Cityscape

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Regulatory Reform and Affordable Housing
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Symposium

Regulatory Reform and Affordable Housing

Guest Editors: Regina C. Gray and Mark A. Reardon

Guest Editor's Introduction

Regulatory Reform and Affordable Housing: Thirty-Years After the Kemp Commission's Report on Regulatory Barriers

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U.S. Department of Housing and Urban Development

The views expressed in this article are those of the authors and do not represent the official positions or policies of the Office of Policy Development and Research (PD&R), the U.S. Department of Housing and Urban Development (HUD), or the U.S. government.

In 1991, at the behest of U.S. Department of Housing and Urban Development (HUD) then-Secretary Jack Kemp, the Advisory Commission on Regulatory Barriers to Affordable Housing delivered a report on how land-use restrictions have worsened housing affordability. Secretary Kemp charged the commission to "explore the effect of the maze of federal, state, and local laws, regulations, ordinances, codes, and innumerable other measures that act as barriers to the development of affordable housing in appropriate places … (and) to catalogue the barriers, identify the sources of those barriers, and propose solutions."

The commission found that:

> In community after community across the country, local governments employ zoning and subdivision ordinances, building codes, and permitting procedures to prevent the development of affordable housing. "Not In My Back Yard"—the NIMBY phenomenon—has become the rallying cry for current residents of these communities. They fear affordable housing will result in lower land values, increasingly congested streets, and a rising need for new infrastructure such as schools (HUD, 1991).
>
> What does it mean if there is not enough "affordable housing?" Most urgently, it means that a low- or moderate-income family cannot afford to rent or buy a safe (up-to-code)

decent-quality dwelling without spending more than 30 percent of their income on shelter, so much that they cannot afford other necessities of life.

Thirty years later, most of the barriers remain, and some of them are higher. In this introduction, we point the reader to subsequent research and information that HUD has published on regulatory barriers, their consequences, and strategies for reducing them. We then preview the significant new research presented by the authors of the articles in this symposium.

HUD Research and Information Resources

One ongoing resource for analysts and practitioners is the Regulatory Barriers Clearinghouse (RBC)—https://www.huduser.gov/portal/Rethinking-American-Communities.html—created to document the prevalence of regulatory barriers that influence the cost of housing and offer best practice solutions for their removal. To this very day, the clearinghouse is managed by the Office of Policy Development and Research (PD&R). It is an easily searchable electronic database containing over 4,800 barriers and solutions spanning all 50 states and over 460 cities and counties. RBC partners include representatives from the housing industry, the National League of Cities, the National Association of Counties, the National Association of Mayors, and many other private and public advocacy groups.

It should be noted that a 2005 symposium in this journal (Volume 8, Number 1) features several comprehensive reviews of the literature to that date. It can be accessed electronically through this link: https://www.huduser.gov/portal/periodicals/cityscpe/vol8num1/index.html.

Subsequent research has offered contributions to the growing body of research outlining regulatory barriers to affordable housing. It has been demonstrated that cities and counties intentionally reduce the supply of market-rate housing by blocking multifamily housing construction through zoning ordinances (Knaap et al., 2008). These limiting actions include the formation of stringent subdivision requirements, notably the number of homes permitted on large lots (NAHB Research Center, 2007). These requirements generally include prohibitions on accessory dwelling units, which can, when allowed, relieve the housing shortage for some tenants (Sage Computing, 2008).

Other barriers include impact fees that may unduly reduce the supply of market-rate housing if they excessively burden the residents of new development, relative to existing residences, for the construction and maintenance of infrastructure that they will all use in common (Bowles and Nelson, 2008). Even precautionary measures, such as environmental reviews of new construction, have been shown to disproportionately constrict supply and increase market-rate housing costs (Randolph et al., 2007). Similarly, barriers may be due to unintentional policy effects, such as obsolete and inefficient building codes that can reduce the supply of market-rate housing (Listokin and Hattis, 2005), or requiring rehabilitation projects to meet the same standards as new construction.

Regulatory barriers, particularly those reflecting local NIMBY sentiments, are often the result of political pressure placed on local politicians. Local governments, including those outside of the South, have put many barriers to the placement of manufactured housing on lots zoned for residential use (Dawkins et al., 2011). Since off-site construction is generally less costly than on-site construction, this constitutes a significant supply constraint.

In sum, land-use requirements are erected by local governments using authority delegated from the states. We hope that the six featured articles in this symposium will offer further insight into how local decisionmakers have grappled with identifying barriers and engaged in regulatory reform.

Featured Symposium Articles

This symposium presents six new research articles on regulatory barriers, some of which utilize increasingly robust datasets continually updated to reflect the most contemporary regulations.

Robert Wassmer and Joshua Williams of California State University, Sacramento, analyze data from the Wharton Residential Land Use Regulatory Index (WRLURI) to estimate the effects of a one-unit change in regulatory strictness on the price of land available for construction in metropolitan areas, finding significant impacts.

Mike Fratantoni, Edward Seiler, and Jamie Woodwell of the Mortgage Bankers Association utilize WRLURI data from 2006 to 2018 and the Federal Housing Finance Agency's (FHFA) Home Affordability Estimate (HAE) to examine changes in community-level land-use restrictions in comparison to trends in housing supply and affordability. They differ from Wassmer and Williams by focusing on intra-metropolitan trends. Here, the authors use two affordability measures to capture both the homebuyer's access to affordable housing and housing tenure. Nine case studies are presented.

Michael LaCour-Little and Weifeng Wu—in collaboration with Fannie Mae—utilize another popular dataset, the National Longitudinal Land Use Survey (NLLUS), to evaluate density controls with rent growth and home appreciation over time and across 50 metropolitan areas. Using data collected in 1994, 2003, and 2019, the authors examine home-price indices published by FHFA and used in conjunction with core-based statistical areas to determine home appreciation rates, while multifamily rental data from the CoStar Group are used for rental price analysis. The authors conclude that density regulations have taken a bifurcated path, whereby jurisdictions in the low- and high-density categories have increased, while those categorized as middle density have decreased significantly.

Janet Li, Michael Hollar, and Alastair McFarlane from HUD seek to advance a balanced view of building codes that recognizes both the benefits and the costs of effective regulation. They focus on energy efficiency as a building code component. Li, Hollar, and McFarlane develop an economic framework by investigating market failures, evaluating impacts on the housing market, and considering the distributional impacts of regulations of residential solar panels as a case application.

Jorge de la Roca, Marlon Boarnet, Richard Green, and Eugene Burinsky of the University of Southern California, and Linna Zhu of the Urban Institute, investigate the value proposition of floor area ratio (FAR) increases to developers in transit-oriented communities (TOCs) in Los Angeles, where developers can obtain higher FARs in TOCs in exchange for the provision of affordable housing. The authors devise detailed financial proformas on the feasibility of hypothetical TOC projects and non-TOC projects in various parts of the city by comparing internal rates of return. The authors show that TOC developments are preferred in all but moderate-strong markets to non-TOC developments using 20 hypothetical locations. The number of TOC permits is also cited as equal to the number of density-bonus program building permits despite the latter program's seniority, indicating a high adoption rate. The authors find that the program's current scale is insufficient to affect housing prices in Los Angeles, but the program can be successfully replicated elsewhere.

Finally, Emily Hamilton of George Mason University estimates the effects of inclusionary zoning on housing supply and prices in the Baltimore-Washington D.C. region. Hamilton tries to distinguish differences in effects between mandatory and optional inclusionary zoning programs on housing supply and prices. She finds that inclusionary zoning programs sometimes increase market-rate housing prices but finds no impact on housing supply.

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The Influence of Regulation on Residential Land Prices in United States Metropolitan Areas

Robert W. Wassmer
Joshua A. Williams
California State University, Sacramento

Abstract

The authors measure how a one-unit change in the Wharton Residential Land Use Regulatory Index of overall regulatory strictness and its specific component categories raises the price of land available for new residential construction in United States metropolitan areas. This information is essential to assess the validity of claims that additional constraints on a local government's ability to impose restrictive residential land use regulations offer a means to generate more equitable and efficient outcomes in U.S. housing markets. The authors find that various measures of the stringency of local land use controls relevant to the development of residential projects do exert measurable positive influences on the average price of an acre of land available for single-family housing and thereby the price of such housing. A decrease in this regulatory stringency by one unit (or about 1 to 1.5 standard deviations from the variation observed in all metropolitan areas) could cut the price of new residential homes by about one-fourth of the standard deviation observed in residential land prices across the United States.

Introduction

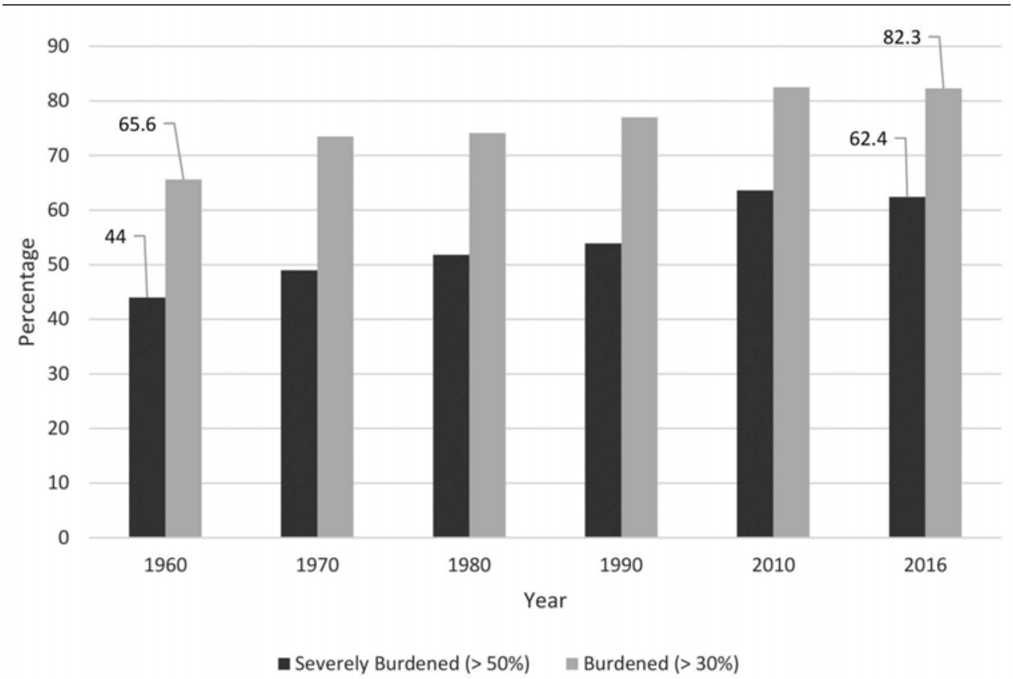
In 2016, more than 80 percent of U.S. renter households in the lowest income quartile reported spending nearly one-third of their income on housing. Moreover, 60 percent of the same households reported that shelter costs took up more than one-half of their income. Exhibit 1 illustrates that these burdens have risen over time. Note that these percentages are U.S. averages. The situation is demonstrably worse in specific metropolitan areas. In the Miami-Fort Lauderdale-West Palm Beach Metropolitan Area, more than 60 percent of all renter households devote more than 30 percent of their income to shelter. At the same time, more than one-third of these renter households devote at least one-half of their income to a landlord.[1] Such values quantify the

[1] Similar 2017 data for all U.S. metropolitan areas can be found at https://www.jchs.harvard.edu/ARH_2017_cost_burdens_by_metro.

financial stress and subsequent anxiety borne by low-income renter households throughout the United States and most renter households in many of its metropolitan areas.

Exhibit 1

Housing Cost-Burdened Renters in the United States' Bottom Income Quintile



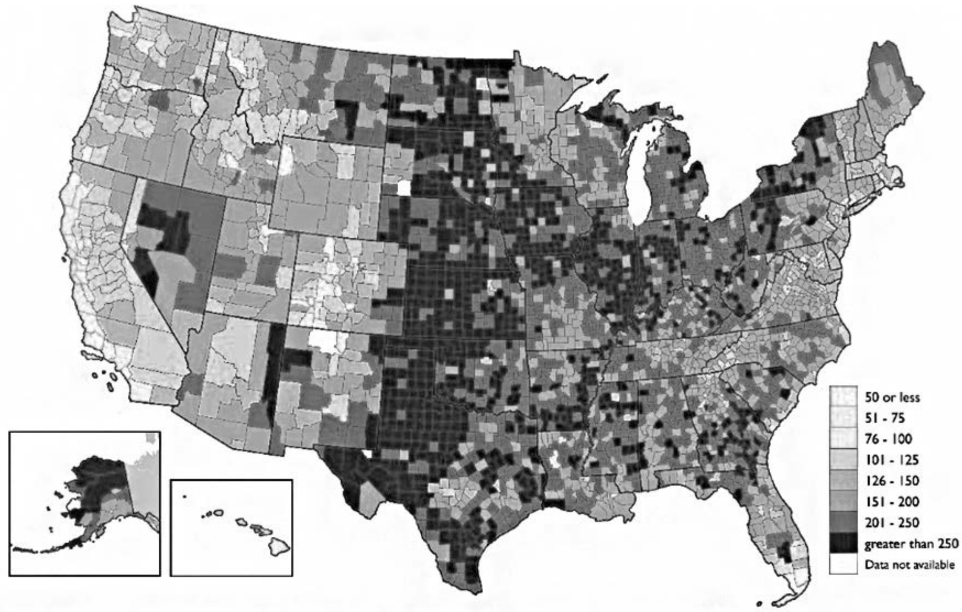
Source: Data from Appendix Table W-6 in America's Rental Housing 2017, https://www.jchs.harvard.edu/research-areas/reports/americas-rental-housing-2017

Exhibit 2 offers a 2017 index measure of homeowner affordability for every U.S. county based on median household income and the use of a conventional 30-year mortgage to finance a median-priced home. In this exhibit, black represents the greatest affordability, whereas white represent the least. The five metropolitan areas with the highest household incomes needed to purchase the median-priced home (with 20 percent down and a 30-year fixed-rate mortgage) were San Jose ($259K), San Francisco ($199K), San Diego ($132K), Los Angeles ($123K), and Boston ($107K). Understanding the hardship that high rents and home prices impose on low-income households throughout the country, it is not a surprise that more than three-fourths of Americans designate this a crisis.[2]

[2] A September 2019 poll by the National Association of Home Builders (2019) indicates that nearly 8 of 10 Americans believed that the United States suffers from a housing affordability crisis.

Exhibit 2

Housing Affordability Index in the United States, by County, 2014–18



Source: Institute for Policy & Social Research, The University of Kansas; calculated using data from U.S. Census Bureau, 2014-18 American Community Survey; Board of Governors of the Federal Reserve System; Freddie Mac.

Housing Affordability calculated such that a value of 100 indicates a household has exactly enough income to qualify for a 30-year mortgage on a median valued home assuming a 20% down payment and qualifying median houshold income of 25% of monthly payment. Calculation also uses 5-year average 30-year mortgage interest rate of 4.04% for 2014-18. Therefore an index value of 200 indicates a household earning the median household income has 200% of income neccesary to qualify for a conventional loan for 80% of the value of a median-priced home.

Source: https://ipsr.ku.edu/sdc/images/HousingAffordUS.jpg, permission for use granted by Xan Wedel of Kansas State Data Center

The full extent of concern over the information contained in exhibits 1 and 2, however, must also include the realization that the high costs of renting or owning shelter extend beyond the household by effectively discouraging (encouraging) labor mobility into (out of) the most productive metropolitan areas in the United States. A metropolitan area's capacity to experience the growth in employment necessary for a healthy local economy depends on whether its housing market offers shelter to present and future residents at an affordable price. Since the early 1980s, real housing costs throughout the United States have risen faster than inflation-adjusted construction costs. Saks (2008) finds that local governments' strict residential land use regulations increase the inelasticity of the long- and short-run housing supply in a metropolitan area. Gyourko and Molloy (2015) offer a definitive summary of how local building codes and land use regulations reduce housing supply, increase price inelasticity, and raise local housing prices. Because migration into a metropolitan-wide labor market is the primary means through which increases in local demand are satisfied, Gyourko and Molloy assert that "the constraints imposed by regulation could have a meaningful influence on the economic health of local communities" (p. 1327). Glaeser (2020) offers an updated and eloquent explanation of the same concern and designates it "The Closing of America's Urban Frontier." For both the social justice reason that the burden of high housing costs falls on low-income households and the economic efficiency concern of reducing the country's economic productivity, the authors desire to measure the influence of regulation on housing prices across U.S. metropolitan areas.

A metropolitan area is the appropriate unit of analysis for this study because a household's employment and shelter opportunities are usually limited to this region. Glaeser and Gyourko (2018) note that it is difficult to quantify the relative strictness of residential housing and land use regulations in one U.S. metropolitan area with another due to the practice of ceding these choices to local governments. Nevertheless, previous studies have examined the effects of local residential land use regulations on the supply and consequent housing prices. Such regulations include minimum lot sizes, population density restrictions, and urban growth boundaries. The reduction of adverse local externalities through locally controlled land use regulation is a justification commonly cited by such regulations' proponents. Although there is truth to this rationale, there also exists a darker side. Responding to the persistent requests of established residents, local governments frequently implement housing and land use regulations with the motive of preserving neighborhood "character" by prohibiting alternative housing forms and deterring potential low-income or minority residents from moving in.[3]

Excessive residential land use regulation in some metropolitan regions has created both equity concerns and efficiency losses. Glaeser, Gyourko, and Saks (2006) establish that with an inelastic supply of housing to a metro area, increased local labor demand raises housing prices without equivalent higher nominal wages. Such a change decreases decreasing real wages for the local workforce. The result is a spatial misallocation of labor between high-skill workers who can afford to remain in the locality and low-skill workers compelled to seek housing and employment elsewhere. As found in Ganong and Shoag (2017), these effects are durable over time and impede a locality's ability to respond efficiently to sudden shocks in labor supply and demand.

This article describes a study that measures the influence of residential land use regulations on housing prices in U.S. metropolitan areas after 5 or more years of enactment. This measurement is made possible through the Wharton Residential Land Use Regulatory Index (WRLURI). Gyourko, Saiz, and Summers (2008) use survey-obtained information from 2006 on regulatory practices from the 2,649 U.S. localities responding to a nationwide survey to construct the WRLURI. These responses led to the creation of two statewide component measures (including state court or legislative behavior) and nine categories of local regulatory behavior, including political pressure, zoning/project approval, land assembly, supply/density restrictions, exactions, and approval delays. The aggregation of these 11 components yields a WRLURI value for each state and unique WRLURI values for 47 metropolitan areas with 10 or more jurisdictions within them responding.[4]

In this empirical investigation, we proxy for the housing price in a specific metropolitan area through the estimated selling price for an acre of land zoned for new residential housing in the

[3] See Wassmer and Wahid (2019) for a further discussion, an empirical investigation related to "Not-In-My-Backyard" (NIMBY) motivations, and a thought-provoking suggestion on how to overcome it.

[4] Gyourko, Hartley, and Krimmel (2019) gathered similar information on local housing and residential land use regulatory environment for 2018. This 2018-based regulatory index uses slightly different component measures and thus is less than entirely comparable to the 2006 WRLURI. The 2018 regulatory index exists for only 44 metropolitan areas, of which only 38 are the same as reported for 2006.

appropriate county or a population-based aggregation of the appropriate counties (Davis et al., 2019). As demonstrated by Glaeser and Gyourko (2018), the primary reason for variations in the price of similarly built homes across U.S. metropolitan areas is the difference in residential land prices between them, not differences in their physical construction costs. The authors measure how a one-unit change in an index of overall regulatory strictness and its specific component categories raises the price of land available for new residential construction in U.S. metropolitan areas. This information is essential to assess the validity of claims that imposing constraints on local governments' ability to impose restrictive residential land use regulations offers an effective means to generate more socially equitable and economically efficient outcomes in U.S. housing markets.

