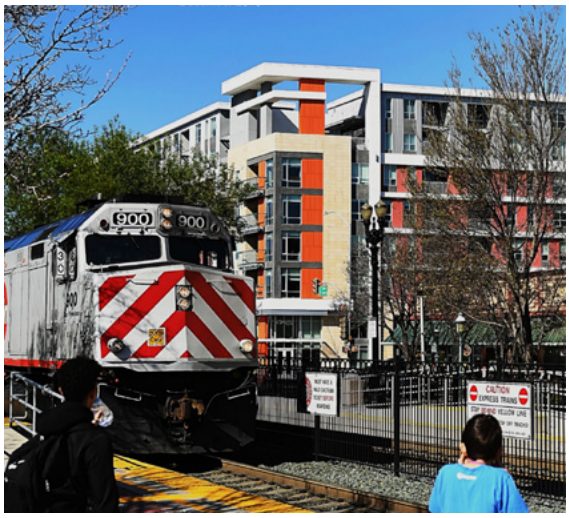
Research Brief

Affordable for Whom?

How New Subsidized Housing Production Affects Displacement and Replacement in the San Francisco Bay Area

March 2022

Jackelyn Hwang, Iris Zhang, Jae Sik Jeon, Karen Chapple, Julia Greenberg, and Vasudha Kumar



Key Takeaways

- The Bay Area has a severe shortfall of affordable units. The median neighborhood has 0 newly constructed subsidized units, and the average neighborhood has just over 2 newly constructed subsidized units.
- We find no conclusive evidence that new subsidized housing construction is effective in preventing displacement of residents of the lowest socio-economic status. However, this is likely due to the lack of affordable units available for analysis. In addition, new subsidized housing units may be reserved for residents from outside the neighborhood, thus failing to mitigate local displacement effects.
- Newly constructed subsidized housing encourages residents of moderate-middle and middle-high socio-economic status to move into neighborhoods. In gentrifying neighborhoods, the increase in move-ins after new subsidized housing is constructed is biggest for the highest socio-economic group. This highlights the urgent need to develop housing options that meet the needs of lowest socio-economic status residents.
- To address the housing affordability crisis and mitigate displacement and exclusion, policymakers must pursue bold initiatives that substantially expand social housing.
- Social housing is the provision of rental or homeownership units affordable at a moderate income or below, and is run by a public or nonprofit entity. To work, it would need to be widely implemented, requiring government investment at levels that match the urgency of the housing crisis.

Executive Summary

Building more subsidized housing is considered as an important way to prevent displacement among residents of lower socio-economic status, especially in areas with rising rents and increasing concerns about gentrification pushing out existing residents. However, researchers have struggled to pinpoint the impacts of new subsidized housing production on residents. In this policy brief, we present findings from an extended study that fills this gap by building unique, fine-grained datasets on construction and resident mobility that capture the impacts of specific housing interventions in the nine-county San Francisco Bay Area. With this novel data, we examine the impacts of new subsidized housing production by looking at movement both out of and into local neighborhoods. In the San Francisco Bay Area context of housing supply shortage, there is a severe shortage of newly constructed subsidized housing units. To address the housing affordability crisis and mitigate displacement and exclusion, policy makers must pursue the preservation of unsubsidized affordable housing as well as bolder initiatives that substantially expand social housing.

The Bay Area has a severe shortfall of affordable units. The median neighborhood has 0 newly constructed subsidized units, and the average neighborhood has just over 2 newly constructed subsidized units.

Introduction

California's housing affordability crisis has many culprits, the most obvious of which are rising income inequality that keeps incomes low while rents increase, and a shortfall in housing production that dates back to the early 1990s and conservatively will reach 1.5 million units by 2025.[1] As the regional economy in the Bay Area continues to grow, an influx of high-income workers has put new pressure on the affordable rental housing stock.

The lack of affordability has forced some households

to move out of the region and makes it challenging for even middle-income households to move in. With scarce resources available to mitigate the crisis, lawmakers need to target spending to the most effective programs.

In recent years, affordable housing advocates have become some of the most vociferous opponents of new market-rate housing development, largely because of concerns about displacement.[2] Among advocates, subsidized housing production has become an important policy goal. Yet, studies to date have failed to produce definitive evidence on the relationship between subsidized housing development and displacement.

This policy brief presents findings from a longer report entitled *Housing Market Interventions and Residential Mobility in the San Francisco Bay Area*, authored by researchers from the Urban Displacement Project at the University of California Berkeley and the University of Toronto, the Changing Cities Research Lab at Stanford University, and the Federal Reserve Bank of San Francisco.[3] Our study examines the impacts of specific housing interventions in the nine-county San Francisco Bay Area. We overcome previous data challenges for the first time by building unique, cross-validated, and fine-grained datasets on mobility and linking them to a bespoke block-level housing construction database. Our findings improve on those of other studies as we are able to examine the socio-economic status of household that move, rather than assuming that households have the same characteristics as their overall neighborhood. By accounting separately for both moves in and moves out by socio-economic status, our study is better able to pinpoint neighborhood change, and we validate results across datasets, achieving unique robustness.