The authors begin their investigation by reviewing the previous literature on this topic through three themes essential for a complete understanding of the analysis. They follow this review with a simple model of the expected determinants of typical residential land prices in a metropolitan area. The authors then describe the data used in the regression analysis and describe this model in greater detail. The regression results and organization tables follow in the subsequent section. In conclusion, the authors offer a summary of their findings and recommendations for future interventions.

Previous Research

Three central themes offer the basis of the authors' review of previous research on the influence of regulation on housing prices. These are (1) the motivations behind imposing land use regulations and the outcomes of them, (2) the factors that determine residential land prices, and (3) the conclusions of earlier empirical studies regarding the magnitude of influence of different forms of regulation on housing prices or rents.

Motivations and Outcomes of Local Land Use Regulation

Gyourko and Molloy (2015) offer a comprehensive summary of this form of regulation's theoretical determinants in their overview of work on regulation and housing supply. In this summary, Fischel's (2001) "homevoter hypothesis" is a central element due to its focus on the voters' desire to use local development restrictions as a tool to maximize or preserve their home values. Gyourko and Molloy conclude that there is scant empirical evidence that jurisdictions with a higher fraction of homeowners adopt stricter residential land restrictions. They add that this is likely due to a lack of sufficient time-series data necessary for an analysis that addresses omitted variable and reverse causality concerns. However, they also conclude that developers and owners of potential land for residential development influence the local regulatory environment for their benefit and describe several studies that support this claim.

Cheshire and Sheppard (2002) hypothesize that the adoption of local land use regulations provides four categories of community benefits: (1) lowering the overall cost of providing public goods to residents, (2) limiting negative externalities caused by incompatible land uses, (3) generating new public goods and amenities for residents, and (3) maximizing the price obtainable (diminishing deadweight loss) by landowners. Chakraborty et al. (2010) describe three similar motivations for enacting local land use regulations: (1) minimizing negative externalities, (2) attracting fiscally net-positive development projects, and (3) excluding low-income and racial or ethnic minority populations. Gyourko, Saiz, and Summers (2008) report a strong correlation between measures of a community's income or wealth and the degree of its regulatory stringency toward residential development. Glaeser and Gyourko (2018) note that the potential dollar value of negative externalities—unrelated to the income, education, class, and race or ethnicity of a neighbor—do not justify the costs to a community of imposing restrictive building regulations at the level used in many U.S. jurisdictions.

Regardless of motive, previous research demonstrates that local land use regulations create detectable impacts on communities enacting them. For example, Chakrabarti and Zhang (2015) find that high land rents in a California city resulting from a restrictive regulatory environment producing a smaller and more inelastic supply of land for residential development ultimately result in slower employment growth for that city. Ganong and Shoag (2017) find that variations in housing affordability across U.S. metropolitan areas result in a spatial misallocation of the national labor force. This misallocation is due to low-skill workers seeking housing and employment outside high-productivity areas that are more likely to be heavily regulated. Hsieh and Moretti (2017a, b) conclude that the outcome is a staggering loss in overall U.S. gross domestic product (GDP). Additionally, Lens and Monkkonen (2016) correlate the degree of stringency in regulation in large U.S. cities with greater neighborhood segregation by income.

Determinants of Residential Land Prices

Cheshire and Sheppard (2002) theorize that the price of a vacant urban lot varies with surrounding amenities and its proximity to local employment centers. Local land use regulations can influence both the supply of local land available for residential development and its demand. Chakraborty et al. (2010) note, however, that the separate influences of these supply and demand effects are difficult to isolate. On the supply side, land use regulations decrease the local elasticity of housing supply by increasing time delays in the permit process and other associated costs of building new housing (Hilber and Vermeulen, 2016; Paciorek, 2013). On the demand side, regulations can also increase local demand for housing through the creation of new amenities and by serving as a signal to established homeowners the local political commitment to preserving the resale value of existing homes by restricting the construction of additional housing in the area (Kahn, Vaughn, and Zasloff, 2010).

Brueckner (2009) and Helsley and Strange (1995) use economic theory to respectively show the anticipated effect of a single jurisdiction adopting residential land use controls and the anticipated effect in a system of cities where such regulations vary across them. For most regulation forms, the result is higher land rents, a reduced local supply of housing, and subsequently higher house prices when considering a city in isolation. In cities with mobility, residents crowd into the unregulated city due to the greater housing availability and the lower market price. If the resulting congestion reaches an undesirable level, however, some households relocate and bid up housing prices and rents in the regulated communities lacking similar congestion. Higher housing prices in more regulated cities is the result achieved in both models.

Empirical Measurements of Residential Land Use Price Impact on Home Prices

Quigley and Rosenthal (2005) examine 40 empirical studies attempting to discern the relationship between residential land use regulation and housing prices. They conclude that these studies did not "establish a strong, direct causal effect because variations in both observed regulation and methodological precision frustrate sweeping generalizations" (2005: 69). Ten years later, Gyourko and Molloy (2015) summarize the same research and conclude that greater regulation leads to less housing supply and higher prices. Improvements in methodological practices since the 2005 survey and Gyourko and Molloy's choice to trust the findings only of surveys that used the new techniques yielded the difference in these conclusions. Even so, Gyourko and Molloy remain somewhat wary of the primarily cross-sectional data sets used to produce these findings due to a greater likelihood of omitted variable and reverse causality biases.

Zabel and Dalton (2011) find that raising the local minimum lot size by 1-acre (1.5 standard deviations) results in nearly a 10-percent increase in local house prices. Jackson (2014) similarly finds that adding one additional land use regulation in an existing community reduces local residential building permits issued by between 4 and 8 percent. Glaeser and Gyourko (2018) compare home prices in 98 metropolitan areas with the minimum profitable production cost (MPPC) of houses in those areas. They report the percentage of markets in which an average home priced substantially above the MPPC rose from 6 percent to 16 percent between 1985 and 2013. They attribute this result to excessive land use and building regulations rather than increases in house construction's physical cost.

Several studies demonstrate that housing price increases due to regulatory effects are quite large. Hilber and Vermeulen (2016) compare panel data on house prices and earnings in 353 local planning authorities (LPAs) in England between 1974 and 2008 with regulatory or physical constraint data in the same places and times. They conclude that house prices in the average English LPA would be about 20 to 40 percent lower by eliminating regulatory restraints on residential land use. Kahn, Vaughn, and Zasloff (2010) use a 1970-to-2000 panel data set to examine homes in California's Coastal Boundary Zone (CBZ) compared with homes outside the CBZ but within the same census tract. They find average home prices within the CBZ to be about 25 percent higher than average home prices outside it. As emphasized in Gray (2019), these empirical studies indicate that land use regulations can substantially affect local housing prices.

A Simple Model of Residential Land Price Determinants

To conduct a regression analysis absent omitted variable bias, one must first specify a theoretical model of the determinants of the dependent variable. The dependent variable under investigation is the price of a fixed type of a new home situated on a specified amount of land in the average community in different U.S. metropolitan areas over different years. The authors begin with equation (1), which assumes that the primary determinant of metropolitan area differences in new house prices is the typical price of an acre of residential land in the area.[5] Equation (2) indicates that such a price varies by the degree of local demand for residential land and its available supply. In equation (3), the authors account for differences in demand for residential land by metropolitan area

[5] As documented in RSMeans (2019) data on building construction cost differences across the United States, the authors recognize that the cost to construct a specific type of home varies somewhat based on the metro area in which the home is built. As noted by Glaeser and Gyourko (2018: 5–6), however, Gyourko and Saiz (2006) found the variance of such costs much smaller than differences in housing price, and thus it is reasonable to assume a single production cost.

population, nominal GDP, and the number of existing housing units. The limits of data availability drive the simple nature of this equation. Metropolitan area GDP approximates the degree of nonresidential demand for available land and differences in household incomes. There should also be less demand for available residential land in areas that already have many existing housing units.

As noted in equation (4), constraints on the supply of land available for new residential activity include the metropolitan area's square miles, the percentage of those miles found to be under water and thus undevelopable, and the presence of regulation. The authors also employ Saiz's (2010) measure of undevelopable land that includes both acreage under water and with a gradient too steep for viable housing construction. Due to endogeneity concerns, explanatory variables are from 2010 or earlier, which is at least 2 years before the yearly values (2012 to 2015) used for the dependent variable of the price of an acre of residential land. Equation (5) concludes the authors' regression model with a list of the various ways that they measure the strictness of the housing and residential land use regulatory environment in a U.S. metropolitan area. Specific details on the 19 different ways chosen to account for that environment follow in the next section, which describes the data sources and derivations.

$$\text{House Price}_{i,t} = f\,(\text{Acre\_Residential\_Land\_Price}_{i,t}); \qquad (1)$$

where,

$$\textbf{\textit{Acre\_Residential\_Land\_Price}}_{i,t} = f(\text{Demand for Resid Land}_{i,t}, \text{Supply of Resid Land}_{i,t}); \qquad (2)$$

where,

$$\text{Demand for Resid Land}_{i,t} = f(\textbf{Population\_2010}_i, \textbf{GDP\_2010}_i, \textbf{Housing\_Units\_2010}_i); \qquad (3)$$

and

$$\text{Supply of Resid Land}_{i,t} = f(\textbf{Square\_Miles\_2010}_i, \textbf{Perc\_Water\_2010}_i \text{ or } \textbf{Saiz\_Perc\_Undev\_Land\_2010}_i, \textbf{Residential Land Use Regulation}_i); \qquad (4)$$

where,

$$\text{Residential Land Use Regulation}_i = (\textbf{WRLURI\_State\_2006}_i \text{ or } \textbf{WRLURI\_Metro\_2006}_i \text{ or } \textbf{WRLURI\_State\_Lag6}_i \textbf{ or } \textbf{WRLURI\_Metro\_Lag6}_i \text{ or } \textbf{Saks\_House\_Reg\_Index}_i \text{ or } \{\textbf{Loc\_Pol\_Press\_Index}_i, \textbf{State\_Pol\_Inv\_Index}_i, \textbf{State\_Court\_Inv\_Index}_i, \textbf{Loc\_Zoning\_App\_Index}_i, \textbf{Loc\_Proj\_App\_Index}_i, \textbf{Loc\_Assem\_Index}_i, \textbf{Supply\_Restric\_Index}_i, \textbf{Density\_Restric\_Index}_i, \textbf{Open\_Space\_Index}_i, \textbf{Exactions\_Index}_i, \textbf{Approv\_Delay\_Index}_i\}); \qquad (5)$$

where,

i = 1 to a various number of United States Metropolitan/Micropolitan Statistical Areas,
t = 2012, 2013, 2014, and 2015.

The authors have included the explanatory variables described as controls necessary to isolate the independent effects of the different forms of regulation noted in equation (5). Also included in this panel-data regression analysis are 2013, 2014, and 2015 dummy variables to account for the year fixed effects relative to the year excluded of 2012. The authors also add a dummy explanatory variable set equal to 1 for the 62 percent of metro areas consisting of only one county. Unfortunately, it is impossible to include metro-specific fixed effects in this model due to data on regulation measures being only available for 1 year and thus fixed across a metro area.[6]

Data

Exhibit 3 provides a brief description of each variable in the regression model and its source. Exhibit 4 subsequently provides descriptive statistics for the same variables. The authors draw the dependent variable of this regression analysis (Acre_Residential_Land_Price) from a Federal Housing Finance Agency (FHFA) data set created by Davis et al. (2019). They describe the methodology used to capture differences in the typical value of an acre of land available for single-family home development in a U.S. county. The method does not rely upon the assessed value of land under a home generated by local governments for property tax purposes, nor does it rely upon data from vacant land sales zoned for residential development. Instead, it uses a database of more than 16 million home appraisals conducted between 2012 and 2018—as required by Fannie Mae, Freddie Mac, and other government-sponsored enterprises (GSEs) for mortgage default protection—that represent more than 80 percent of all single-family homes in the country. Davis et al. then determine land values under each of these privately appraised single-family houses by subtracting the housing structure's depreciated replacement cost. A potential cause for concern with this method is that some homes sell for less than the structure's replacement cost. An investigation of this occurrence by Davis et al. indicates that it is highly unlikely in homes less than 10 years old; thus, they limit their calculation to these homes (about 8 million) and also use a broadly accepted method of adjusting for the influence of lot size on land prices. Finally, they interpolate land price per acre for single-family homes less than 10 years old (obtained through CoreLogic, Inc. data) without a GSE assessment report. To inspire even greater confidence in their results, they use the data to conform to stylized facts concerning U.S. land prices for single-family homes. The authors aggregated the county values reported in this research up to the equivalent multi-county metropolitan areas based on population weights. Somewhat astonishingly, they discovered that the price of an acre of land available for residential development in the 347 U.S. metropolitan areas observed from the 4 years of 2012 through 2015 ranges from a maximum of $4,392,128 in 2015 (San Francisco-Oakland-Hayward, CA metropolitan statistical area [MSA]) to a minimum of $67,928 in 2013 (Savannah, GA MSA).

[6] This is also the case for Perc_Water_2010 or Saiz_Perc_Undev_Land_2010. The authors tried a full year and metropolitan area fixed effects panel-data estimation using a WRLURI index varying by year calculated through a linear extrapolation of the WRLURI 2006 to 2018 values discussed earlier. This estimation required the exclusion of the 2010 control variables and is perhaps an explanation for the authors' finding of the statistical insignificance of WRLURI measures in a panel-data regression analysis including both metropolitan area and time fixed effects.

Exhibit 3

Variable Description and Source (1 of 2)

Variable Name	Description	Source
Acre_ Residential_ Land_Price	Approximation of the selling price of an acre of land available for single-family home construction based on appraisal values for a home less than 10 years old with the land price determined by subtraction of home replacement cost with adjustments. Value calculated for the county and aggregated to the metropolitan area using population weights.	Davis et al. (2019)
Population_2010	Metropolitan area population derived from the 5-year American Community Survey data.	https://data.census.gov/cedsci/
GDP_2010	Metropolitan area all-industry gross domestic product.	https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas and Panek, Rodriguez, and Baumgardner (2019)
Square_ Miles_2010	Metropolitan area square miles, including inland water, coastal water, territorial sea, and the Great Lakes (allowing a maximum of 3 miles off the coastline).	https://data.census.gov/cedsci/ https://www2.census.gov/geo/pdfs/reference/GARM/Ch15GARM.pdf
Perc_ Water_2010	Percentage of metropolitan area square miles, including inland water, coastal water, territorial sea, and the Great Lakes (allowing a maximum of 3 miles off the coastline).	https://data.census.gov/cedsci/ and https://www2.census.gov/geo/pdfs/reference/GARM/Ch15GARM.pdf
Saiz_Perc_ Undev_ Land_2010	Percentage of undevelopable land within 50 kilometers of the metropolitan area's central city that exhibits a slope greater than 15 percent and consists of wetlands, lakes, rivers, and international bodies of waters. For 95 metropolitan areas with a population greater than 500,000 in 2010.	Saiz (2010)
Housing_ Units_2010	Total of houses, apartments, group of rooms, or a single room occupied or intended for occupancy as separate living quarters in a metropolitan area based on 5-year American Community Survey data.	https://data.census.gov/cedsci/
WRLURI_ State_2006	A higher value measures a more restrictive residential land use environment for the state in which the metropolitan area is primarily located—based on values discussed below from Loc_Pol_Press_Index to Approv_Delay_Index. Index calculation details in the source.	Gyourko, Saiz, and Summers (2008)
WRLURI_ Metro_2006	As above, but precisely calculated for the 47 metropolitan areas, with survey results from 10 or more localities in the metropolitan area.	Gyourko, Saiz, and Summers (2008)
WRLURI_Metro_ Expand_2006	As above, but precisely calculated for the 99 metropolitan areas, with survey results from five or more localities in the metropolitan area. The authors calculated with the source-provided data.	Gyourko, Saiz, and Summers (2008)
WRLURI_ State_Lag6	Like WRLURI_State_2006, but 2006 through 2009 yearly values based on a linear extrapolation between 2006 index value in Gyourko, Saiz, and Summers (2008) and 2018 index value reported in source for 77 metropolitan areas.	Gyourko, Hartley, and Krimmel (2019)

Exhibit 3

Variable Description and Source (2 of 2)

Variable Name	Description	Source
WRLURI_ Metro_Lag6	Like WRLURI_Metro_2006, but 2006 through 2009 yearly values based on a linear extrapolation between 2006 index value in Gyourko, Saiz, and Summers (2008) and 2018 index value reported in source for 38 metropolitan areas.	Gyourko, Hartley, and Krimmel (2019)
WRLURI_Metro_ Expand_Lag6	WRLURI_Metro_Expand_2006, but 2006 through 2009 yearly values based on a linear extrapolation between 2006 index value in Gyourko, Saiz, and Summers (2008) and 2018 index value reported in source for metropolitan areas.	Gyourko, Hartley, and Krimmel (2019)
Saks_House_ Reg_Index	A six-source index for which a higher value represents a more restrictive residential regulatory environment for the 75 metropolitan areas for which the source calculated. Index calculation details are in the source, with all six sources measured from before 2010.	Saks (2008)
Loc_Pol_ Press_Index	Positively reflects the 2006 degree of local actors' involvement in the development process and the standardized number of land preservation initiatives on the ballot between 1996 and 2005.	Gyourko, Saiz, and Summers (2008)
State_Pol_ Inv_Index	Positively reflects 2005 state-level legislative and executive branch activity in land use regulation and 2006 survey response of local officials to how involved state is in local residential building activity.	Gyourko, Saiz, and Summers (2008)
State_Court_ Inv_Index	Positively represents the state appellate courts' relative level of intervention to overrule or restrain locally enacted land use regulations.	Gyourko, Saiz, and Summers (2008)
Loc_Zoning_ App_Index	Records the number of regulatory organizations necessary to approve a local zoning change for a specific development project.	Gyourko, Saiz, and Summers (2008)
Loc_Proj_ App_Index	Records the number of regulatory organizations necessary to approve a specific local development project without requiring a zoning change.	Gyourko, Saiz, and Summers (2008)
Loc_Assem_ Index	A dummy value equal to 1 for the presence of a town hall meeting requirement in New England jurisdictions to approve a zoning change.	Gyourko, Saiz, and Summers (2008)
Supply_Restric_ Index	Records the number of positive responses to questions about statutory limits on annual building permits issued by a locality.	Gyourko, Saiz, and Summers (2008)
Density_Restric_ Index	A dummy value equal to 1 for the presence of a locally mandated 1-acre minimum lot-size requirement for land development.	Gyourko, Saiz, and Summers (2008)
Open_Space_ Index	Equals 1 if homebuilders in the locality are subject to open-space requirements or must pay fees in place of such, and zero if not the case.	Gyourko, Saiz, and Summers (2008)
Exactions_Index	A dummy value equal to 1 if developers pay their allocable share of the costs of infrastructure improvements for a project, and zero if not the case.	Gyourko, Saiz, and Summers (2008)
Approv_Delay_ Index	Indicates the difference in average months between building permit application and the builder's final receipt for a given project in a locality.	Gyourko, Saiz, and Summers (2008)

Exhibit 4

Descriptive Statistics

Variable Name	Observations	Mean	Standard Deviation	Minimum	Maximum
Acre_Residential_ Land_Price	1,388	194,587.90	327,111.20	67,927.51	4,392,128.28
Population_2010	1,388	718,703.95	1,614,975.00	29,393.00	18,897,109.00
GDP_2010 (1,000s)	1,388	36,996,198.90	99,216,920.46	1,708,671.00	1,286,777,512.00
Square_Miles_2010	1,388	2,675.74	3,038.96	31.22	27,408.25
Perc_Water_2010	1,388	13.06	31.17	0.0224	254.24
Saiz_Perc_Undev_ Land_2010	336	24.51	20.19	0.9300	79.6400
Housing_Units_2010	1,388	299,540.23	638,543.42	15,595.00	7,527,752.00
WRLURI_State_2006	1,388	-0.1186	0.6270	-1.13	2.32
WRLURI_Metro_2006	168	0.2224	0.6168	-0.80	1.79
WRLURI_Metro_ Expand_2006	396	0.2744	1.12	-1.19	7.50
WRLURI_State_Lag6	308	0.2528	0.9346	-1.19	7.50
WRLURI_Metro_Lag6	152	0.2799	0.5715	-0.8000	1.79
WRLURI_Metro_Expand_Lag6	308	0.2528	0.9346	-1.19	7.50
Saks_House_Reg_Index	300	-0.0665	1.01	-2.40	2.21
Loc_Pol_Press_Index	396	0.1175	0.6030	-0.7887	3.07
State_Pol_Inv_Index	396	0.0379	0.8914	-1.71	2.42
State_Court_Inv_Index	396	2.09	0.7077	1.00	3.00
Loc_Zoning_App_Index	396	2.01	0.3281	1.27	2.95
Loc_Proj_App_Index	396	1.61	0.4805	0.3657	3.63
Loc_Assem_Index	396	0.0556	0.2193	0.00	1.70
Supply_Restric_Index	396	0.2240	0.4138	0.00	2.48
Density_Restric_Index	396	0.2472	0.2314	0.00	1.00
Open_Space_Index	396	0.6042	0.2327	0.0734	1.00
Exactions_Index	396	0.7600	0.2083	0.1928	1.00
Approv_Delay_Index	396	5.96	2.32	0.00	14.79
Single_County_Dummy	1,388	0.6174	0.4862	0.00	1.00

Source: As listed in the last column of Exhibit 3

Also deserving further description is the authors' use of the lagged 2010 values of all industry GDP in U.S. metropolitan areas to account for this demand influence expected to drive up residential land prices in later years. The Bureau of Economic Analysis (BEA) produced these new estimates of metropolitan-wide GDP because previous subnational economic activity measures depended solely on labor data. The new GDP estimates better capture capital-intensive industries' output by relying on business revenue and production value data. Comparing their prototype GDP values to earlier earnings-based approaches, Panek, Rodriguez, and Baumgardner (2019) found the mean-absolute-percent-difference (MAPD) between estimates for the labor-intensive industries of services and government at around 4 percent. At the same time, it is near 14 percent for goods-producing industries. This divergence level indicates consistency in their estimation of production value in labor-intensive forms and additional output information now captured for more capital-intensive industries.

The explanatory variables of the 2010 values for metropolitan area population, housing units, and square miles all came from U.S. Census sources. As noted earlier, the authors desire a measure of the square miles that make up a metro area to account for all land potentially available for new housing development. The Census measure includes uninhabitable water areas found within a metropolitan area and up to 3 miles off coastlines (including the Great Lakes). To control for the fact that this land is undevelopable, they include the percentage square of miles in a metropolitan area covered by water. Saiz (2010) has taken this one step further and calculated for 95 metropolitan areas an expanded measure that determines land within 50 kilometers of a metro area to be undevelopable if covered by water or at a steeper-than-15-percent topographic grade. The authors use his reported percentage value in an alternative regression specification.

The authors are indebted to the previous derivations of Gyourko, Saiz, and Summers (2008); Gyourko, Hartley, and Krimmel (2019); and Saks (2008) for the measures of variation in regulatory stringency used in this analysis. The widely used WRLURI assesses local regulations' relative stringency related to new housing development. The index stems from a 2006 survey of nearly 7,000 local governments in the United States, of which about one-third responded. Gyourko, Saiz, and Summers aggregated these responses and relevant information from other sources into an index value for the 47 metropolitan areas where at least 10 or more localities in the area offered a response. As recorded in Table 11 of Gyourko, Saiz, and Summer (2008: 713), the calculated WRLURI ranged from the most restrictive at 1.79 for the Providence-Fall River-Warwick, RI-MA, MSA; to the least restrictive at -0.80 for the Kansas City, MO-KS, MSA. The authors record these values as the WRLURI_Metro_2006 explanatory variable in their regression.

As recorded in Table 10 of Gyourko, Saiz, and Summers (2008: 711), a similar index calculated at the state level results in Hawaii registering as most obstructive at 2.32 and Kansas the least at -1.13. The authors use these values as the WRLURI_State_2006 explanatory variable in their regression. The authors realize that the metropolitan-specific index better represents a metropolitan area's regulatory environment; however, it comes with a dramatic reduction in the number of metropolitan areas available for the authors' regression analysis (from 347 to 47). The authors chose to recalculate the metropolitan index to expand the number of metropolitan areas they could use, using the original survey data for metropolitan areas with at least five surveys returned from localities within them.[7] This variation more than doubles the metropolitan areas included in the index (from 47 to 99) and yields the explanatory variable WRLURI_Metro_Expand_2006.

To increase their arsenal of explanatory variables accounting for the influence of regulatory stringency in U.S. metropolitan areas on residential land prices between 2012 and 2015, the authors use an updated version of the WRLURI created by Gyourko, Hartley, and Krimmel (2019) based on 2018 survey data. The comparison between the 2006 and 2018 WRLURI values are not

[7] Gyourko, Saiz, and Summers (2008) generously offer this data to the public at http://real-faculty.wharton.upenn.edu/gyourko/land-use-survey/.

perfect due to slight differences in the sub indexes used to generate the data. Even so, the authors deem the values close enough to generate three new explanatory variables (WRLURI_State_Lag6, WRLURI_Metro_Lag6, and WRLURI_Metro_Expand_Lag6) that take on the WRLURI interpolated values for years 2006 through 2009, representing a 6-year lag to the acre price of residential land used for 2012 through 2015.

The authors would be remiss not to take advantage of a separate Saks (2008) index measure of the degree of housing supply regulation in 75 of the U.S. metropolitan areas used here. Her index, with larger values, again representing greater difficulty likely encountered in the building of new homes, ranges from 2.21 for the New York, NY MSA to -2.40 for Bloomington-Normal, IL MSA. This regulation index's basis is local government officials answering 24 survey questions across four different land use and housing-related surveys taken in the mid-1970s to the late 1980s. Consequently, in the authors' second regression specification using the Saks_House_Reg_Index to account for a metropolitan area's regulatory environment, any potential concern for this index's endogenous nature with residential land prices from the early to mid-2000s is not an issue.

Lastly, one of this research study's core goals is to detect the influence of the 11 different subindexes that Gyourko, Saiz, and Summers (2008: 698–702) develop to generate the aggregated WRLURI. Table 1 in Gyourko, Saiz, and Summers contains a brief description of what each subindex entails, beginning with the entry on the Loc_Pol_Press_Index and continuing through the Approv_Delay_Index. Gyourko, Saiz, and Summers do not report subindex values for separate metros. Still, the authors calculate them using the base survey results that are publicly available and the same aggregation method of restricting calculation to only those areas with 10 or more local observations or going with the 5 or more observations additionally used here. The tradeoff in this choice is again between potentially greater accuracy with a requirement of 10 or more metropolitan areas or a larger sample with a lesser requirement of 5 or more. Having tried both, the authors decided to report regressions using the five-sample calculation due to greater statistical significance and no large differences in calculated signs and magnitudes of influence.

Regression Analysis and Results

As specified earlier in equations (1) through (5), the authors record the results of 38 different regressions in exhibits 5 and 6. The distinction between the two tables is that the first uses the percentage of a metropolitan area's square miles covered by water as the supply-side constraint. The second uses Saiz's (2010) expanded measure that includes land at too steep a gradient for development. Multicollinearity—that biases the reported regression coefficient standard error downward and makes it more likely to find the variables statistically insignificant—among the explanatory variables included in these regressions may be an issue. The calculation of variance inflation factors (VIFs) for each explanatory variable yielded the multicollinearity concern of a VIF far larger than five for the population, housing units, and GDP measures. There was no detected concern for any other explanatory variables, including the regulatory measures. An investigation of the potential issue of heteroskedastic standard errors in the estimated regression coefficients through a Breusch-Pagan/Cook-Weisburg (Baum, 2001) rejected ($p < 0.00$) the null hypothesis of its absence in this regression. Consequently, the authors report robust standard errors clustered by the metropolitan area for all regression coefficients.

Exhibit 5

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Perc_Water_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (1 of 3)

Variable Name	1	2	3	4	5	6	7
Population_2010	0.1812 (0.1540)	0.0544 (0.1564)	0.0842 (0.1587)	0.0724 (0.1361)	0.1068 (0.1327)	0.0748 (0.1744)	0.1631 (0.1488)
GDP_2010	0.0051*** (0.0018)	0.0063*** (0.0022)	0.0053** (0.0022)	0.0051*** (0 .0018)	0.0060** (0.00256	0.0058** (0.0024)	0.0038** (0.0018)
Square_ Miles_2010	8.03** (3.29)	6.85 (6.42)	5.52 (8.01)	7.02** (3.31)	1.75 (11.28)	7.91 (9.40)	-6.50 (8.12)
Perc_Water_2010	2,506.41* (1,325.47)	436.33 (1386.73)	1,483.21 (975.94)	984.18* (567.70)	343.62 (1,285.07)	1,015.94 (1,194.88)	3,751.56 (2,493.51)
Housing_ Units_2010	-1.05*** (0.27)	-0.9840*** (0.3619)	-0.8472*** (0.2957)	-0.7732*** (0.1990)	-1.07*** (0.3550)	-0.9190*** (0.3326)	-0.8576*** (0.2229)
WRLURI_ State_2006	**154,443.80***** (25,443.25)						
WRLURI_ Metro_2006		**271,285.60**** (122,762.80)					
WRLURI_Metro_ Expand_2006			**104,224.20***** (23,580.39)				
WRLURI_ State_Lag6				**154,599.30***** (26,071.75)			
WRLURI_ Metro_Lag6					**338,685.30**** (146,389.50)		
WRLURI_Metro_ Expand_Lag6						**135,782.80***** (37,307.10)	
Saks_House_ Reg_Index							**229,518.60***** (64,547.52)
Single_County_ Dummy	-4,185.17 (24,943.55)	195294.70 (208233.20)	-48,478.85 (71,070.95)	-3,990.45 (24,442.72)	186,014.90 (203,038.6,)	-6,6439.73 (85,653.81)	139,212.50 (91,962.45)
Year_2013_ Dummy	7,854.67*** (1,995.65)	33,535.32** (13,069.32)	15,463.94*** (4,784.98)	2,649.09 (1,652.47)	36,336.22** (13,941.55)	21,111.16*** (6,451.52)	26,727.44*** (9,248.815)
Year_2014_ Dummy	25,420.02*** (4,993.92)	82,977.62** (31,166.16)	43,433.59*** (13,451.22)	16,555.05*** (4,115.79)	89,852.44** (3,3941.33)	58,017.64*** (17,753.51)	71,861.12*** (20,523.37)
Year_2015_ Dummy	38,234.22*** 7,348.05	118,748.40** (48,808.15)	63,623.4*** (20,716.36)	26,040.88*** (6,029.16)	130,948.20** (51,830.50)	85,211.3*** (27,309.62)	106,672.00*** (30709.64)
Constant	139,871.70*** (27,424,87)	245,475.60** (94,679.26)	150,533.20** (44,757.58	150,810.20*** (26,355.34)	236,229.10** (98,943.66)	166,517.20*** (46,692.09)	198,466.50** (2,763)
Std Dev of Dependent Variable [Regulation Influence as % Std Dev]	327,111 [47.2]	641,205 [42.3]	460,129 [22.7]	291,136 [53.1]	668,004 [50.7]	499,117 [27.2]	589,736 [38.9]
Observations	1,388	168	396	1,380	152	308	300
R-Squared	0.4680	0.5219	0.5025	0.4516	0.5377	0.5245	0.5813

Exhibit 5

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Perc_Water_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (2 of 3)

Variable Name	8	9	10	11	12	13	14	15	16	17	18	19
Population_2010	0.0918	0.1105	0.1118	0.0722	0.1026	0.0954	0.10256	0.1015	0.0964	0.0890	0.0799	0.1248
	(0.1321)	(0.1549)	(0.1343)	(0.1661)	(0.1534)	(0.1540)	(0.1529)	(0.1518)	(0.1576)	(0.1523)	(0.1612)	(0.1198)
GDP_2010	0.0050***	0.0052**	0.0049**	0.0050**	0.0051**	0.0052**	0.0051**	0.0051**	0.0051**	0.0054**	0.0053**	0.0050**
	(0.0019)	(0.0023)	(0.0021)	(0.0021)	(0.0023)	(0.0022)	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0019)
Square_Miles_2010	0.4829	4.40	1.53	-0.1327	4.83	5.78	4.81	4.91	4.62	4.94	3.05	6.17
	(7.24)	(8.91)	(7.18)	(9.96)	(8.96)	(8.23)	(8.83)	(8.78)	(9.04)	(8.62)	(9.01)	(6.62)
Perc_Water_2010	1,613.33	1,462.43	1,667.39*	1,775.64	1,814.93	1,755.69	1,820.36	1,734.65	1,822.64	1,755.13	1,854.03	1,654.74*
	(1,084.75)	(1,054.57)	(1,004.99)	(1,143.40)	(1,107.01)	(1,102.35)	(1,133.24)	(1,215.09)	(1,115.65)	(1,092.57)	(1,140.13)	(877.70)
Housing_Units_2010	-0.8402***	-0.8773***	-0.8648***	-0.7458***	-0.8485***	-0.8469***	-0.8485***	-0.8474***	-0.8308***	-0.8547	-0.8129***	-0.9256***
	(0.1788)	(0.2745)	(0.2158)	(0.2543)	(0.2678)	(0.2862)	(0.2708)	(0.2720)	(0.2644)	(0.2537)	(0.2673)	(24,506.64)
Loc_Pol_Press_Index	46,371.99	**72,301.02***										
	(37213.59)	(41,377.81)										
State_Pol_Inv_Index	**49,360.25***$_1$		**136,564.50*****									
	(25,198.58)		(41,298.94)									
State_Court_Inv_Index	43,594.27			60,830.94								
	(53,632.65)			(72,562.50)								
Loc_Zoning_App_Index	85,505.49				891.15							
	(74,622.96)				(64,397.99)							
Loc_Proj_App_Index	-18,906.77					58,975.60						
	(52,798.19)					(37,612.97)						
Loc_Assem_Index	107,619.80						-8,620.62					
	(118,652.50)						(69,737.20)					
Supply_Restric_Index	-113,074.50							33,880.05				
	(95,977.44)							(75,342.91)				
Density_Restric_Index	-18,5540.4								-57.682.54			
	(128,603.2)								(120,980.70)			
Open_Space_Index	863.00									**242,785.20***		
	(105,789.1)									(145,469.00)		
Exactions_Index	44,302.69										209,668.20	
	(105,433.3)										(144,653.10)	
Approv_Delay_Index	**73,877.11****$_2$											**70,732.32*****
	(30,676.37)											(24,506.64)

Exhibit 5

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Perc_Water_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (3 of 3)

Variable Name	8	9	10	11	12	13	14	15	16	17	18	19
Single_County_ Dummy	-107,032.10	11,667.43	-72,228.77	8,041.50	19,471.43	13,956.04	19,678.54	20,823.30	27,254.29	-5,288.58	26,544.68	-66,121.75
	(100,619.10)	(68,294.08)	(83,907.68)	(78,603.93)	(72,248)	(69631.7)	(70,617.49)	(71,866.75)	(71,088.34)	(80,702.98)	(68,595.91)	(82,431.83)
Year_2013_ Dummy	14,872.49***	16,071.47***	15,224.04***	16,034.85***	16,150.3***	16,094.59***	16,152.4***	16,163.96***	16,28.92***	15,900.20***	16,221.75***	15,285.73***
	(4,566.09)	5180.57	(46,83.519)	(5,067.98)	(5,209.38)	(5,186.26)	(5,209.82)	(5,203.46)	(5,344.75)	(5,026.42)	(5,264.60)	(4,653.14)
Year_2014_ Dummy	42,842.15***	44,041.13***	43,193.70***	44,004.51***	44,119.96***	44,064.25***	44,122.05***	44,133.62***	44,198.58***	43,869.86***	44,191.41***	43,255.38***
	(13,268.73)	13,795.81	(13,306.89)	(13,658.79)	(13,804.94)	(13,795.97)	(13,810.69)	(13,800.87)	(13,943.21)	(13,616.65)	(13,866.83)	(13,296.01)
Year_2015_ Dummy	63,031.95***	64,230.94***	63,383.50***	64,194.31***	64,309.76***	64,254.05***	64,311.86***	64,323.42***	64,388.38***	64,059.66**	64,381.21***	63,445.19***
	(20,635.43)	(21,008.54)	(20,565.91)	(20,867.71)	(21006)	(21,006.02)	(21,015.07)	(21,002.94)	(21,142.71)	(20,830.38)	(21,069.16)	(20,556.56)
Constant	-424,269.20	140,585.70***	192,143***	20,028.97	132,534.40	43,059.48	134,768.30***	127,456.40**	144,880.00**	1,414.65	-24,771.10	-229,779.8**
	(301,821.40)	(43,958)	(55,131.17)	(108,197.70)	(131,114.5)	(82.521.04)	(46,458.97)	(51,373.15)	(57,795.98)	(58,266.55)	(95,141.42)	(106,013)
Std Dev of Dep Variable	460,129	460,129	460,129	460,129	460,129	460,129	460,129	460,129	460,129	460,129	460,129	460,129
[Regulation % Std Dev]	[10.7]$_1$, [16.1]$_2$	[15.7]	[29.7]							[52.7]		[15.4]
Observations	396	396	396	396	396	396	396	396	396	396	396	396
R-Squared	0.5973	0.4528	0.5048	0.4523	0.4449	0.4485	0.4449	0.4457	0.4456	0.4591	0.4532	0.5600

*Note: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.*
Source: Authors' calculated regression results using STATA

Exhibit 6

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Saiz_Perc_Undev_Land_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (1 of 3)