This brief is the third of a series, summarizing findings on the relationship between new subsidized housing production and mobility into and out of neighborhoods in the Bay Area, with an additional focus on gentrifying areas. By looking at movement both out of and into local neighborhoods over a four-year period, we examine how new subsidized housing development impacts displacement – both direct and exclusionary – over the short-term. Other briefs in the series focus on impacts of new production and tenant protections as well as the destination outcomes of displaced households. Direct displacement pushes people to move out of their neighborhoods, whereas exclusionary displacement limits who can move into a neighborhood, highlighting reduced housing choice particularly for lower-SES people.

We begin with a brief description of subsidized housing, followed by a summary of our data and methods. After a description of new housing construction and mobility patterns, we outline our findings. A conclusion outlines policy recommendations and next steps for research.

Background

Subsidized Housing

Local governments incentivize the production of

subsidized housing in order to provide affordable housing options for residents and discourage displacement due to rent pressures. Research on the impact of subsidized housing production produces mixed results. On the one hand, adding housing affordable to the lowest income households may free up more units for other extremely low- and very low-low-income households. On the other hand, new construction of subsidized units may crowd out other nearby new rental construction in gentrifying areas, complicating these dynamics.

Data and methods

Most studies try to measure displacement by comparing the number of low-income residents in a neighborhood across two time periods, but this approach prohibits determining whether households actually moved out of the neighborhood or simply changed income level, making it difficult to compare displacement in other neighborhoods, such as those without rent-stabilized units. The displacement identified in such studies turns out to have little relationship to involuntary household mobility. In this study, we use individual and household mobility and the type of neighborhood moved to (similar or downward) as proxies for displacement, or forced moves, and assess exclusionary displacement by examining who moves into neighborhoods with specific interventions. Exclusionary displacement limits who can move into a neighborhood, highlighting reduced housing choice particularly for lower-SES people.

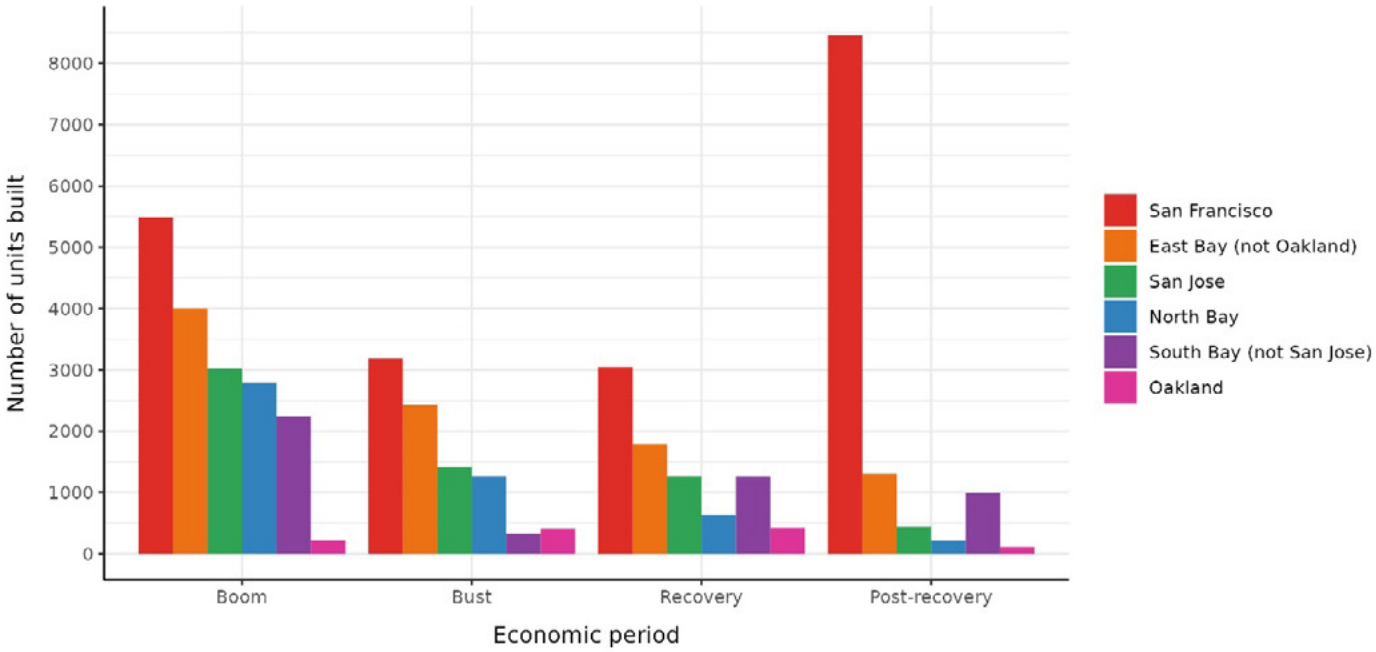
We use two different proprietary datasets on individual and household characteristics. This provides unique robustness to our study, since we can validate results across datasets. To measure mobility, we use Infogroup and Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) data, excluding data for individuals or households where the head is under 25 years old. To measure mobility, we use Infogroup and Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) data, excluding data for individuals or households where the head is less than 25 years old. Using these two very different data sources, it is challenging to devise equivalent socio-economic categories for comparison. Infogroup offers income data but requires significant smoothing and weighting to be comparable to the American Community Survey. CCP provides credit scores that measure financial stability, a proxy for socio-economic status (SES). Both teams mapped their datasets to four categories: extremely low (under 30% area median income (AMI)), very low-low (30%-50% AMI), moderate-middle (50%-100% AMI), middle-high (over 100% AMI), and the Infogroup analysis added a high category (over 150% AMI).

We present these results for the overall Bay Area. We also run an analysis on a subset of gentrifying tracts in the three major cities (Oakland, San Francisco, San Jose), representing “hot-market” areas. For more detail on the model controls and variable construction, see Appendix A.

The San Francisco Bay Area context: Shortage of subsidized housing

We first examine trends in housing over time. From 2002-2019, 356,610 new units were produced in the Bay Area, of which 13.1% were subsidized. This falls far short of demand, creating unusual pressure on the regional housing market.[4] Figure 1 displays the distribution of new subsidized housing production across different regions in the Bay Area and over time. Most new production over the last two decades occurred during the housing boom period (2002-2006), with construction slowing down throughout the Bay except for a spike in San Francisco during the post-recovery period (2015-2019). The map of subsidized housing construction in Figure 2 shows that there was an uneven distribution of these units across the Bay, concentrating mostly in San Francisco, Oakland, and San Jose.

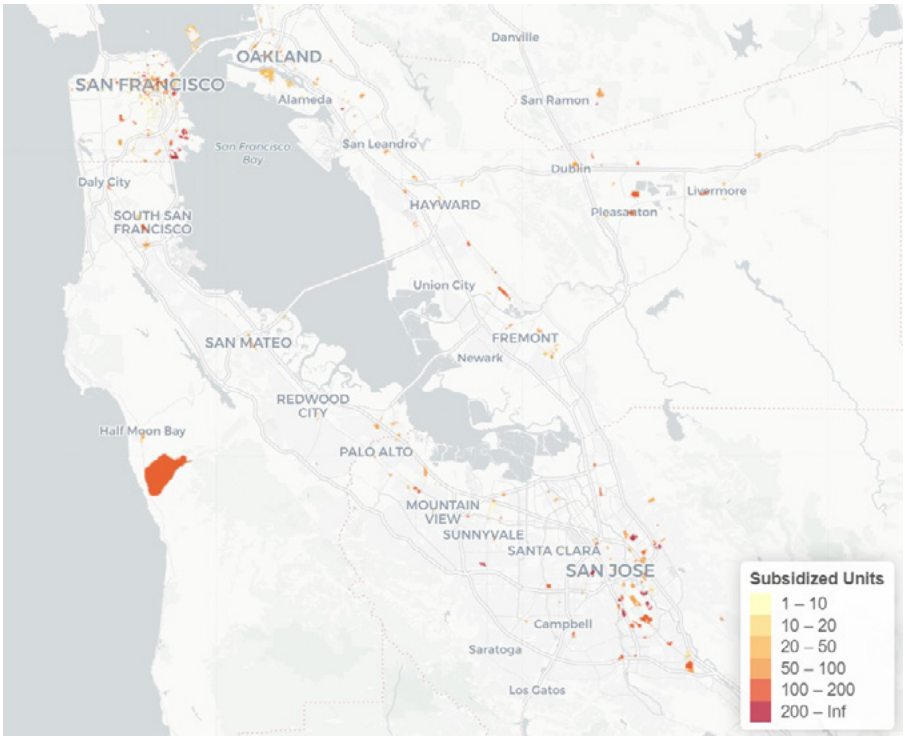
Figure 1. Subsidized housing construction decreased over time but spiked in San Francisco during the Post-recovery period (2015-2019).



Construction of New Housing Over Time by Subregion during Boom (2002-2006), Bust (2007-2009), Recovery (2010-2014), and Post-recovery (2015-2019) periods

Source: Urban Displacement Project (UDP) New Housing Production Database

Figure 2: Subsidized housing construction is concentrated in San Francisco, Oakland, and San Jose.



New Subsidized Unit Construction in the Bay Area by Census Block, 2000-2019

Source: UDP New Housing Production database

Next, we show a series of visualizations showing outmigration and inmigration rates in a typical neighborhood (defined as the block group) from when there are no newly produced subsidized units to 10 new subsidized units, looking at two and four years after units are built. However, it is important to note that the median neighborhood has 0 newly constructed subsidized units, and the average neighborhood has just over 2 newly constructed subsidized units.