Variable Name	1	2	3	4	5	6	7
Population_2010	0.1362	0.0132	0.0978	0.1306	-0.0016	0.0338	0.0687
	(0.1151)	(0.1400)	(0.1219)	(0.1158)	(0.1502)	(0.1348)	(0.1266)
GDP_2010	0.0050***	0.0065***	0.0053**	0.0050***	0.0074***	0.0065***	0.0048***
	(0.0019)	(0.0023)	(0.0020)	(0.0019)	(0.0026)	(0.0023)	(0.0018)
Square_ Miles_2010	-2.91	4.77	1.05	-3.35	15.40	6.71	-3.88
	(6.93)	(9.96)	(9.05)	(6.95)	(12.15)	(10.23)	(7.78)
Saiz_Perc_ Undev_Land_2010	7,302.35**	12,557.94*	10,636.50**	7,163.00***	16,327.12**	12,020.09**	6,159.29**
	(2,792.87)	(6,370.04)	(5,071.60)	(2,745.75)	(7,987.95)	(5,360.52)	(2,935.62)
Housing_ Units_2010	-0.9539***	-0.0924***	-0.9176***	-0.9321***	-1.07***	-0.9645***	-0.7778***
	(0.1673)	(0.2048)	(0.1776)	(0.1629)	(0.25)	(0.2044)	(0.1846)
WRLURI_ State_2006	124,790.80***						
	(43,694.82)						
WRLURI_ Metro_2006		96,857.93					
		(71,329.48)					
WRLURI_Metro_ Expand_2006			27,188.27				
			(36,800.32)				
WRLURI_ State_Lag6				**144,050.60*** **			
				(49,400.09)			
WRLURI_ Metro_Lag6					57,473.16		
					(81,573.04)		
WRLURI_Metro_ Expand_Lag6						27,109.75	
						(38,332.55)	
Saks_House_ Reg_Index							**147,086.70** **
							(65,857.28)
Single_County_ Dummy	-27,815.96	37,818.98	-68,021.69	-30,879.68	-5.233.00	-11,970.53	60,524.28
	(77,588.59)	(106,440.80)	(117,987.9)	(78,021.04)	(137,185.80)	(101,108.50)	(127,582.30)
Year_2013_ Dummy	18,958.04***	32,091.89***	21,732.41***	15,442.61***	32,530.61***	25,623.45***	27,734.83***
	(5,759.71)	(11,431.92)	(6,833.175)	(5,605.33)	(10,947.10)	(8,162.438)	(8,892.23)
Year_2014_ Dummy	51,785.62***	86,069.32**	59,938.75***	46,530.70***	89,286.92**	68,308.65***	72,898.31***
	(15,932.09)	(32,973.82)	(19,761.12)	(15,217.82)	(34,369.96)	(22,748.79)	(23,614.49)
Year_2015_ Dummy	75,307.26***	126,779.9**	87,517.02***	68,312.87***	131,828.6**	99,463.48***	100,6061.8***
	(24,383.09)	(51,389.54)	(30,718.07)	(23,240.44)	(54,443.2)	(34,981.59)	(36,050.22)
Constant	64,700.22	-1,390.75	-5,841.24	70,421.92	-46,814.03	-9,042.75	120,288*
	(43,266.47)	(81,586.82)	(65,393.16)	(43,340.51)	(102,907)	(64,806.05)	(64,182.41)
Std Dev of Dependent Variable [Regulation Influence as % Std Dev]	479,041 [26.7]	654,404	537,249	479,041 [30.1]	678,030	567,394	568,537 [25.9]
Observations	336	152	260	336	140	228	224
R-Squared	0.6032	0.6461	0.6200	0.6043	0.6784	0.6562	0.6329

Exhibit 6

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Perc_Water_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (2 of 3)

Variable Name	8	9	10	11	12	13	14	15	16	17	18	19
Population_ 2010	0.0794	0.1074	0.1148	0.0683	0.1001	0.0959	0.0975	0.1008	0.0890	0.0843	0.0809	0.1236
	(0.1318)	(0.1250)	(0.1266)	(0.1460)	(0.1314)	(0.1189)	(0.1310)	(0.1244)	(0.1371)	(0.1351)	(0.1360)	(0.1058)
GDP_2010	0.0048***	0.0054***	0.0052**	0.0052***	0.0056**	0.0054**	0.0054**	0.0053**	0.0053**	0.0056**	0.0055**	0.0050***
	(0.0018)	(0.0020)	(0.0020)	(0.0019)	(0.0023)	(0.0020)	(0.0021)	(0.0020)	(0.0021)	(0.0021)	(0.0021)	(0.00198)
Square_ Miles_2010	-4.57	0.9155	-1.11	-5.228	1.68	1.33	0.9051	0.9429	1.22	1.49	-1.11	1.31
	(9.15)	(9.44)	(9.274)	(10.87)	(10.51)	(9.11)	(10.09)	(9.49)	(10.17)	(9.55)	(9.70)	(7.22)
Saiz_Perc_Undev_ Land_2010	7,182.70**	11,725.58***	10,269.01**	10,731.68***	11,615.14**	11,322.07**	12,187.81**	11,409.05**	11,327.02***	10,979.82***	11,174.14***	8,623.80****
	(2806.99)	(4,338.11)	(4,299.54)	(3714.06)	(4,466.27)	(4,445.87)	(4,803.06)	(4,539.17)	(4,240.51)	(3,998.87)	(4,146.41)	(3,225.64)
Housing_ Units_2010	-0.8152***	-0.9668***	-0.9410***	-0.8065***	-0.9633***	-0.9157***	-0.9356***	-0.9218***	-0.8899***	-0.9161***	-0.8865***	-0.9535***
	(0.1761)	(0.1969)	(0.1716)	(0.1927)	(0.2054)	(0.1867)	(0.2046)	(0.1890)	(0.1821)	(0.1819)	(0.1863)	(0.1511)
Loc_Pol_Press_ Index	22,082.75	**113,925.00****										
	(64,396.77)	(46,376.09)										
State_Pol_Inv_ Index	22,677.31		**54,901.17***									
	(37,229.25)		(31,244.00)									
State_Court_ Inv_Index	82,632.51			82,541.10								
	(72,613.06)			(75,608.68)								
Loc_Zoning_ App_Index	5,7130.01				110,402.50							
	(108,969.70)				(127,068.70)							
Loc_Proj_App_ Index	34,052.78					42,991.04						
	(106,556.50)					(75,560.91)						
Loc_Assem_ Index	2,5816.69						-22,7162.00					
	(125,164.80)						(169,986.60)					
Supply_Restric_ Index	-179,3231.50							4,354.64				
	(176,643.20)							(110,303.50)				
Density_ Restric_Index	-390,269.30								-139,691.20			
	(244,828.10)								(154,626.70)			
Open_Space_ Index	33,386.84									234,002.10		
	(187,775.9)									(187,363.70)		
Exactions_Index	-50,762.15										215,512.90	
	(133,978.8)										(146,388.90)	
Approv_Delay_ Index	**76,796.13*****											**65,921.80*****
	(28,692.52)											(21,426.20)

Exhibit 6

Regression Results Using *Acre_Residential_Land_Price* as Dependent Variable (Perc_Water_2010 as Supply Constraint, Robust Standard Errors Clustered on Metropolitan Areas) (3 of 3)

Variable Name	8	9	10	11	12	13	14	15	16	17	18	19
Single_County_ Dummy	-186,849.50	-62153.69	-80,023.54	-86,853.07	-84,757.36	-52,189.23	-78,095.08	-55,915.87	-54,844.13	-64,228.86	-43,373.44	-107,842.60
	(164,702.90)	(121784.8)	(121,665.50)	(141,053.20)	(139,108.30)	(1240,45.10)	(136,981.30)	(131,699.20)	(122.791.10)	(123,898.90)	(116,275.80)	(118,210.50)
Year_2013_ Dummy	19,904.29***	21822.69***	21,547.77***	21,442.70***	21,474.94***	21,975.99***	21577.44***	21,988.66***	21,935.14***	21,790.76***	22,111.62***	21,119.78***
	(5,845.451)	(6819.40)	(6,753.71)	(6,519.27)	(6,636.03)	(6,835.98)	(6639.62)	(6,798.50)	(6,881.49)	(6,804.63)	(6,.986.74)	(6,394.34)
Year_2014_ Dummy	58,110.63	60029.03***	59,754.11***	59,649.04***	59,681.28***	60,182.33***	59783.78***	60,125.00***	460,141.49***	59,997.11***	60,317.96***	59,3426.12***
	(18,707.63)	(19706.2)	(19,630.01)	(19,321.55)	(19,419.46)	(19,704.4)	(19471.25)	(19,638.06)	(19,764.99)	(19,677.73)	(19,890.15)	(19,308.33)
Year_2015_ Dummy	85,688.9	87607.3***	873,32.38***	87,227.31***	87,259.55***	87,760.6***	87362.04***	87,703.26***	87,719.75***	87,575.37**	87,896.22***	86,904.39***
	(29,928.85)	(30641.83)	(30,574.95)	(30,253.71)	(30,337.97)	(30,620.8)	(30403.45)	(30,547.85)	(30,691.31)	(30,606.02)	(30,810.98)	(30,289.22)
Constant	-512,341.80	-22,011.22	30,454.29	-161,708.30	-234,972.30	-88,044.69	-19,182.78	-22,763.21	4,653.96	-149,209.60	-179,029.00	-314,746.80**
	(335,258.80)	(53,547.29)	(62,212.03)	(160,374.60	(272,235.20)	(111,257.20)	(54,366.69)	(49,648.65)	(46,951.07)	(136,057.80)	(141,271.60)	(125,053)
Std Dev of Dep Variable [Regulation % Std Dev]	537,249	537,249	537,249	537,249	537,249	537,249	537,249	537,249	537,249	537,249	537,249	537,249
	[14.3]	[21.2]	[10.2]									[12.3]
Observations	260	260	260	260	260	260	260	260	260	260	260	260
R-Squared	0.7012	0.6238	0.6228	0.6250	0.6197	0.6183	0.6250	0.6171	0.6191	0.6243	0.6225	0.674

*Note: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.*
Source: Authors' calculated regression results using STATA

The authors' interpretation of the findings in exhibits 5 and 6 begins with a quick examination of results for the control variables. Across all regressions, the metropolitan area population's detected influence and GDP on its residential land price is positive, whereas housing units' influence is negative. Only the latter two explanatory variables exhibit a statistically significant influence with greater-than-90-percent confidence in a two-tailed test of different-than-zero influence, however. The detected directions of effect match prior expectations. The insignificance of the population measure is likely due to multicollinearity. Although limited in its statistical significance, the square miles of a metropolitan area exhibit the expected positive influence on the residential land price. After controlling for the square miles of land theoretically available for development, the measured constraints of the undevelopable percentage being water (in exhibit 5) or the percentage being water or sloped land (in exhibit 6) also display the expected effect of raising a metropolitan area's residential land price. The more accurate measure of undevelopable land is desirable due to its statistical significance in all regressions. Of further note is the lack of significance regarding whether a metropolitan area consists of one or two counties. The dummy explanatory variables representing yearly fixed effects are statistically significant and rising consistently over time. The authors expected these findings given the U.S. macroeconomy's growth over the years under observation and nominal dollar-value use.

The authors turn to an examination of the explanatory variables in the middle horizontal portions of exhibits 5 and 6, whose determination of statistical significance and magnitude are the primary motivators of this study. In exhibit 5, where Perc_Water_2010 acts as the measured constraint on available land, the first page of results shows that the different aggregate forms of both the WRULRI and Saks indexes exert a statistically significant and positive influence on residential land prices. These indexes measure relative differences in land use regulations' stringency as they apply to new housing construction; thus, the authors found that greater regulatory strictness raises the price of land available for new homes and, subsequently, their price in the local housing market. The number of metropolitan area observations varies in each regression, as indicated by the second-to-the-bottom line of exhibits 5 and 6; thus, the mean and the standard deviation of the dependent variable also vary. A comparison of the magnitude of the influence of the different indexes used requires some accounting of those variances. The authors account for this in the third line from the bottom of each exhibit. There, they report the standard deviation of the dependent variable. Below that, they record the magnitude of the regression coefficient(s) divided by its standard deviation. In exhibit 5, these are in the 40- to 50-percent range, apart from a 20- to 30-percent range for the expanded WRLURI regulatory index measures requiring only a minimum of five observations. Such influences are substantial and worthy of consideration.

On the second page of exhibit 5 regression results, the regulatory indexes included are the 11 subindexes of the greater WRLURI calculated by Gyourko, Saiz, and Summers (2008). The authors' analysis strategy here is to first include all of these in a single regression (8) and then separately in regressions (9–11).[8] Only the State_Pol_Inv_Index and the Approv_Delay_Index indicate statistically significant influences when the authors include all the subindexes. These influences respectively measuring 10.7- and 16.1-percent increases in the standard deviation of the residential

[8] This step may be unnecessary because the pairwise correlations between these WRLURI components only exceed 0.50 for State_Pol_Inv_Index and Approv_Delay_Index at 0.55, and the variance inflation factors are all less than 3.

land prices included in the regression from 99 different metropolitan areas across 4 years. When the authors included the subindexes separately, the State_Pol_ Inv_Index's statistical significance and magnitude (29.7) and the Approv_Delay_Index (15.4) remained. Furthermore, the additional importance of the Loc_Pol_Press_Index (15.7) and the Open_Space_Index (52.7) is also detected.

In comparison, the regression results in exhibit 6 come from a duplication of the 19 regression specifications in exhibit 5, excepting only the substitution of the more comprehensive Saiz_ Perc_Undev_Land_2010 for Perc_Water_2010. This tradeoff of greater accuracy in measuring undevelopable land in a metropolitan area with a reduction in the regression sample size yields different findings regarding the WRLURI measures. Instead of both the state- and metropolitan-based indexes exerting a statistically significant influence different from zero (as in exhibit 5), only the statewide measures remain significant. The WRLURI_State_2006 index indicates a 26.7-percent increase in the residential land price standard deviation for a one-unit change toward more restrictiveness. Suppose this statewide index's values vary by year based on an interpolation between values in Gyourko, Saiz, and Summers (2008) and in Gyourko, Hartley, and Krimmel (2019). In that case, the detected influence of WRLURI_State_Lag6 indicates a slightly higher 30.1-percent increase in the standard deviation of the residential land price for a one-unit change in this index. Interestingly, a very similar relative effect of a one-unit change in the Saks_ House_Reg_Index results in a 25.9-percent increase in the standard deviation of that regression's dependent variable.

Examining the WRLURI component findings on the second page of exhibit 6, a few consistencies emerge. In regression (8), where all subindexes are accounted for, the Approv_Delay_Index is statistically significant. In regression (9) through (11), the influence of Loc_Pol_Press_Index, State_Pol_Inv_Index, and the Approv_Delay_Index remain, but the importance of the Open_ Space_Index is lost. Perhaps the loss of open-space preservation is related to the control of land in the metro area with a steeper-than-15-percent grade in exhibit 6 regression results, which was not present in exhibit 5.

Conclusion

High home prices and rental rates in a U.S. metropolitan area impose significant negative welfare implications for low- and even moderate-income households experiencing them. A lack of housing affordability in a metropolitan area also impedes labor's necessary migration into a burgeoning metro area's economy. It even serves to drive existing low-skill laborers out, which slows the potential for even greater economic activity.[9] Although a majority recognize these concerns as legitimate and warranting some form of government intervention to counteract them, policy reforms are slow to materialize. Perhaps this lack of government intervention is better understood if one frames the availability of new affordable shelter (either owned or rented) as a non-depletable and non-excludable "public good" that benefits new homeowners, renters, and the metro area's overall economic prosperity. Simultaneously, such a public good may impose disproportionate costs relative to benefits on the specific localities (and their established homeowners) that host the additional units. Established homeowners who are relatively affluent and members of the

[9] See Wassmer (Forthcoming) for an empirical study that finds evidence in support of this contention.

majority demographic group within those localities may be especially sensitive to these costs and the potential entry into their neighborhoods of new residents belonging to different demographic groups than their own. These homeowners may publicly decry the lack of affordable housing in their metropolitan area and generally support a lessening of restrictions by other localities in the region to construct more. Still, they do so with the politically potent caveat that the construction of such be "not-in-my-backyard." These NIMBYs are often able to command the attention of elected and appointed local government officials who oversee the implementation of local land use regulations. The result is the observed tendency for local decisionmakers to maintain or increase residential land use regulations' stringency in many U.S. metropolitan areas. A "tragedy-of-the-commons" results in an overall reduction in public welfare through the insufficient construction of affordable housing throughout the entire metropolitan area.

Thus, there is an argument to be made for state and federal governments to make more substantial efforts to reduce or rescind local land use regulatory authority. There is a need to legally compel more affordable housing in all neighborhoods and jurisdictions that constitute high-cost metropolitan areas. This encroachment on community-level decisionmaking is institutionally possible but politically unpalatable. Local authority over land use decisions is virtually sacrosanct in the United States. To combat this, more evidence identifying a strong relationship between a restrictive regulatory environment for the construction of new housing and subsequent housing unaffordability in a metropolitan area offers an essential start in supporting state and federal action on this policy front.

The authors grounded the regression results offered here in several practices used in previous analyses of this type. They also added newly available data on residential land prices in U.S. metropolitan areas as a reasonable complementary proxy for housing price variations across these areas. Furthermore, they used explanatory variable controls that include newly available data on the amount of economic activity in the metropolitan area and accurate accounting of the percentage of developable land in the area. The authors accomplish this through panel data, which allows for the control of time fixed effects and endogeneity through lagged values of the explanatory variables (as suggested by Gyourko and Molloy, 2015).

The emphasis here has been on the regression results in exhibit 6 that use the percentage of a metropolitan area's square miles that are undevelopable due to being under water or exhibiting too steep a topographical grade. The authors' rationale for this choice was that failing to control for an undevelopable grade likely prejudices the detected influence of metropolitan-specific development restrictions that exhibited a greater likelihood of statistical influence in exhibit 5. As the first page of exhibit 6 indicates, the WRLURI values calculated for a metropolitan area's primary state exhibit the hypothesized positive effect on metro-specific residential land prices. This effect consists of a one-unit-higher WRLURI state value in 2006, raising a metropolitan area's residential land price by about 27 percent of the standard deviation variation in residential land price for the following years of 2012 through 2015. Suppose the WRLURI state value varies between 2006 and 2009 and acts as a constant 6-year lag to the dependent variable of metropolitan area residential land price between 2012 and 2015. In that case, the calculated influence is slightly higher, at 30 percent. Interestingly, when the authors substitute the Saks' metropolitan-specific regulation index for the state-level

WRLURI, the derived effect of a one-unit change in this index is a similar increase, equivalent to 26 percent of the standard deviation residential land prices observed in the regression sample.

The stringency of local political pressure, state political processes, and the likelihood or length of approval delays all exert statistically significant and the hypothesized positive influences on residential land price variation across U.S. metropolitan areas—the highest magnitude detected influence being an increase in residential land price equivalent to about 21 percent of its standard variation across metropolitan areas for a one-unit change in the degree of local political pressure exerted on local land use decisions. As noted in Gyourko, Saiz, and Summers (2008, Table A1), the derivation of their local political pressure index comes from the survey response of a local official regarding their opinion (from “not at all important” to “very important”) on local political activities, such as (1) city council, managers, and commissioners’ involvement in, and community pressure on, local growth management; (2) the degree to which the local fiscal situation affects residential development choices; (3) the importance given to city council or citizen opposition to local residential development; (4) the importance of school crowding to single-family home development decisions; and finally (5) the number of local ballot initiatives passed in the past 10 years.

The second-in-magnitude subindex influence detected here was an account of the degree of approval delays typical for residential development. A one-unit change in this index in a U.S. metropolitan area raises residential land prices in that area by about 12 percent of the variation in residential land prices if other subindexes are not accounted for and about 14 percent if they are. The approval delay index is based on eight measures asking local survey respondents to choose among five categorical responses (1.5 for “less than three months” to 24 for “more than 24 months”) regarding average lengths of time for their jurisdiction to complete the reviews of residential projects. It also accounted for the typical times between rezoning application and building permit issuance for single- or multifamily projects that are either less than or greater than 50 units.

The third-most-significant subindex influence detected is a measure of state political involvement in the local residential land development process. Specifically, suppose a metropolitan area exhibited a one-unit increase in this index of state involvement. In that case, the average residential land prices in the metropolitan area are higher by about 10 percent of the standard deviation in residential land prices across all metropolitan areas. Gyourko, Saiz, and Summers (2008, Table A1) chose to measure greater state involvement by the local responder’s opinions of the state legislature’s degree of involvement in affecting the locality’s residential building activities and the governor’s and state legislature’s previous 10-year activity level in enacting statewide land use restrictions.