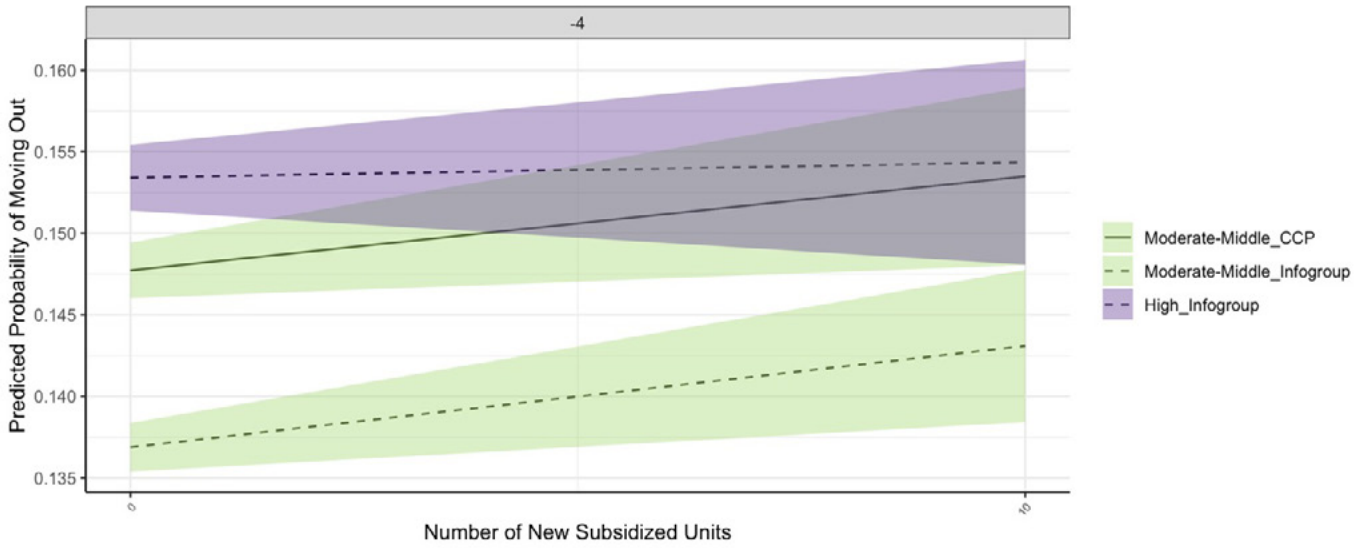
Since the robustness of our analysis relies on two different datasets of individuals and households, we present findings from each dataset. Our analysis describes mobility for nine SES groups from the CCP (solid lines) and Infogroup (dotted lines) datasets, ranging from the **extremely low in yellow to the very low-low in orange, moderate-middle in green, middle-high in blue, and high in purple**. The two different datasets agree on most, but not all, patterns. We only present results where there is agreement among the two datasets, and thus exclude results for the very low-low SES group, for which there is no agreement. Note that we do not present any results on outmigration in gentrifying areas as they inconclusive across the datasets for all SES groups

The Impacts of Tenant Protections on Displacement (Outmigration)

There is too little subsidized housing to identify substantial impacts on displacement for the lowest SES group.

The number of newly subsidized units in Bay Area neighborhoods is vanishingly small, which may explain their overall insignificant effects on mobility. In addition, new units may be reserved for residents from outside the neighborhood, thus failing to mitigate local displacement effects. Two years after units are built, there are no significant effects on mobility. However, after four years (Figure 3), we find that residents in the moderate-middle SES group are significantly more likely to leave their neighborhoods, with probabilities increasing by an estimated 0.6% and 1.2% for the CCP and Infogroup datasets respectively. There were no statistically significant effects for high SES residents.

Figure 3. Four years after new subsidized housing construction, moderate-middle SES residents experience an increase in outmigration.



San Francisco Bay Area: Moving out after four years.

Sources: FRBNY Consumer Credit Panel/Equifax Data, Infogroup, and Neighborhood Housing Preservation Database

The next section turns to the effects of subsidized housing production on inmigration, i.e., the potential of newly built affordable units to encourage lower SES residents to access neighborhoods in the Bay Area.

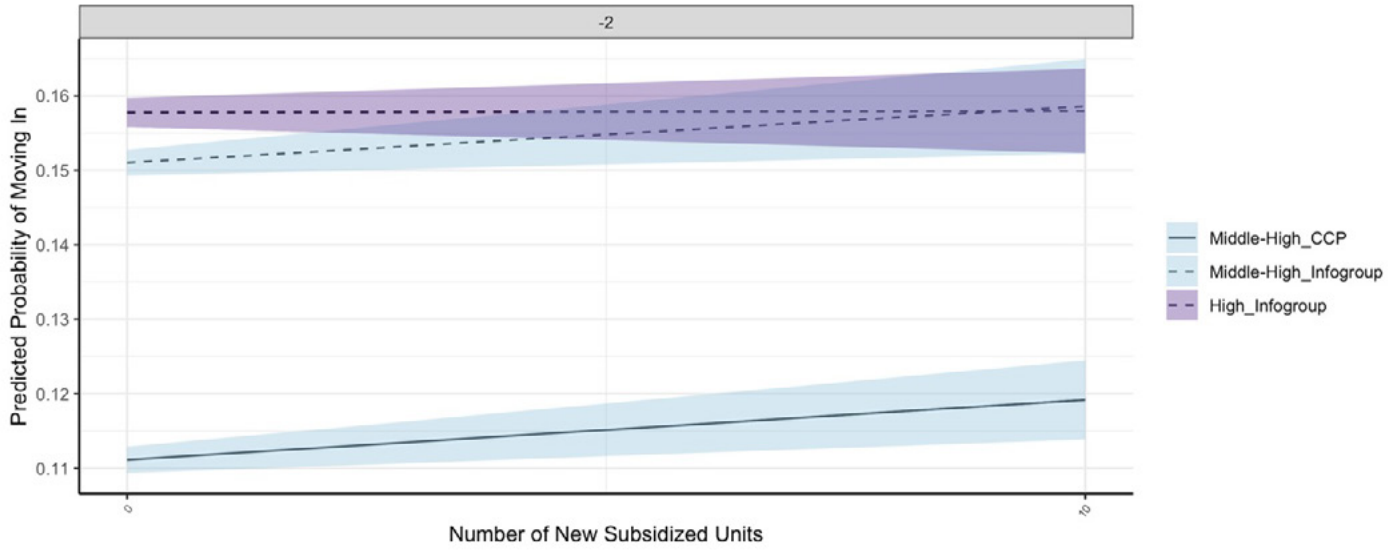
The Impacts of Subsidized Housing on Exclusionary Displacement (Inmigration)

Four years after new subsidized units are built, extremely low socio-economic status residents are less likely to move in.

Though our results for the lowest SES group are inconclusive for the first two years following new subsidized housing production, we find that these units encourage middle-high SES residents to move in (Figure 4). Effects are overall very small, however, with an increase of 1.6% in the inmigration rate for middle-high SES residents.

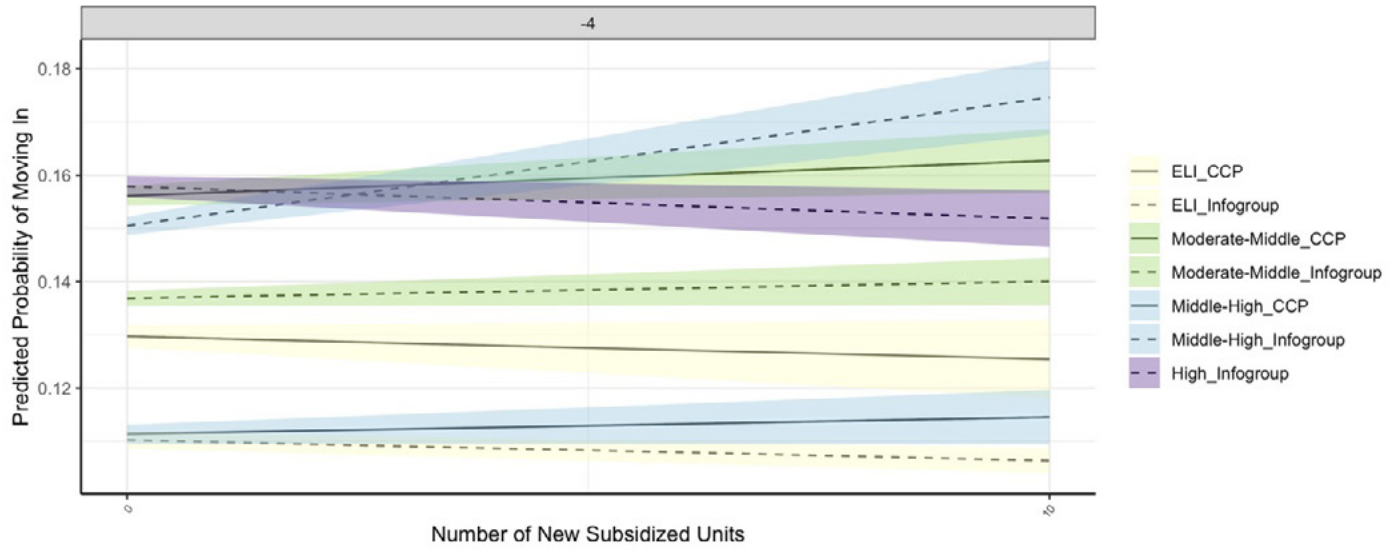
By four years afterwards, extremely low socio-economic status residents are less likely to move in. Instead, moderate-middle and middle-high SES residents are more likely to move in. This may suggest that the greatest benefits of subsidized housing construction are not experienced by lowest SES residents, highlighting the urgent need to develop housing options that meet their needs.

Figure 4. Two years after new subsidized housing is built, middle-high SES residents experience the greatest increase in inmigration rates, followed by ELI residents.



San Francisco Bay Area: Moving in after two years.

Figure 5. ELI and high SES residents are less likely to move in four years after new subsidized housing construction.



San Francisco Bay Area: Moving in after four years.