Considering these findings, the authors suggest the following policy-relevant takeaways. Of most importance is the authors’ overall finding that the relative stringency of local land use controls exerts a measurable positive influence on the average price of an acre of land available for single-family housing and, thereby, the housing price. A decrease in this regulatory stringency by one unit (or about 1.0 to 1.5 standard deviations from the variation observed in all metropolitan areas) could cut the price of new residential homes by about one-fourth of the standard deviation observed in residential land prices across the United States. Second, if choosing among the categories of regulatory influences that make up Gyourko, Saiz, and Summers’ (2008) WRLURI for the most potent policymaking opportunity to reduce metropolitan-area regulatory stringency, it would be finding a way to reduce local political involvement in the regulatory process. Doing so would likely result in a comparable reduction of NIMBY pressure on local decisionmakers when considering the construction of additional affordable housing in their jurisdictions. The policy should also include efforts to reduce state-level involvement in encouraging and authorizing local control of growth management policies and land use decisionmaking authority.

Moreover, reducing the time delay between the initial proposal and completion of residential development projects would encourage developers to acquire available land in high-cost metropolitan areas for new housing projects, thereby increasing the general supply of new housing and lowering its price across the metropolitan area. Housing developers are aware of the "time value of money." They are less likely to undertake new projects in jurisdictions with a high rate of uncertainty regarding the exact amount of time it will take to approve and construct a housing project.

The reforms just suggested are very likely to encounter significant resistance from numerous jurisdictions that have previously enacted them in the name of "local control." Furthermore, such resistance is also likely to come from the lower houses of state legislatures, where many members represent districts whose voters adhere to NIMBY principles. To overcome such opposition, Glaeser (2020) suggests the need for federal intervention in this arena through Congress establishing a direct link between federal highway funding and the construction of more single- and multifamily housing units where they are most needed. Another policy avenue for Congress is authorizing the HUD Secretary to withhold agency funds from jurisdictions that erect extreme housing and residential land use barriers. Congress could also amend the National Affordable Housing Act of 1990 to remove a prohibition on the non-approval of consolidated housing plans (HUD, 2020). As just suggested, intense federal pressure on states and municipalities to increase their inventories of affordable housing units could provide a politically convenient excuse for policymakers at those government levels to enact unpopular reforms in their jurisdictions to meet the new requirements. Perhaps state governors, elected to represent statewide interests and not subject to the legislature's local political pressures, could also draw courage from these federal directives and do more of the same for their states.

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Trends in Regulation and Affordability in Select U.S. Metropolitan Areas and Communities

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Abstract

We connect land-use restriction changes in the last decade and a half to the contemporaneous evolution in housing supply and affordability for a diverse set of metropolitan markets across the United States through brief case studies. We further drill-down to the community level to examine patterns within metropolitan areas. Our study indicates that we need to think small, at least for the size of the market area, which is the right unit of analysis. While comparing metropolitan areas across the country can be informative, within-metropolitan area analysis, which holds constant commuting patterns, employment bases, amenities, and other important drivers of housing values, may be more illuminating when examining the impact of different regulatory approaches and changes. Data below the metropolitan level is harder to obtain and may not have the same number of transactions as at higher levels of geography. However, the results are much more likely to be applicable for informing local policymakers regarding the impacts of their potential regulatory actions on housing affordability.

Introduction

There is an intuitive hypothesis that increased regulation leads to decreased affordability. This hypothesis has spurred numerous debates, as well as efforts to reign in restrictions on development in order to boost housing supply and lower cost burdens (Greene and Ellen, 2020). The wellpublicized lack of affordable housing in many locations across the United States has recently prompted heightened attention to these questions.[1]

While intuitive, it is not easy to establish a causal relationship between regulation levels and affordability.

One fundamental challenge is that even when looking at affordability and regulatory constraints separately, neither is easy to quantify. Haurin (2016) expresses that the measurement of housing affordability is far from straightforward since affordability measures often attempt to summarize many disparate economic issues into one number. He emphasizes that the focus on a single number (for example, the median) is less desirable than looking across the whole distribution of income and housing costs. Similarly, there have been few sturdy measures by which analysts can assess and track the level of constraint caused by local or other land-use regimes. It is also important to note that while most regulations impose costs on developers and builders, they may also benefit consumers, representing a challenge in measuring the net effect of the many housing-related regulations (pre-, during, and post-development) on social welfare. (Gyourko and Molloy, 2015). As a result, estimating any effect of increased regulation on affordability has remained an empirical challenge due to, among other factors, a lack of "convincing instruments or some form of experimental variation" (Glaeser and Gyourko, 2018).

To better understand these challenges, first, we explore the literature on measuring affordability, on measuring land-use restrictions, and on how the two may interact. We then discuss the measures we find most informative in assessing each of those. Next, we present a series of metropolitan case studies to show how restrictions and affordability interact at a broad geographical level. We conclude with a cross-metropolitan analysis and discussion of the key take-aways.

Land-use regulation is not a new phenomenon, and as Glaeser (2020) and Ganong and Shoag (2017) chronicle, such regulations have been around for at least 50 years. Glaeser's *Cityscape* article provides a historical narrative on the closing of the American urban frontier that is "associated with unaffordable housing, widening gaps in housing wealth, a spatial mismatch between local productivity, population growth, and the end of regional income convergence." He reports that migration and movement were possible until the 1960s because "communities made it easy to build. Land-use regulations were modest, and infrastructure could be easily added."

Ganong and Shoag (2017) seek to measure longer term housing supply regulations by examining state appeals court records. They find that the growth of these regulations was particularly rapid from 1970 to 1990 when they reached about 75 percent of their 2015 level. In this study, we focus on changes in the last decade-and-a-half and look for patterns of similarity and change at the community and metropolitan level. This period—leading up to the Great Financial Crisis and the

[1] The National Low Income Housing Coalition produces an annual and influential report, "The Gap: A Shortage of Affordable Rental Homes," (2020) that highlights the national shortage of affordable rental homes (https://reports.nlihc.org/gap). In addition, many compelling narratives delve deeply into specific locational cases. For example, Conor Dougherty's recent 2020 book, *Golden Gates: Fighting for Housing in America*, provides a gripping look at different aspects of the Bay Area housing crisis. Case studies highlight the variation in situation across geography, and this is further borne out in a 2020 study from Freddie Mac (Khater, Kiefer and Yanamandra, (2020)) that examines the state-level housing shortages while considering additional factors such as interstate migration flows.

steady recovery and house price appreciation since—is conceivably an auspicious period to look at these changes. Yet, our starting point is one where many constraints were already in place, and despite being a noteworthy decade-and-a-half in real estate, our study is at the intensive margin.

As Glaeser (2020) notes in the previous quote, excessive regulation may lead to an economic loss due to households' inability to move to more productive locations because of a lack of affordable housing. This is also highlighted in a recent U.S. Congressional Budget Office (CBO) report on the slowdown of productivity growth (Shackleton, 2020): "Restrictive land-use regulations increasingly raise housing costs and discourage workers from migrating to denser urban areas, where most growth in productivity occurs." While such macroeconomic effects are beyond the scope of this article, we point to a forthcoming Research Institute for Housing America (RIHA)-sponsored report by Asquith (2021) that will add to the understanding of such productivity effects by estimating how housing market frictions affect migration to locations with higher wages.

In this article, we use the Wharton Residential Land-Use Regulatory Index (WRLURI) survey data from 2006 and 2018 to gauge the restrictiveness of land-use regulations. We also utilize two measures of affordability that build on more traditional approaches and allow us to look at affordability from the perspective of a potential homebuyer (covering both accessibility, i.e., what it takes to gain access to homeownership; and sustainability, i.e., what it takes to be able to stay in the home). Importantly, both affordability measures allow evaluation of affordability across the income distribution.

Armed with these, we present brief case studies from nine large and varied metropolitan areas across the country to provide a view into how affordability and land-use restrictions—and the measures of them—have evolved in recent years. Further, as part of these case studies, we narrow our focus to the community level. As Woodwell (2015) points out, location matters, and it is key to examining how changes in land-use constraints are associated with residential housing supply changes at a granular level. Fortunately, the WRLURI data are collected at the community level and afford us this capacity.

We conclude with a cross-metropolitan discussion of the interactions of land-use restriction and affordability. We observe that on a cross-sectional basis at two points in time, we can say that metropolitan areas with higher levels of regulation have less affordable housing. We also note, however, that this may not be the right question to ask. The relevant question for a given metropolitan area is, we believe, how will changes in land-use regulation at the margin impact housing affordability? Here we note that, while there are many efforts to think big about addressing the lack of affordability, the data indicate that the analysis needs to think small, at least concerning the size of the market area that is the appropriate unit of analysis. While comparing metropolitan areas across the country can be indicative, within metropolitan area analysis—which holds constant commuting patterns, employment bases, amenities, and other important drivers of housing values—may be more illuminating.

Literature Review

The topic under consideration here ties together two subjects that have been targets of intense research. As a result, there are numerous high-quality studies on regulation and land-use restrictions, on affordability measurement, and on the links between them. While this research provides a solid foundation upon which to build, it also demonstrates many of the challenges of comprehensively measuring affordability or land-use restriction, and the challenges connecting the two.

Regulations and Land-Use Restrictions

There are many types of regulations imposed by different levels of government. For example, Downs (1991) lists land-use restrictions, building codes, environmental protection standards, and process requirements that add delay and costs to housing production.

To understand these costs in detail, Emrath (2016) surveyed single-family homebuilders to estimate—at all stages of development and construction—the share of regulatory costs in the price of a home. The report lists a comprehensive set of regulatory line-items and their dollar and time costs. He finds that while the dollar cost of regulations to build a single-family home increased from 2011 to 2016, the proportion of the home value attributed to regulation was constant. Emrath and Walter (2018) conduct a similar exercise for multifamily construction and find that regulation exceeds 30 percent of a typical multifamily project development costs. It is of note that these reports focus on regulatory costs, but as Emrath notes, "Governments presumably impose regulations under the belief that they will generate some benefits." In this article, we focus on the cost side of the equation but note that regulations may, in many cases, be beneficial for consumers.

The regulatory focus of this article is land-use restrictions. Our data are based on the surveys described in Gyourko, Saiz, and Summers (2008) and Gyourko, Hartley, and Krimmel (2019). The surveys, which we refer to as 2006 WRLURI and 2018 WRLURI, were both conducted nationwide to understand local land-use control environments and how local regulations can affect building—by prohibiting or restricting it or by imposing requirements that cause delays or other costs. The data from these two surveys are discussed in greater detail in the next section.

Notably, the two rounds of WRLURI data collected at the community level are cross-sectional surveys, with more than 500 communities that fully answered both surveys. As Gyourko, Hartley, and Krimmel (2019) note, these surveys provide "the first consistent nationwide data to document changes in residential land-use regulation at the local jurisdiction level."

In addition to land-use regulations, other factors need to be considered when we discuss housing supply elasticities. Saiz (2010) finds that most areas in which housing supply is inelastic are severely land-constrained by their geography. Regulations and natural geography need to be considered simultaneously to understand patterns of demographic growth and urbanization.

The above reports measure regulatory costs through the laborious collection of survey data. Thus, it is valuable to develop proxy measures, as Ganong and Shoag (2017) do by enumerating the appearance of the words "land use" in state court cases as far back as 1950.

A recent report by Gyourko and Krimmel (2020) estimates the "zoning tax" across 24 metropolitan areas for 2013 through 2018. As Glaeser and Gyourko (2018) described, the zoning tax measures the difference between market prices and the value of the land to homeowners. They argue that the divergence between these two values is due to owners' inability to divide and sell land due to zoning restrictions. Thus, the zoning tax is ostensibly a measure of how much land-use regulation is artificially increasing the price of land. Gyourko and Krimmel (2020) show it is highly correlated with the degree of regulatory strictness in the market (as measured by 2018 WRLURI values). Moreover, they investigate how the zoning tax varies by location within each metropolitan area and find that the "zoning tax declines with distance from the metropolitan core in the vast majority of our metropolitan areas, but there is much interesting variation around that basic pattern."[2]

Affordability

The measurement of housing affordability is not straightforward, notes Haurin (2016), emphasizing that affordability measures attempt to summarize many disparate economic issues into one number. He characterizes a set of criteria that can allow us to quantify affordability and stresses that it is important to look across the whole distribution of income and housing costs as opposed to one point (such as the median).

Mota (2015) echoes many of the points raised by Haurin and delves into the key features of each of these metrics "to obtain a more comprehensive understanding of housing affordability." Mota also acknowledges that focusing on a single metric "will provide only a partial view of affordability concerns." He divides the commonly used housing affordability metrics into two categories: household-level measures and market-level measures. The former includes ratios of households' current housing costs to other household-level parameters (such as housing cost-to-income ratios and residual income approaches), and the latter gauges the "extent to which potential homeowners can afford the recurring monthly costs associated with current mortgage rates and house prices."

Woodwell (2015) uses American Housing Survey (AHS) data to examine a household-level measure, the ratio of housing costs to incomes, and (per Haurin, 2016) does so across income and housing cost distributions for five metropolitan areas and the whole of the United States. While his focus is on affordable multifamily rental housing, we stress that AHS data can be used for all tenure—rental and homeowner—data.

Regarding market-level indexes, Mota examines three measures, including the National Association of Realtors (NAR) Housing Affordability Index (HAI) and the National Association of Home Builders (NAHB)/Wells Fargo Housing Opportunity Index (HOI). Other recently built indexes include Bourassa and Haurin's (2017) dynamic housing affordability index (detailed in Haurin's 2016 RIHA report) and Chung et al.'s (2018) home affordability estimate (HAE) index. HAE builds on some of the earlier indexes (such as NAR HAI and NAHB/Wells Fargo HOI) and analyzes the share of housing stock that is affordable to certain households (such as median-income and low-income households). That is, measures can be built for points across the income distribution.

[2] The dominance of a monocentric structure for U.S. metro areas is validated by Arribas-Bel and Sanz-Gracia (2014), who use spatial analysis techniques to show that over the 1990–2010 period the monocentric structure persisted in a majority of metropolitan areas in the United States.

HAE measures affordability related to funds available for down payments, initial monthly housing-related payments, and future projections of household income and costs. It also ensures that households have sufficient residual income for typical non-housing expenses.

Linking Restrictions, Housing Supply, and Affordability

In a 2005 *Cityscape* article, Quigley and Rosenthal claim that while, in theory, excessive land-use regulations and restrictions limit housing supply, "measuring the effect of local land-use regulation on housing prices is a formidable empirical challenge."

Many leading housing scholars repeat this sentiment. For instance, Gyourko and Molloy (2015) summarize that with cross-sectional evidence, "it is very difficult to disentangle the causes and effects of regulation from local demographic and socioeconomic characteristics that might be correlated with regulation," and even with time-series data, "it is challenging to identify the effects of regulation."

One of the reasons that the effects of land-use restrictions on social welfare are difficult to assess is because they not only have supply limiting effects, but as described in Hamilton (1975), they also increase local housing demand by improving local quality of life and the provision of public goods. From an econometric standpoint, it is extremely challenging to determine the direction of the causality: Did the increase in regulation lead to higher housing costs, or did the higher housing costs encourage residents to push for increased regulation? Nevertheless, there is a growing literature that tackles these empirical challenges.

Turner, Haughwout, and van der Klaauw (2014) used the 2006 WRLURI, U.S. Geological Survey, and CoStar transactions data to evaluate the effect of land-use regulation on land value and on welfare. They break down the effects of regulation into three components (the cost to the landowner, the cost to one's neighbors, and a supply effect) that, in turn, are used in a novel estimation strategy. They find that marginal reductions in land-use regulation are likely to have substantial welfare benefits to areas on the less developed edges of towns and smaller benefits for areas near town centers.

Albouy and Ehrlich (2018) estimate that typical land-use restrictions impose costs that appear to exceed quality-of-life benefits, reducing net welfare. They utilize the large inter-metropolitan variation in land values, construction prices, and regulatory and geographic restrictions to estimate a cost function for housing in the United States in a two-step empirical analysis—the effect of restrictions in raising the cost of housing relative to input prices, and the effect of increasing housing prices relative to local wages. They find that observed land-use restrictions raise housing costs by 15 percentage points on average, reducing average welfare by 2.3 percent of income on net. Albouy and Ehrlich also find, through a disaggregated analysis of regulations, that state-level restrictions impose higher costs than local ones.

Lin and Wachter (2019) develop a general equilibrium model with household choices on consumption and location and with housing developer choices on housing production to estimate the impact of land-use regulation on housing prices in cities in California. Using property transaction-assessment data from 1993 to 2017 and the 2006 WRLURI data, they structurally estimate supply-side and demand-side effects. They find that if land-use regulation in Los Angeles (LA), the city where housing prices are most impacted by regulation, were to be decreased to the level observed in the least regulated cities, housing prices would decline by one-fourth. Lin and Wachter also point out other empirical pitfalls—estimations without quality adjustment underestimate the impact of land regulation on prices, and similarly, estimations without spillover consideration also underestimate them.

While the Lin and Wachter report shows the effect on housing prices, our report's focus is on affordability.

Molloy, Nathanson, and Paciorek (2020) examine how housing supply constraints affect housing affordability, linking housing prices and affordability by defining affordability as the quality-adjusted price of housing services.[3] Using metropolitan data from 1980–2016 and addressing multiple issues of endogeneity, the authors find that while there were sizeable effects of supply constraints on house prices, there were modest-to-negligible effects on rent, lot size, structure consumption, location choice within metropolitan areas, sorting across metropolitan areas, and housing expenditures.

Molloy and colleagues link housing supply constraints to affordability through the price of housing services (such as rent levels). In another recent report, Vigdor and Williams (2020) examine the pattern of escalating rents over the past 60 years, considering the role of various policy interventions in the housing market. This report rounds out our literature survey by examining a different type of regulation—landlord-tenant law.[4] The authors find that in the 1970s, when many American cities witnessed population decline and reduced demand for housing, reforms to landlord-tenant law were associated with an 11-percent rent increase. They also find that more recent laws exposing landlords to liability from lead paint lawsuits are associated with rent increases as high as 15 percent. The authors conclude that "providing a safe and habitable place for renters comes with a price," and while certain restrictions should be considered a necessity, we must keep in mind a balanced approach. As Woodwell (2015) warns in a different context: "A large gap exists between the income of many American households and the cost of building and maintaining safe and decent housing."

Description of Data

In our analysis, we rely primarily on three data sets, one of which (the Census Bureau's American Housing Survey) is well established, and two (the Wharton Residential Land-Use Regulatory Index Survey and FHFA's Home Affordability Estimate Data) which are less well known. In concert, they provide a new view into the relationship between land-use restrictions and affordability within and across metropolitan areas.

[3] In theory, supply constraints increase the price of housing services by less than the purchase price of a home since the purchase price responds to expected future increases in rent as well as contemporaneous rent levels. Households respond to changes in the price of housing services ("rent") by altering their housing consumption and location choices.

[4] We include this report, not only to be cognizant of the effects on the rental market, but also to remind ourselves of the many factors that make up the effects of the regulatory environment.

2006 and 2018 Wharton Residential Land-Use Regulatory Index Surveys

The 2006 WRLURI nationwide survey of municipalities, as described in Gyourko, Saiz, and Summers (2008), was designed to generate, when combined with supplemental state and local information, an index to measure regulatory constraints and rank communities in terms of the stringency of land-use regulatory environments.[5] The aggregate measure (that we use in this article) comprises 11 subindexes—nine that pertain to local characteristics and two that reflect state court and state legislative/executive branch behavior. The aggregate WRLURI index, generated using factor analysis of the subindexes, is standardized so that the sample mean is zero, and the standard deviation equals one. The 2006 survey includes data on 1,904 communities. Following Gyourko, Saiz, and Summers (2008), the bottom quartile of the 2006 index scores (where WRLURI < -0.55) are labeled as lightly regulated, the top quartile (where WRLURI > 0.74) as highly regulated, and the interquartile scores are labeled as average regulated.