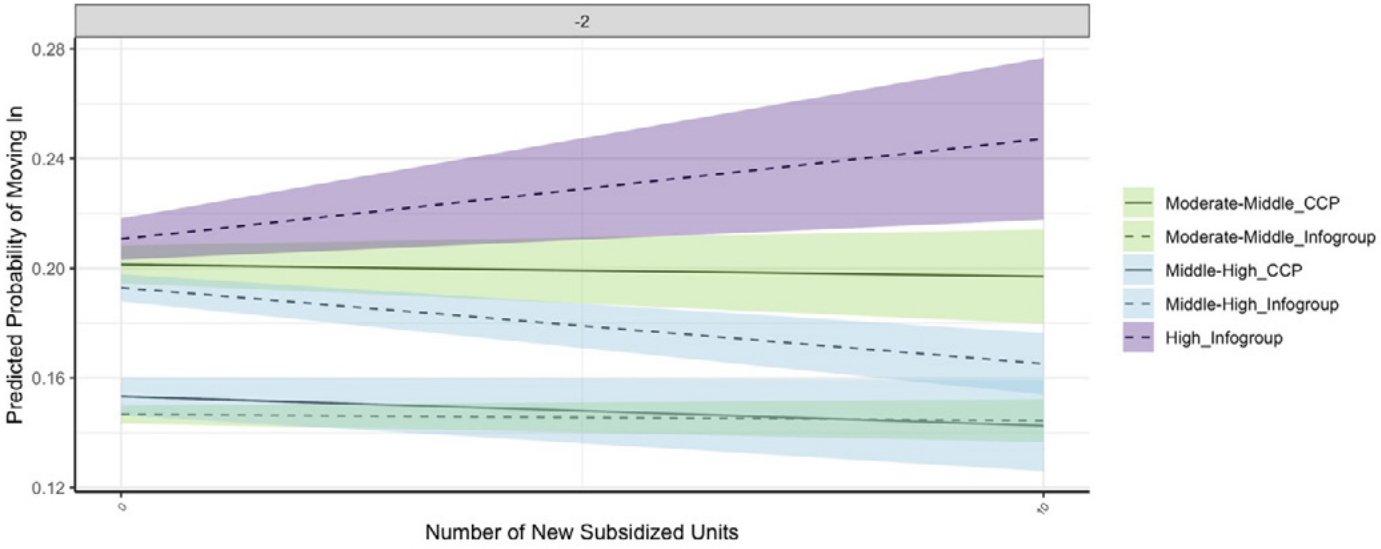
Sources: FRBNY Consumer Credit Panel/Equifax Data, Infogroup, and Neighborhood Housing Preservation Database

In gentrifying neighborhoods, the increase in move-ins after new subsidized housing is constructed is biggest for the highest socio-economic group.

Next, we examine whether newly constructed subsidized units in gentrifying neighborhoods allow lower SES residents to move in. Within a strong housing market like the Bay Area, low-income neighborhoods may experience growth dynamics that are different from weaker markets or high-income areas. Specifically, gentrifying areas in core cities may experience such high demand that subsidized housing construction is not able to alleviate housing market pressures and prevent displacement, making it crucial to conduct an analysis specific to gentrifying areas. We subset our sample to the set of Oakland, San Francisco, and San Jose neighborhoods that are gentrifying (i.e., increasing in housing prices or rents, while also experiencing an influx of high-income, high-educated residents) to examine the impacts of tenant protections in these hot-market areas. However, we find no conclusive evidence that subsidized units have significant effects on mobility in gentrifying neighborhoods.

We find no conclusive evidence that new subsidized units have statistically significant effects for the two lowest SES categories in any years. Instead, we find that newly constructed affordable units discourage moderate-middle and middle-high SES residents to move in, while encouraging high SES residents to move in (Figure 6). Four years after construction, however, there is no conclusive evidence of significant effects for any SES group.

Figure 6. Two years after new subsidized housing is built, high SES residents experience an increase in inmigration.



Gentrifying Neighborhoods: Moving in after two years.

Sources: FRBNY Consumer Credit Panel/Equifax Data, Infogroup, and Neighborhood Housing Preservation Database

Conclusion and policy implications

In the context of the San Francisco Bay Area's tight housing market, this study overcomes previous data challenges for the first time to examine the impacts of specific housing interventions. The woeful lack of subsidized units across the Bay Area makes it difficult to ascertain the effects of building these units. In addition, most cities lack community preference policies for subsidized housing, meaning that the new construction does not necessarily stem outmigration. This may explain why we do not find conclusive evidence on the impacts of new subsidized production on displacement among the lowest SES residents. However, our analysis shows that moderate-middle SES residents are significantly more likely to leave their neighborhoods four years after units are built, while other moderate-middle and middle-high SES residents are more likely to move in. This may occur because the new construction has a catalytic impact on the neighborhood, encouraging some higher-SES groups to move in. By four years after, extremely low SES residents are less likely to move in. In gentrifying neighborhoods, the increase in move-ins after new subsidized housing is biggest for the highest socio-economic group.

Policymakers in the San Francisco Bay Area should in-

crease production of subsidized housing in conjunction with community preference policies that offer local residents first dibs on such new housing. New production of subsidized housing can help support vulnerable residents in accessing affordable housing. The increased moves out among moderate-middle socio-economic status residents after new subsidized housing can be mitigated by expanding tenant protections. Since moderate-middle and middle-high socio-economic status residents also appear to take advantage of neighborhoods with new subsidized housing, policymakers should pay urgent attention toward developing affordable housing solutions for the lowest socio-economic groups.

Our full study examines the impacts of new housing production, tenant protections, and subsidized development. We find that building more market-rate housing and tenant protections alone may not alleviate the housing crisis or improve access to housing. To address the housing affordability crisis and mitigate displacement and exclusion, policymakers must pursue bold initiatives that substantially expand social housing. Social housing is the provision of rental or homeownership units affordable at a moderate income or below, and is run by a public or nonprofit entity. To work, it would need to be widely implemented, requiring government investment at levels that match the urgency of the housing crisis.

Image Credit: DM PHOTOGRAPHY

An additional strategy is the preservation of unsubsidized affordable housing by acquiring multi-unit rental properties that are at risk of becoming unaffordable via a program like San Francisco's Small Sites Acquisition and Rehab Program may be effective. Other potential approaches include tenant or community opportunity to purchase policies such as San Francisco's, transfer tax breaks for building owners when selling to a nonprofit or community land trust condominium conversion restrictions, and community land trusts.

The San Francisco Bay Area is an extreme case study, with job growth outpacing new housing production and resulting in supply shortages and price spikes that date back at least thirty years. In this context, the traditional mechanism for providing housing affordability for all but the lowest SES households–filtering–is broken. In the face of this structural problem, existing subsidized housing units are only providing minimal relief, and their impacts may be distorted due to the severe lack of housing options overall. Therefore, in regions where there is no shortage of affordable housing to start with like in the Bay Area, these policies may have very different impacts.

About the Authors

Jackelyn Hwang, Ph.D., is Assistant Professor of Sociology and Director of the Changing Cities Research Lab at Stanford University.

Iris Zhang, M.A., is a Ph.D. student in Sociology at Stanford University

Jae Sik Jeon, Ph.D., is Assistant Professor of Real Estate Studies at Konkuk University.

Karen Chapple, Ph.D., is Professor Emerita of City & Regional Planning at UC Berkeley, and Director of the School of Cities/Professor of Geography & Planning at the University of Toronto.

Julia Greenberg, M.P.P., is Research Manager at the Urban Displacement Project at UC Berkeley.

Vasudha Kumar, B.Sc. is the Social Science Research Analyst at the Changing Cities Research Lab at Stanford University

Acknowledgements

We thank Casey Pablo Butcher, Alex Kim, Brooke Ada Tran, Patricia Wei, Alisha Zhao, and Isaac Schmidt for their excellent research assistance with the full report, Lizzy Mattiuzzi, Rocio Sanchez-Moyano, James Pappas, Pedro Peterson, Brian Asquith, and Kate Pennington for their thoughtful comments, and Rachel Schten for formatting and graphic support. Funding for the report was provided to UC Berkeley and Stanford University by the Chan Zuckerberg Initiative DAF and the Silicon Valley Community Foundation. For the new housing production and tenant protections databases, we used data provided by Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the data can be found at http://www.zillow.com/ztrax. The results and opinions are those of the author(s) and do not reflect the position of Zillow Group.

About IGS

The Institute of Governmental Studies is California's oldest public policy research center. As an Organized Research Unit of the University of California, Berkeley, IGS expands the understanding of governmental in-stitutions and the political process through a vigorous program of research, education, public service, and publishing.

About CCRL

The Changing Cities Research Lab at Stanford University uses innovative data and methods to study the relationship between contemporary changes in U.S. cities and the durability of neighborhood inequality and segregation. With a focus on gentrification and racial stratification, CCRL aims to advance policy solutions that promote equity as cities change.

About UDP

The Urban Displacement Project (UDP) is a research and action initiative of the University of California Berkeley and the University of Toronto. UDP conducts community-centered, data-driven, applied research toward more equitable and inclusive futures for cities. Our research aims to understand and describe the nature of gentrification, displacement, and exclusion, and also to generate knowledge on how policy interventions and investment can support more equitable development.

Endnotes

1 Based on estimates in Myers & Park (2019), who estimate a need for 2.5 million additional units by 2025, with just 1 million permits projected. Also see California Department of Housing and Community Development 2000; Rodríguez-Pose & Storper 2020.

2 See, for example, the battle against SB 50 http://hrcsf.org/2020/01/22/tenant-groups-oppose-sb50/.

3 Chapple et al. 2022. This full report can be accessed here

4 Metropolitan Transportation Commission, 2020.

5 Carlson 2020

6 DeLuca et al. 2013; Desmond and Shollenberger 2015;

References

Carlson, H. J. (2020). Measuring displacement: Assessing proxies for involuntary residential mobility. City & Community, 19(3), 573-592.

Chapple, Karen, Jackelyn Hwang, Jae Sik Jeon, Iris Zhang, Julia Greenberg, and Bina P. Shrimali. 2022. "Housing Market Interventions and Residential Mobility in the San Francisco Bay Area." Federal Reserve Bank of San Francisco Community Development Working Paper 2022-1. doi: 10.24148/cdwp2022-01.

DeLuca, Stephanie, Philip M. E. Garboden, and Peter Rosenblatt. 2013. "Segregating Shelter: How Housing Policies Shape the Residential Locations of Low-Income Minority Families." Annals of the American Academy of Political and Social Science 647 (1): 268–99.

Desmond, Matthew, and Tracey Shollenberger. 2015. "Forced Displacement from Rental Housing: Prevalence and Neighborhood Consequences." Demography 52 (5): 1751–72.

Manville, M., & Monkkonen, P. (2021). Unwanted Housing: Localism and Politics of Housing Development. Journal of Planning Education and Research.

Monkkonen, P., & Manville, M. (2019). Opposition to development or opposition to developers? Experimental evidence on attitudes toward new housing. Journal of Urban Affairs, 41(8), 1123-1141.

Metropolitan Transportation Commission. (2020). Vital Signs: Housing Production. Retrieved August 8, 2021, from https://www.vitalsigns.mtc.ca.gov/housing-production

Myers, D., & Park, J. (2019). A Constant Quartile Mismatch Indicator of Changing Rental Affordability in U.S. Metropolitan Areas, 2000 to 2016. Cityscape, 21(1), 163–200.