The 2018 WRLURI survey, as described in Gyourko, Hartley, and Krimmel (2019), examines local residential land-use regulatory regimes for over 2,450 primarily suburban communities across the United States. There are 12 subindexes in the 2018 WRLURI; the 12th (new) subindex—the Affordable Housing Index—indicates whether developers were required to "include affordable housing, however defined, in their projects." As in the 2006 data, factor analysis was used to create an aggregate WRLURI value for each jurisdiction that was standardized to a mean of zero and a standard deviation of one. Gyourko and colleagues grouped the metropolitan core-based statistical area WRLURI data (2,333 observations) into quartiles so that the bottom quartile (where WRLURI ≤ -0.64) is labeled as lightly regulated, the top quartile (where WRLURI ≥ 0.64) as highly regulated, and the interquartile scores are labeled as average regulated.

The WRLURI survey allows us to document changes over time for just over 500 communities that fully answered both surveys in 2006 and 2018. WRLURI thus provides, as Gyourko, Hartley, and Krimmel (2019) describe, the first consistent nationwide data to document changes in residential land-use regulation at the local jurisdiction level.

American Housing Survey Data

AHS is a longitudinal housing-unit survey that is the most comprehensive national housing survey in the United States, providing information on the size, composition, and quality of housing in the nation and measuring our housing stock changes. It is sponsored by the U.S. Department of Housing and Urban Development (HUD) and conducted every odd-numbered year by the U.S. Census Bureau. Data for 2019 were released in September 2020. AHS was redesigned in 2015, and in 2019 it contained survey data on 117,422 units.[6] The sample design, well suited for studying housing in metropolitan areas, comprises an integrated national longitudinal sample (of 86,151 units in 2019) and an integrated metropolitan longitudinal sample (of 31,271 housing units).

[5] The WRLURI data we use were downloaded from http://real-faculty.wharton.upenn.edu/gyourko/land-use-survey/ on March 11, 2020.

[6] The 2015 redesign of the AHS was a major undertaking. It included a new sample being redrawn, new households being asked to participate in the survey, a new questionnaire, changes in variables, streamlined recodes and imputation methods, and a new weighting methodology, https://www.census.gov/programs-surveys/ahs/about/methodology.html.

The integrated national longitudinal sample includes three parts: representative samples of the U.S. and Census divisions (approximately 35,000 units), a metropolitan survey of each of the 15 largest metropolitan areas (approximately 46,000 units), and a representative sample of housing units receiving HUD rental assistance (approximately 5,000 units). The integrated metropolitan longitudinal sample includes ten additional metropolitan areas with approximately 3,000 units per metropolitan area.

Home Affordability Estimate Data

The Federal Housing Finance Agency (FHFA) HAE proposed by Chung et al. in 2018 estimates the housing stock share in a metropolitan area that is affordable to certain households. As mentioned previously, HAE data are similar in design (and highly correlated) to other market-level measures. However, HAE is our preferred measure because it is more flexible for evaluating households at different places in the income distribution (for example, median income, low income, and very low income). However, FHFA has not yet readied HAE for production, and data are currently only available for select geographies through the second quarter of 2018. Data were downloaded from the FHFA website.[7] The HAE data are a mix of MSA (metropolitan statistical area) and MSAD (metropolitan statistical area division) level data. For example, the Dallas-Fort Worth-Arlington MSA comprises two MSADs (Dallas-Plano-Irving and Fort Worth-Arlington) in the HAE dataset. There are multiple MSADs in the HAE data for the Los Angeles, Dallas, and Philadelphia MSAs for our case studies. Since HAE values are close for MSADs within these MSAs, we select and report on one set of MSAD data for each of these MSAs—Los Angeles-Long Beach-Glendale, Dallas-Plano-Irving, and Philadelphia, respectively.

Case Studies

To better understand the relationships between affordability and land-use regulations—and their evolution in recent years—we look at how these data play out in a series of metropolitan areas. We start with a deep-dive into Washington, D.C., to explore various aspects of the data, and then conduct shallower dives into other metro areas to present a picture of the range of experiences.

Washington, D.C. Metropolitan Area

While the Washington, D.C. metropolitan area is not typical from a socioeconomic standpoint, being the highest educated metropolitan area (de Vise, 2010) and, according to the 2010 Census, the highest per-capita income metropolitan area in the nation, the area exemplifies high house price growth, affordability issues, and higher than mean land-use restrictions. It is also home to the three authors, so it is a good starting point for analysis. We begin the analysis with a detailed discussion of the interplay of various affordability measures in the Washington area, and then relate them to changes in land-use restrictions.

[7] https://www.fhfa.gov/PolicyProgramsResearch/Research/Pages/wp1804.aspx.

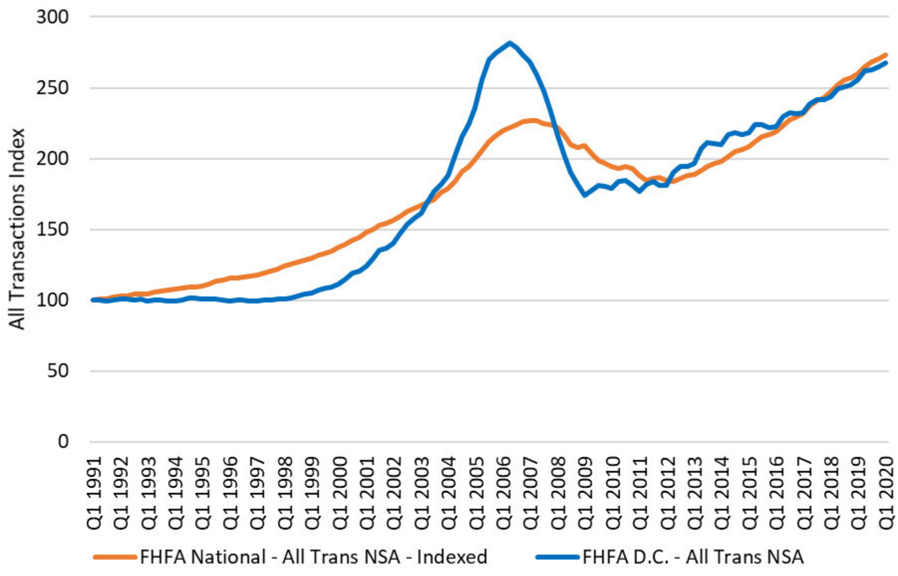
Affordability

We are aware from Molloy, Nathanson, and Paciorek (2020) that housing supply constraints likely distort housing affordability by less than their estimated effects on house prices suggest, and therefore contrast the change in house prices to the change in several measures in affordability to corroborate this relationship.[8]

Exhibit 1 shows that house prices in the D.C. area remained relatively constant through most of the 1990s but then increased 2.7-fold between 1997 and 2006 (when the first WRLURI survey took place). During the boom years, the D.C. area house price appreciation was faster than for the United States, as was the subsequent decline. In the last 8 years, the index has increased at an average annual pace of approximately 5 percent (a rate similar to the national rate). The house price index for Washington, D.C. had rebounded to approximately 90 percent of its 2006 level in 2018 when the second WRLURI survey was administered.

Exhibit 1

Federal Housing Finance Agency All-Transactions House Price Indices for the United States and the Washington, D.C. Metropolitan Area



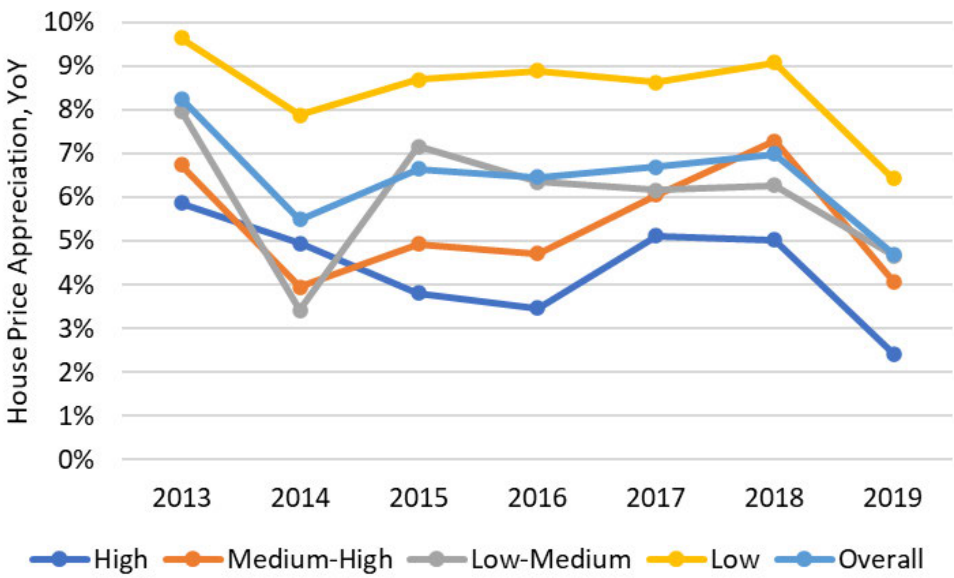
FHFA = Federal Housing Finance Agency. NSA = not seasonally adjusted. Q = quarter.
Note: Not seasonally adjusted, first quarter 1991, indexed to 100.
Source: Federal Housing Finance Agency

[8] Neal, Goodman, and Young (2020) report, "Since 2009, housing demand has outstripped supply, quite significantly in some areas." For example, their report shows that while 1.2 million households were formed in 2018, the net addition to the housing stock was 850,000 units, creating a 350,000-unit shortage in 2018 alone. The authors conclude the opening paragraph, "This shortage has increased home prices and rents, a trend that will continue for the foreseeable future absent policy changes." The situation in the Washington, D.C. metro area from 2013–2017 shows a relatively smaller shortfall—over this period there were approximately 65,000 housing units added (based on AHS data), and there were 71,000 additional households (American Community Survey 1-year estimates). However, to understand if there are binding supply constraints, additional factors need to be considered. In a forthcoming RIHA paper, Asquith (2021) uses a theoretical framework to provide an estimation of what would occur in terms of migration and labor markets if house price polarization were reversed, namely by easing the land use regulations in the highest priced places.

While overall house price appreciation for a metropolitan area is of consequence, not all housing types appreciate at the same rate. Indeed, research by the American Enterprise Institute Housing Center indicates that lower price-tier houses have appreciated faster than higher tier houses in the D.C. area in recent years (exhibit 2). While this helps build housing wealth faster for owner-occupants, it also can adversely affect the affordability of these homes.

Exhibit 2

Year-Over-Year House Price Appreciation for the Washington, D.C. Metropolitan Area, by Housing



YoY = year over year.
Source: Authors' Tabulations of American Enterprise Institute Data

The price of a home is only one of many inputs used to estimate owner-occupied (and tangentially, rented) housing affordability. As Haurin (2016) points out, measurement of housing affordability is not straightforward since the summary indexes (often) attempt to summarize multiple disparate economic issues into one number. Moreover, the focus on a single number is also limiting—as demonstrated in exhibit 2—and thus, Haurin highlights the importance of looking across the whole distribution of income and housing costs instead of one point (such as the median).

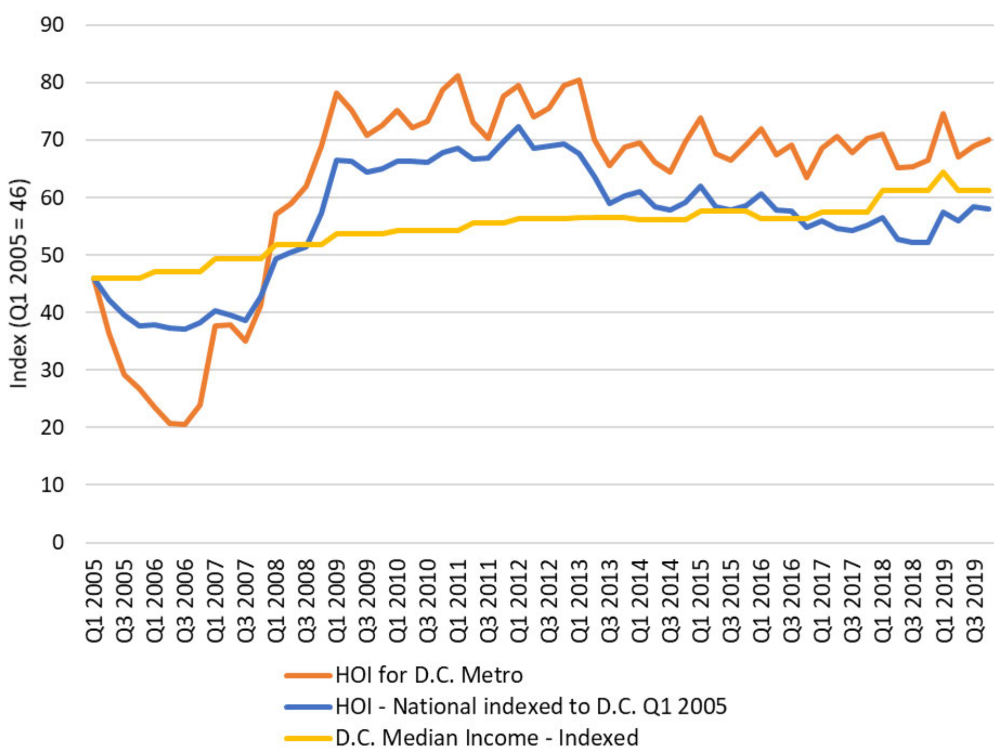
With that in mind, we look at three affordability measures to illustrate the recent experience in the Washington, D.C. metropolitan area.

The first measure, the NAHB/Wells Fargo HOI, measures the share of home sales in a metropolitan area for which the monthly income available for housing (equal to 28 percent of metropolitan median income) is at or above the monthly cost for that unit.

While recent year-over-year house price increases have averaged 5 percent annually in the D.C. metropolitan area, the HOI decreased by 10 points (from around 80 to 70) over the same period and has been centered around 70 since 2013 (exhibit 3). In part due to increasing metropolitan median incomes and decreasing interest rates, the HOI has not been highly correlated with house prices since 2013 in the D.C. metropolitan area. At the national level, the HOI is near where it was 6 years ago.

Exhibit 3

Housing Opportunity Index for the Washington, D.C. Metropolitan Area and the United States, and Index of D.C. Median Income



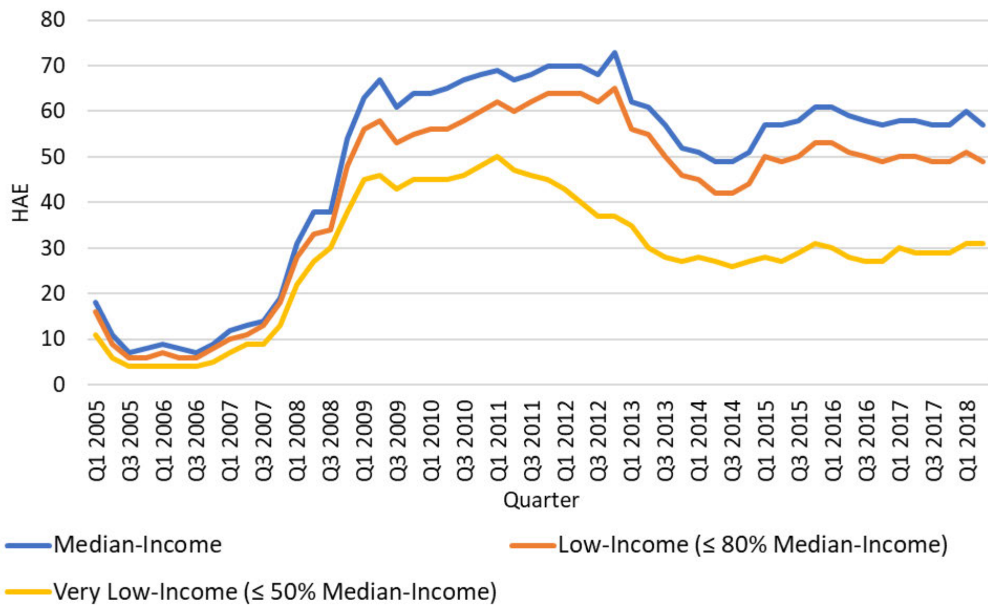
HOI = housing opportunity index. Q = quarter.

Source: National Association Home Builders/Wells Fargo

While the correlations between the HOI and the three HAE series (in exhibit 4) are very high—96.9 percent (median-income), 96.9 percent (low-income), and 91.7 percent (very low-income)—the spreads between the three HAE lines show the change in varying levels of affordability for the three income levels in the D.C. metropolitan area and emphasize the importance of looking across the distribution of income and housing costs.

Exhibit 4

Home Affordability Estimate for the Washington, D.C. Metropolitan Area



HAE = home affordability estimate. Q = quarter.
Source: Federal Housing Finance Agency

Before examining our third affordability measure for the D.C. metropolitan area, AHS data waves from 2013, 2015, 2017, and 2019 that allows us to look across the income and housing cost distributions, we briefly discuss what has happened to rental affordability in the D.C. area.

As mentioned previously, measuring affordability for ownership can be tricky because it integrates several disparate economic factors to produce a single number. On the other hand, renter affordability measures may be considered more straightforward in that one can directly compare contemporaneous housing expenditures to income. Indeed, the attractive "simplicity" of the traditional expenditure-to-income ratio is also commonly used to determine if homeownership is sustainable.[9,10]

The Joint Center for Housing Studies of Harvard University (JCHS) employs useful cutoff points to emphasize expenditure-to-income affordability issues: moderately burdened households are those paying between 30 percent and 50 percent of their income to housing costs, and severely burdened households are those paying 50 percent or more of their income to housing costs (JCHS, 2020, 2019).

[9] A PD&R Edge article from 2017 (available at: https://www.huduser.gov/portal/pdredge/pdr-edge-featd-article-081417.html) discusses the traditional measure and references a recent paper by Ben-Shahar, Gabriel, and Golan (2019) that uses a novel consumption-adjusted approach that finesses the traditional housing price-to-income approach to account for variations in household incomes and preferences.

[10] The HOI and HAE are, in many respects, indexes that measure accessibility to homeownership. Expenditure-to-income measures focus on sustainability. That is, can homeowners afford to make their monthly payments once they are in the home?