Rodríguez-Pose, A., & Storper, M. (2020). Housing, urban growth and inequalities: The limits to deregulation and upzoning in reducing economic and spatial inequality. Urban Studies, 57(2), 223–248.

Appendix A. Data and Model Construction.

Data

The Infogroup Residential Historical Data provides annual information on individual owner and renter households from 2006-2019, including geographic coordinates of where the households live, household income, and demographic characteristics (many imputed), with an average of approximately 3 million Bay Area households per year. The process of validation revealed that the Infogroup data requires careful data cleaning and wrangling, including elimination of households not consistently represented in the dataset, and weighting to be consistent with the American Community Survey. The CCP data provides quarterly information on a 5% sample of adult consumers from 2002-2018, with census block-level[i] information on where respondents live, as well as respondents' age, loans, mortgages, financial issues (e.g., delinquencies, bankruptcy, foreclosure), and Equifax Risk Scores (credit scores that indicate financial stability), with an average of 240,000 Bay Area residents per year.
For data on subsidized housing, we constructed a database which uses data from the California Housing Partnership and includes properties that either used to or currently receive state (LIHTC, HCD, CalHFA) or federal funding (HUD, USDA).

Model Construction

To account for household-level characteristics that are related to differences in whether individuals (or households) move, the Infogroup team controls for age and race of household head, length of residence, number of children, number of adults, and marital status. The CCP/Equifax team controls for age, whether the household has a mortgage as a proxy for homeownership, whether the household has delinquency on credit accounts as a proxy for financial instability, and the adult household size. Both control for locational characteristics by including indicators in our models of the subregion: the City of Oakland, the City of San Francisco, the City of San Jose, the North Bay (Marin, Napa, Sonoma, and Solano Counties), South Bay (San Mateo and Santa Clara Counties) excluding San Jose, and East Bay (Alameda and Contra Costa Counties) excluding Oakland. The Stanford team also includes indicators in our models for the panel year.

We account for several neighborhood-level characteristics that could be associated with mobility patterns. These include percent Hispanic, percent college-educated, percent foreign-born, poverty rate, percent homeownership, median home value, median gross rent, vacancy rate, and percent of housing built in the last 20 years, all based on 2000 U.S. Census data. In addition, we include the number of subsidized housing units as of 2016 from the National Housing Preservation Database[iii] Finally, since neither of these data sources accounts for household size in assigning SES categories, the analysis controls for this. We subset the Infogroup data to renters, but the Equifax/CCP data does not differentiate between renters and owners.

We examine mobility each year into and out of block groups, a census geographic unit typically containing between 600 and 3,000 residents; the number of blocks in a block group ranges from about six in a dense city to as many as 30 in an outlying suburb. This measure lacks the precision of data produced from surveys that ask directly about the decision to move but is highly correlated with data that measures motivation.[5] This measure thus falls short of a full measure of forced moves, but still captures disproportionate mobility that may occur for complex reasons not easily captured in a closed-ended survey. Thus, we also duplicate our analysis focused on whether people move to similar or lower-income/higher-poverty neighborhoods to better reflect constrained moves in another policy brief.[6]

Our analysis estimates two models. First, we estimate the probability that an individual (CCP) or household (Infogroup) of different SES levels moves out of a block group following new subsidized production using a linear probability model. Second, we estimate the probability an individual or household moves into a block group following new subsidized production using a linear probability model. We test how the effects of new production differ across SES categories by including interaction terms between the housing variable and SES categories in these two sets of models.

In the subsidized housing production models, we also include a control for the natural log-transformed number of new market-rate units, as well as the percent of housing units covered by rent stabilization or just cause that year. To account for the possibility that outmigration and inmigration rates are simply a product of neighborhood churning, we also include a rolling prior 3-years' average of the block group out- and inmigration rates by SES.[ii]

To examine only gentrifying neighborhoods in the three cities, we construct gentrification measures from the 2000 and 2006-2010 ("2010") ACS. Tracts are considered

gentrifiable if the median household income in 2000 was less than the subregion's median household income in 2000. Among gentrifiable tracts, tracts are split into gentrifying and non-gentrifying tracts. Tracts are considered be nongentrifying only if 1) the percentage increase in either the median rent or median home value was less than the subregion's 25th percentile of the percent increase on either of those indicators, and 2) the percent increase in either the population of college-educated residents or the median household income was less than the subregion's 25th percentile of the percent increases on either of those indicators. Tracts are considered to be gentrifying otherwise.

[i] These data are based on 2000 Census boundaries and utilize a crosswalk from the National Historical Geographic Information System to 2010 Census block group and tract boundaries for the analysis.

[ii] For the Stanford team, because the CCP data starts at 2002 and does not include values for 2004, panel year 2002 (222,881 observation) is dropped, panel year 2003 is based on the prior year rates, panel years 2005 and 2006 are based on the two-year averages from 2002 and 2003, and 2003 and 2005 respectively. 3-year averages are only used for panel years 2007 and above.

[iii] Due to collinearity issues, the Berkeley team removes the "percent college-educated" control from the San Francisco and Oakland models.