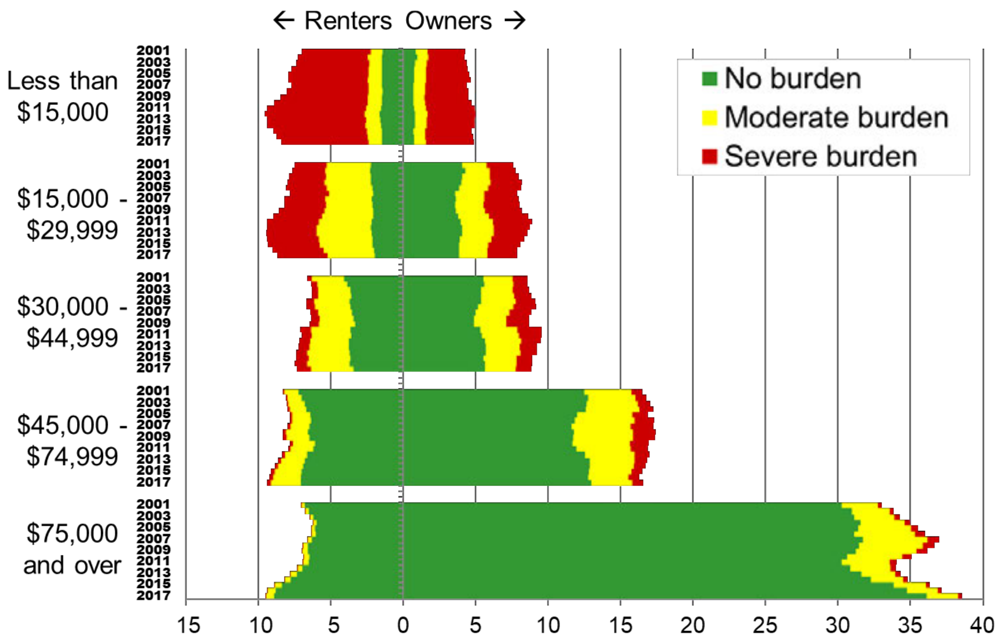
Exhibit 5 shows the evolution of the number of renter and owner burdened households, by income levels, from 2001–2017. The exhibit summarizes some stylized facts:

- Since lower-income households are more likely to rent than to own, and the rental market is composed of a higher share of low-income households (Woodwell, 2015), households with affordability challenges are more heavily concentrated in rental than ownership markets.

- Growth in the number of low-income households during the great recession, and more recent declines, have been a key driver of overall affordability metrics.

Exhibit 5

Number of Owner and Renter Households, by Real Income and Level of Housing Cost Burden, Selected Years (Millions of Households, 2017 $)

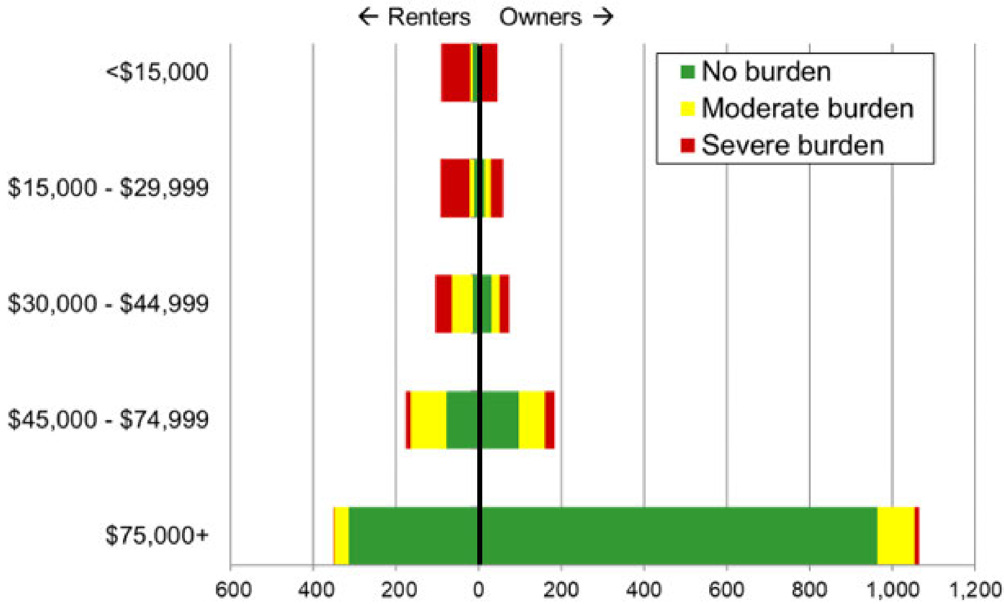


Source: Authors' tabulations of Joint Center Housing Studies data

Exhibit 6 shows the situation for the Washington, D.C. metropolitan area in 2017.

Exhibit 6

Number of Owner and Renter Households in the Washington, D.C. Metropolitan Area, by Real Income and Level of Housing Cost Burden, 2017 (Thousands of Households)

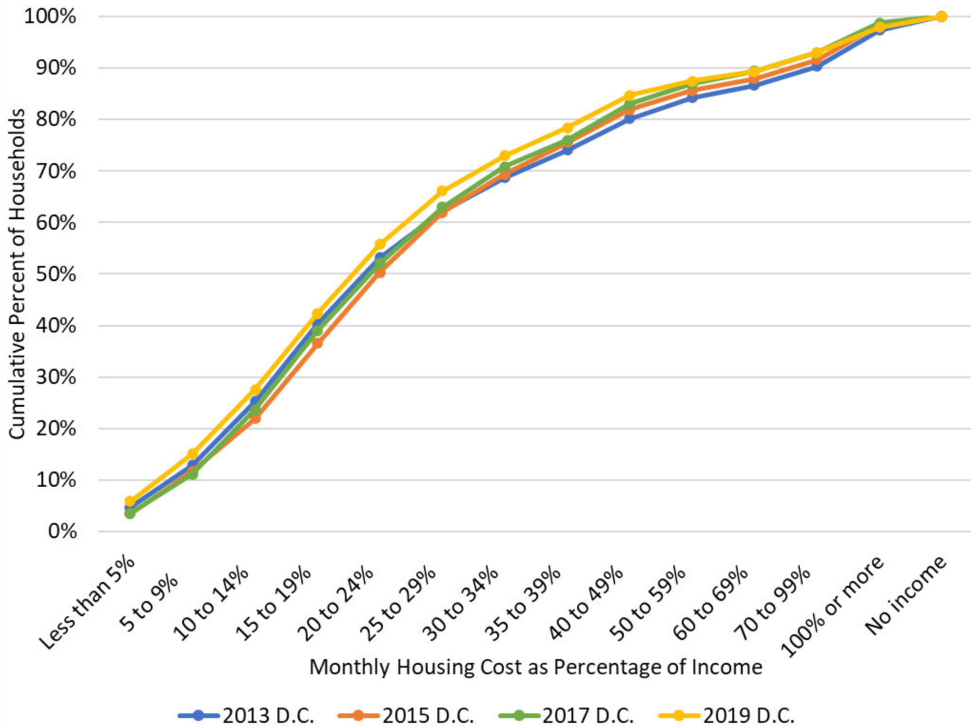


Source: Authors' tabulations of Joint Center Housing Studies data

Exhibit 7 demonstrates, using the four most recent waves of AHS data collection, how housing costs as a percentage of household income evolved from 2013 to 2019 for households in the Washington, D.C. metropolitan area.

Exhibit 7

Cumulative Distribution of Monthly Housing Cost as Percentage of Income for the Washington, D.C. Metropolitan Area



Source: Authors' tabulations of American Housing Survey data

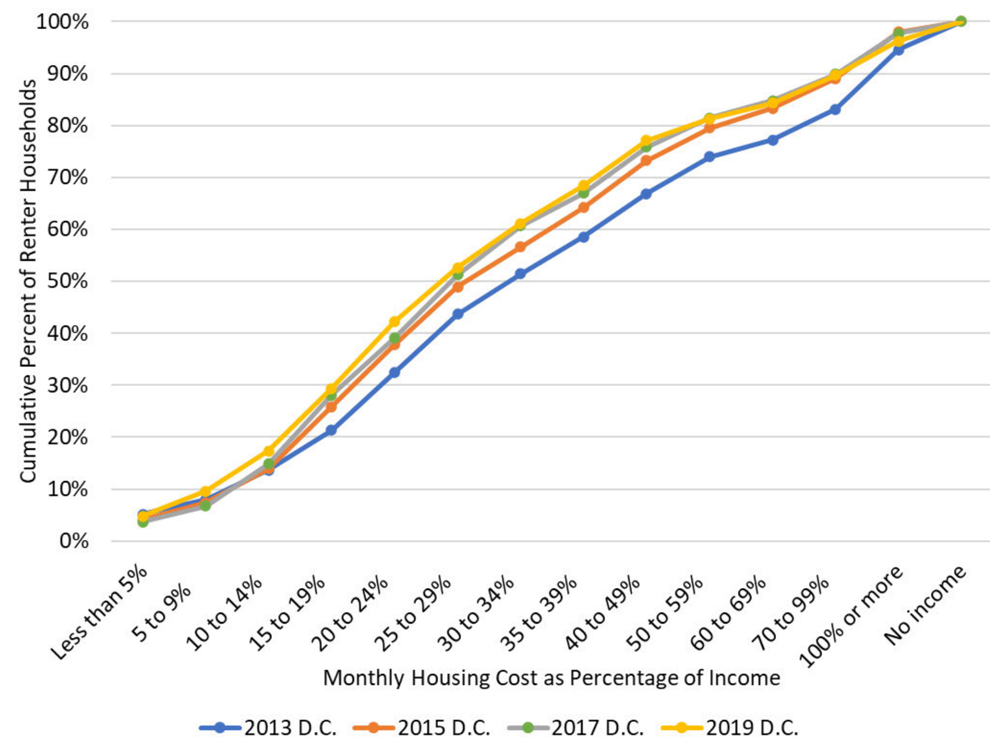
In the 2013 data, 80.2 percent of households spent less than 50 percent of their income on housing costs. In 2015 and 2017, 81.9 percent and 83.1 percent did, and in 2019 84.6 percent did so. In other words, the proportion of households that were severely burdened fell from 19.8 percent to 15.4 percent over these 6 years.

When we filter the AHS data for owner-occupied homes, the proportion of severely burdened homeowners stayed at approximately 13 percent through the first three waves of data and improved to 11 percent in 2019. On the other hand, the share of renters facing affordability challenges decreased over each of the four waves (as demonstrated by the upward movement of the lines in exhibit 8). Indeed, the severely burdened rate for renters fell from 33.1 percent in 2013 to 26.8 percent and 24.1 percent in 2015 and 2017 and 22.9 percent in 2019. However, while the share of severely burdened renters decreased by more than 10 percentage points, it should be noted that the number of higher income renter households increased over this 6-year period. For example, in 2013, 51.5 percent of renters had incomes of at least $50,000, while in 2019, 61.5 percent did so.

This example highlights a drawback of traditional cost-burdened measures—a measurement of a broad group may belie the experiences of many individual members of that group.[11]

Exhibit 8

Cumulative Distribution of Monthly Housing Cost as Percentage of Income for Renters in the Washington, D.C. Metropolitan Area



Source: Authors' tabulations of American Housing Survey data

Land-Use Restrictions

The 2006 WRLURI included 15 communities in the D.C. metropolitan area. Excluding the communities for which there were missing data in one or more subindexes (and thus no aggregate WRLURI score available), we are left with 12 communities. Exhibit 9 lists the communities and their WRLURI scores.

[11] JCHS tabulations of 2017 American Community Survey (1-year) data show this starkly for San Francisco, where the median income for homeowners is $130,000 versus $75,000 for the United States, and more than one-third of renters earn more than $100,000. High housing costs are partially met by high household incomes.

Exhibit 9

Communities in the Washington, D.C. Metropolitan Area and Their Associated 2006 Wharton Residential Land-Use Regulatory Index

Community	2006 WRLURI
Manassas Park City, VA	-0.4490
Warrenton Town, VA	-0.3814
Brentwood Town, MD	-0.2402
Laurel City, MD	-0.2292
Falls Church City, VA	-0.1075
Indian Head Town, MD	0.0334
Vienna Town, VA	0.1847
Forest Heights City, MD	0.5105
Herndon Town, VA	0.6928
Front Royal Town, VA	0.8947
Mouth Airy Town, MD	1.6360
Bowie City, MD	1.9114

WRLURI = Wharton Residential Land-Use Regulation Index.
Source: Authors' tabulations of WRLURI data

The sample of 1,904 nationwide 2006 WRLURI scores were standardized (to sample mean zero and standard deviation one) and grouped into three buckets: lightly regulated communities with WRLURI < -0.55 (the bottom quartile of scores), highly regulated with WRLURI > 0.74 (the top quartile), and average regulated (with scores in the interquartile range, -0.55 to 0.74). The 2006 D.C. metropolitan area has no lightly regulated communities in the sample, nine average regulated, and three highly regulated communities. The (simple) average WRLURI for the 12 communities is 0.37.[12]

The 2018 WRLURI survey includes 15 communities in the D.C. metropolitan area with WRLURI scores.[13] These are shown in exhibit 10.

[12] For more details on WRLURI weights see the discussions in Gyourko, Saiz, and Summers (2008) and Gyourko, Hartley, and Krimmel (2019). All our reported results use equal weighting of observations, following the presentation of all results in the main body of the 2019 WRLURI paper. Note that weighting does not affect any major conclusions (see footnote 12 in the 2019 paper).

[13] The 2018 WRLURI data include two communities in West Virginia. The authors focused on core-based statistical areas for the 2018 sample. We exclude them to be consistent with the 2006 geographic metropolitan area definition.

Exhibit 10

Communities in the Washington, D.C. Metropolitan Area and Their Associated 2018 Wharton Residential Land-Use Regulatory Index

Community	2018 WRLURI
Manassas Park City, VA	-0.9416
Culpeper, VA	-0.6957
Hyattsville, MD	0.0315
Fairfax, VA	0.2678
Vienna, VA	0.2963
Cheverly, MD	0.3171
Middletown, MD	0.3464
Manassas, VA	0.5591
Purcellville, VA	0.9087
Alexandria, VA	1.0282
Walkersville, MD	1.0904
Brunswick, MD	1.2491
District Heights, MD	1.3823
Rockville, MD	2.5716
Warrenton, VA	2.7155

WRLURI = Wharton Residential Land-Use Regulatory Index.
Source: Authors' tabulations of WRLURI data

The standardized sample of 2,233 nationwide 2018 WRLURI scores means that lightly regulated communities have a WRLURI ≤ -0.64 and highly regulated ones have WRLURI ≥ 0.64. As such, the 2018 D.C. metropolitan area has two lightly regulated communities in the sample, six average regulated, and seven highly regulated communities. The (simple) average WRLURI for the 15 communities is 0.74.

It is thus tempting to conclude that land-use regulations have increased in the D.C. metropolitan area in the period between the two samples. However, comparing the two samples may not be apt. First, the means and standard deviations for the two overall samples may have shifted so that a simple comparison may be spurious.[14] Second, the data are not longitudinal, and sample sizes are small. Of the 12 communities in the 2006 D.C. metropolitan area sample, three are repeated in 2018. The WRLURI for Manassas Park, Virginia, decreased from -0.45 to -0.94 (to become lightly regulated), the index for Vienna, Virginia, increased from 0.18 to 0.30 (to remain average regulated), and the index for Warrenton, Virginia, increased dramatically from -0.38 to a metropolitan area high of 2.72 (with scores increasing on multiple subindexes).

[14] Gyourko, Hartley, and Krimmel (2019) provide a summary of the communities they can compare across the two samples. They conclude that the fundamental nature of the local regulatory environment has not changed much; what existed near the start of the century is still there in basic form. There is no evidence of tools and methods being abandoned or of radically new methods in use. Moreover, they find that the Great Recession clearly did not lead to general declines in regulatory intensity. Finally, at the metro level, they find no cases in which a previously highly regulated area reversed course and became lightly regulated on average.

The apparent increase in land-use regulations between the two samples for Warrenton begs whether there was an associated decrease in housing supply over this period.[15] We analyze this using U.S. Census Bureau Building Permit Survey data. In exhibit 11, we show, for every third year from 2006–2018, the number of annual residential permits for Warrenton, for all Fauquier County, and three neighboring counties: Prince William, Loudoun, and Stafford.[16]

Exhibit 11

Number of Residential Building Permits for the Town of Warrenton and Four Counties for 2006–2018

	Year	One Unit Buildings	Two–Four Unit Buildings	Five+ Unit Buildings	Total
Town of Warrenton	2006	67	0	3	70
	2009	7	0	0	7
	2012	11	1	0	12
	2015	0	0	0	0
	2018	7	0	1	8
Fauquier County	2006	506	0	7	513
	2009	106	0	0	106
	2012	164	1	0	165
	2015	200	0	0	200
	2018	289	0	1	290
Loudoun County	2006	2,937	0	17	2,954
	2009	1,638	0	27	1,665
	2012	2,980	9	36	3,025
	2015	2,635	0	35	2,670
	2018	2,511	3	28	2,542
Prince William County	2006	3,007	0	6	3,013
	2009	1,729	79	6	1,814
	2012	1,397	21	22	1,440
	2015	1,444	0	27	1,471
	2018	1,248	0	13	1,261
Stafford County	2006	818	0	2	820
	2009	455	2	0	457
	2012	638	7	1	646
	2015	785	0	0	785
	2018	1,048	0	0	1,048

Source: Authors' tabulations of U.S. Census Building Permit Survey data

[15] For a richer understanding of the Town of Warrenton—it's population, demand for housing, and other details regarding its town planning and issues—see Town of Warrenton, Virginia (2009).

[16] These three neighboring counties are east of Fauquier County (and thus closer to Washington, DC) and have all seen large population growth in the last few decades.

Between 2006 and 2018, the two WRLURI survey years, the number of permits in Fauquier County decreased by 43 percent. There were 513 permits issued in the county in 2006 and only 106 in 2009. The number of permits then steadily increased as we moved further from the Great Recession, with 290 residential permits issued in 2018. Interestingly, the patterns in the three neighboring counties are all different, with only Stafford County having more permits in 2018 than in 2006.

Warrenton had eight permits issued in 2018 versus 70 in 2006. This is a decrease of 89 percent. The average number of residential permits issued from 2000–2005 was 156, so 2006 reflects a slowing down as the housing boom turned. The pace of permits issued was last in double digits in 2010 (30 permits) and 2011 (20 permits), and the most recent data for 2019 show that only three permits were issued in 2019.

The Washington, D.C. metropolitan area example makes evident many of the challenges of formalizing the relationships between land use and affordability, including the abstract measurement of land-use regulation, the small area sample size of some of the data on levels of construction, and the challenges of disentangling the many components of affordability.

Survey of Other Metropolitan Areas

As mentioned previously, while the Washington metropolitan area is a strong choice for exploring the various concepts related to affordability and land-use restriction, it is in no way representative of the country as a whole. In this subsection, we expand our examination through data on eight additional metropolitan areas with varied housing and socioeconomic characteristics. The order of the metropolitan areas is presented geographically west to east. For each metropolitan area, we look at what has happened regarding affordability in recent years and compare their WRLURI survey results with a key finding that each area is subject to a unique set of circumstances and trends.

Los Angeles-Long Beach-Anaheim, CA

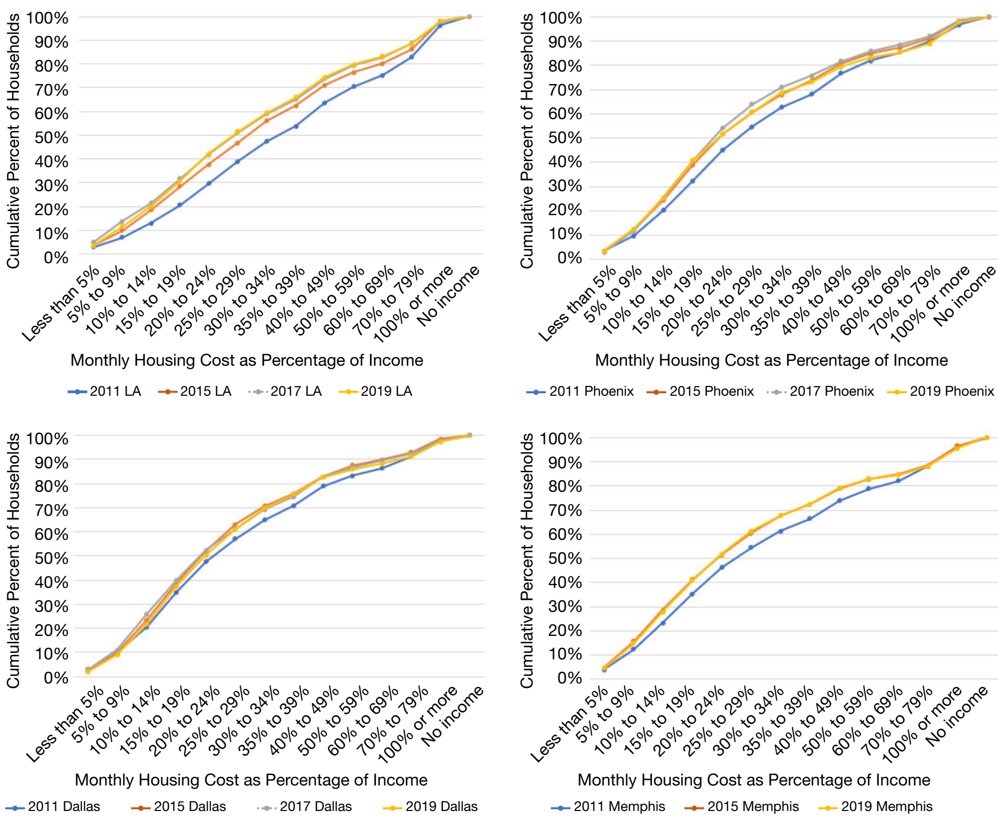
The Los Angeles metropolitan area (comprising Los Angeles and Orange Counties) is one of the least affordable in the country, with HAE affordability measures for homeowners in the single digits in the first quarter of 2018; only 7 percent of the housing stock was affordable for the median household in the Los Angeles metropolitan division, 5 percent for low-income households, and 1 percent for very low-income households.[17] Only one MSA had lower affordability in the FHFA measure in the first quarter of 2018: San Francisco.

Exhibit 12 demonstrates, using the 2011, 2015, 2017, and 2019 waves of AHS data collection, how housing costs as a percentage of household income evolved in the LA metropolitan area.

[17] As discussed in the data section, the FHFA data separates out Anaheim-Santa Ana-Irvine MSAD. The HAE measures for the first quarter of 2018 are even lower than the LA-Long Beach-Glendale metropolitan division—only 3 percent of the housing stock was affordable to the median-income household, 2 percent to low-income households, and 0 percent to very-low-income households.

Exhibit 12

Cumulative Distribution of Monthly Housing Cost as Percentage of Income in the Los Angeles, Phoenix, Dallas, and Memphis Metropolitan Areas



Source: Authors' tabulations of American Housing Survey data

In 2011, 63.6 percent of households spent less than 50 percent of their income on housing costs. In 2015, 71.1 percent did, 73.7 percent did in 2017, and 74.3 percent did in 2019. In other words, the proportion of households that were severely burdened fell from 36.4 percent to 25.7 percent over these 8 years. Similarly, the proportion of burdened households fell from 61.1 percent to 48.5 percent.

That is, one-half of the households in the LA metropolitan area was housing cost-burdened in 2017 and 2019, whereas the proportion of the housing stock within reach of the median-income family in the LA metropolitan division continued to fall from over one-third in the first quarter of 2012 to 7 percent in the first quarter of 2018.

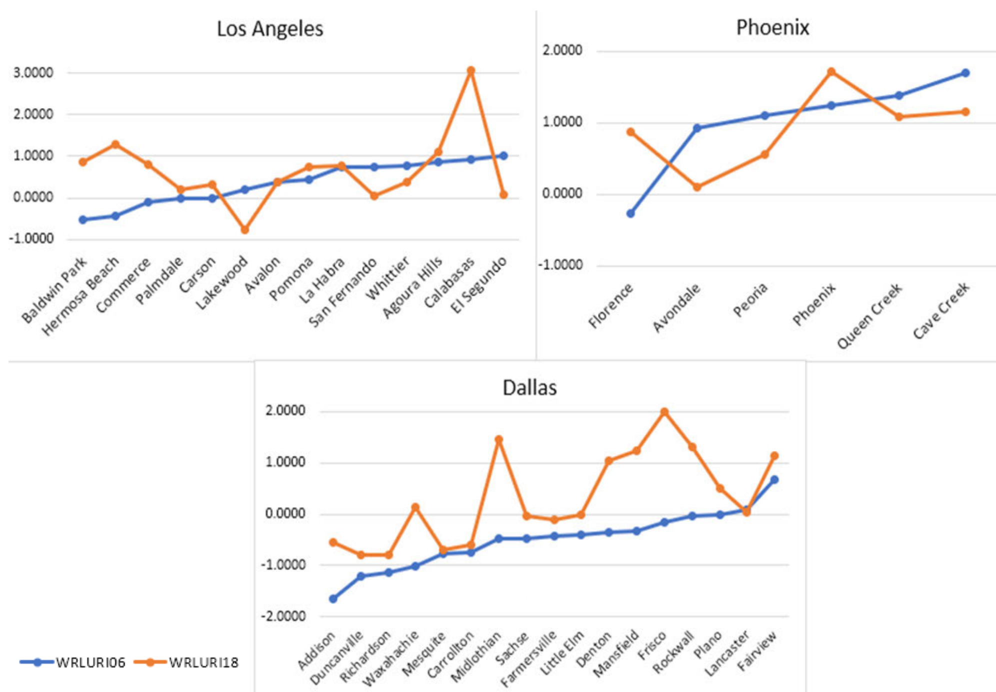
The 2006 WRLURI survey included 32 communities for the LA metropolitan area. Of these, 1 was lightly regulated, 19 were average regulated, and 12 heavily regulated. The average WRLURI in 2006 was 0.52. In 2018, there were 48 communities (3 were lightly regulated, 23 average regulated, and 22 heavily regulated). The average WRLURI in 2018 was 0.73.

While having WRLURI indexes above the mean, the LA area also has 52 percent of its land unavailable for residential or commercial real estate development (Saiz, 2010). These two factors are important determinants of housing supply inelasticity. As Saiz concludes, taken together, these two factors can "help us understand why robust national demographic growth and increased urbanization has translated mostly into higher housing prices" in Los Angeles.

Of the 32 communities in the 2006 WRLURI sample, 14 were also surveyed in 2018. The average WRLURI for these communities increased from 0.36 to 0.67 over this period, and the standard deviation increased from 0.51 to 0.86. As shown in exhibit 13, 4 of the 14 moved to a higher regulated status, 4 to a lower status, and 6 remained in the same status.

Exhibit 13

Wharton Residential Land-Use Regulatory Index Scores for Communities in Both the 2006 and 2018 Surveys for the Los Angeles, Phoenix, and Dallas Metropolitan Areas



WRLURI = Wharton Residential Land-Use Regulatory Index.
Source: Authors' tabulations of WRLURI data

Phoenix-Mesa-Scottsdale, AZ

The Phoenix metropolitan area has experienced strong house price growth since the FHFA All-Transactions House Price Index bottomed out in 2011. In the last 6 years, house prices have increased between 7 percent and 9 percent annually, and the HAE affordability measures of owner-occupied accessibility that were at 82, 76, and 64 respectively for median-, low- and very low-income households in 2011, fell to 52, 43, and 21 in the first quarter of 2018. On the other hand, as seen in exhibit 12, the percentage of housing-burdened households decreased from 45 percent in 2011 to 39 percent in 2015 and 36 percent in 2017. However, that proportion bounced back to 39 percent in 2019.

The 2006 WRLURI survey included 18 communities for the Phoenix metropolitan area. Of these, nine were average regulated and nine heavily regulated. The average WRLURI in 2006 was 0.71. In 2018, there were 11 communities (1 was lightly regulated, 4 average regulated, and 6 heavily regulated). The average WRLURI in 2018 was 0.64.

Furthermore, six Phoenix metropolitan area communities were in both the 2006 and 2018 WRLURI surveys (see exhibit 13). The average WRLURI for these communities decreased from 1.02 to 0.91 over this period; one of the six communities—Florence Town—moved to a higher regulated status (average to highly regulated), while two moved to a lighter regulated status (highly to average regulated).

While having WRLURI indexes above the mean, the Phoenix area has only 14 percent of its land unavailable for residential or commercial real estate development (Saiz, 2010). These two factors taken together can help us understand the rapidly growing population in the Phoenix metropolitan area.

Dallas-Fort Worth-Arlington, TX

The Dallas area has recently experienced the largest metropolitan population growth in the nation, with approximately 245,000 occupied housing units added between 2015 and 2019.[18] While the HAE affordability measure of owner-occupied accessibility decreased between 2015 and 2018, it remained above 2006 levels for median-income households (75 in the first quarter of 2018 versus 59 in 2006) and low-income households (65 versus 54). However, it decreased for very low-income households from 45 in 2006 to 33 in the first quarter of 2018. As shown in exhibit 12, 43 percent of households were housing burdened in 2011, 37 percent in 2015, and 39 percent in 2017 and 2019.

The 2006 WRLURI survey included 31 communities for the Dallas metropolitan area. Of these, 10 were lightly regulated, 19 average regulated, and 2 heavily regulated. The average WRLURI in 2006 was -0.33. In 2018, after dropping non-MSA counties, there were 47 communities with a WRLURI score (10 were lightly regulated, 22 average regulated, and 15 heavily regulated). The average WRLURI in 2018 was 0.18.

Furthermore, as shown in exhibit 13, 17 Dallas metropolitan area communities were in both the 2006 and 2018 WRLURI surveys. The average WRLURI for these communities increased from -0.50 to 0.31 over this period, and 9 of the 17 moved to a higher regulated status (3 from light to average and 6 from average to heavy). No communities moved to a lower regulated status. Moreover, the WRLURI standard deviation for these communities increased from 0.56 to 0.89 from the 2006 to the 2018 surveys.

[18] Also see https://www.census.gov/newsroom/press-releases/2018/popest-metro-county.html.

Memphis, TN-MS-AR

While the Memphis metropolitan area has relatively low housing costs—in the 2015 AHS, the median housing cost was $807 a month (compared to $977 nationally and $1,089 in the Dallas metropolitan area)—it also has a relatively low median income ($41,900 in the 2015 AHS versus $50,300 nationally and $58,000 in Dallas). As such, as shown in exhibit 12, housing burden rates were 46 percent in 2011, 40 percent in 2015, and 39 percent in 2019 (higher than the comparable rates for the Dallas metropolitan area).[19,20]

The 2006 WRLURI data for the Memphis MSA includes three communities. All are classified as highly regulated with a mean WRLURI of 1.16. The 2018 survey data includes three communities for which a WRLURI score is computed. Two of these communities are highly regulated, and one is lightly regulated. The mean WRLURI for 2018 is 0.31. Furthermore, while no communities were included in both surveys, the city of Memphis is included in the 2018 survey. Its WRLURI score is 1.01, in the highly regulated quartile.

Atlanta-Sandy Springs-Roswell, GA

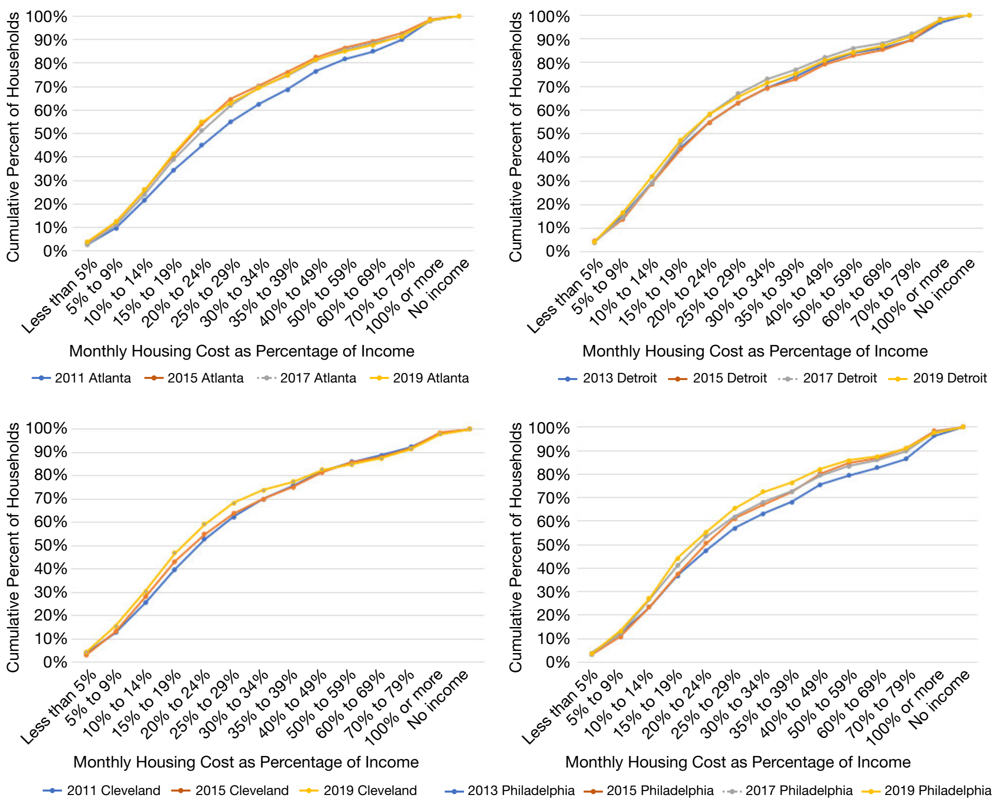
The Atlanta metropolitan area has experienced strong house price growth since the FHFA All-Transactions House Price Index bottomed out in 2012. In the last 6 years, house prices have increased between 6 percent and 10 percent annually, and the HAE affordability measures of owner-occupied accessibility that were at 81, 76, and 67 respectively for median-, low- and very low-income households in 2011, fell to 69, 63, and 45 in the first quarter of 2018. On the other hand, as seen in exhibit 14, the percentage of housing burdened households decreased from 45 percent in 2011 to 36 percent in 2015 and then increased to 38 percent and 37 percent in 2017 and 2019, respectively.

[19] Moreover, while the median monthly housing cost to own was (only) $71 more than to rent in 2015 (versus a $336 difference for the Dallas metro area), the homeownership rate in Shelby County, Tennessee (that includes approximately 70 percent of the metro area population) continued on a downward trend, falling from 57.8 percent in 2015 to 56.3 percent in 2018 (Source: ACS).

[20] Given the prevailing situation in the Memphis area, the Mortgage Bankers Association, in collective action with lenders, other industry participants, and government partners has developed a major program, CONVERGENCE, to promote "more sustainable, affordable homes for purchase and rental for underserved people and communities, especially minorities and low-to-moderate-income Americans." (See: https://www.mba.org/advocacy-and-policy/convergence). As part of the CONVERGENCE program design, the collective partners are working to reform regulatory barriers in the Memphis area, as well as redefining land use and zoning rules (details are available in MBA, 2020).

Exhibit 14

Cumulative Distribution of Monthly Housing Cost as Percentage of Income in the Atlanta, Detroit, Cleveland, and Philadelphia Metropolitan Areas



Source: Authors' tabulations of American Housing Survey data

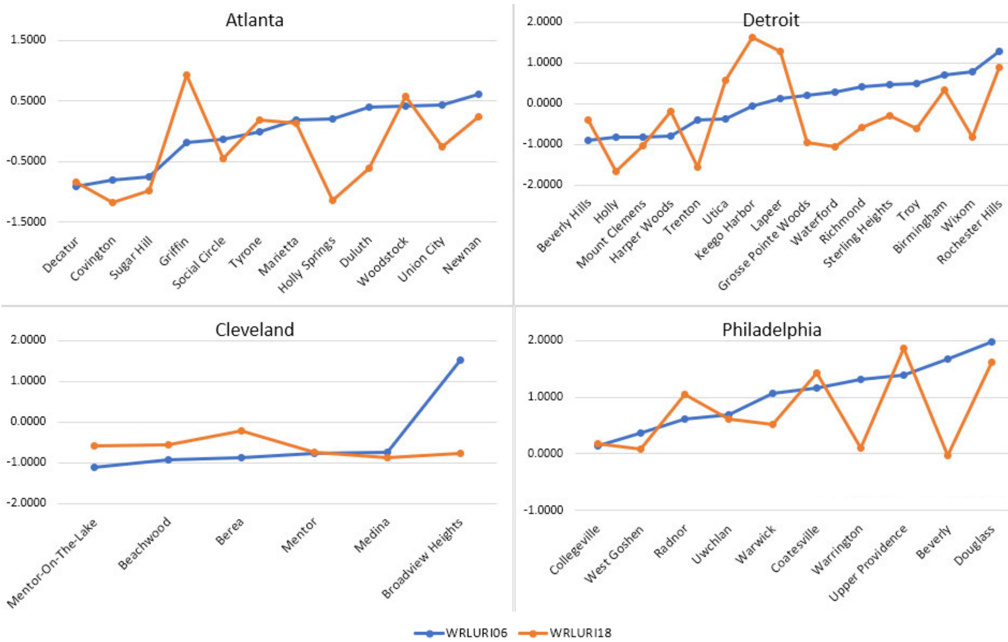
The 2006 WRLURI survey included 26 communities (with WRLURI scores) for the Atlanta metropolitan area. Of these, 4 were lightly regulated, 17 were average regulated, and 5 heavily regulated. The average WRLURI in 2006 was 0.04. In 2018, 27 communities were surveyed in the Atlanta MSA (6 were lightly regulated, 19 average regulated, and 2 heavily regulated). The average WRLURI in 2018 was -0.12.

Furthermore, 12 Atlanta metropolitan area communities were in both the 2006 and 2018 WRLURI surveys (see exhibit 15). The average WRLURI for these communities decreased from -0.04 to -0.28 over this period, and the standard deviation increased from 0.52 to 0.70. One of the 12 communities—Griffin City—moved to a higher regulated status (average to highly regulated). One of the 12 communities—Holly Springs—moved to a lighter regulated status (average to lightly regulated).

While having WRLURI indexes near the mean, the Atlanta area also has a low 4 percent of its land unavailable for residential or commercial real estate development (Saiz, 2010). These two factors taken together can help explain the "sprawling" growth of the Atlanta region (Van Mead, 2018).

Exhibit 15

Wharton Residential Land-Use Regulatory Index Scores for Communities in Both the 2006 and 2018 Surveys for the Atlanta, Detroit, Cleveland, and Philadelphia Metropolitan Areas



WRLURI = Wharton Residential Land-Use Regulatory Index.
Source: Authors' tabulations of WRLURI data

Detroit–Warren–Dearborn, MI

The AHS data, as depicted in exhibit 14, show that the distribution of monthly housing costs as a percentage of household income did not change in a meaningful way from 2013 to 2015, but did so from 2015 to 2017 when the proportion of households that were burdened decreased from 37 percent to 33 percent. However, the proportion increased to 35 percent in 2019.

The HAE affordability measures of owner-occupied accessibility at 92, 90, and 85 respectively for median-, low- and very low-income households in 2011, fell to 81, 78, and 67 in the first quarter of 2018. With that said, only the Kansas City, Pittsburgh, and Cleveland metropolitan areas had HAE values as high (that is, as affordable) as the Detroit area in the 2018 HAE data.

The 2006 WRLURI survey included 46 communities for the Detroit metropolitan area. Of these, 10 were lightly regulated, 30 were average regulated, and 6 heavily regulated. The average WRLURI in 2006 was 0.10. In 2018, there were 60 communities with WRLURI scores (25 were lightly regulated, 27 average regulated, and 8 heavily regulated). The average WRLURI in 2018 was -0.42.

Of the 46 communities in the 2006 WRLURI sample, 16 had WRLURI scores in 2018 (see exhibit 15). The average WRLURI for these communities decreased from 0.03 to -0.28 over this period, but the standard deviation increased from 0.67 to 0.98; 4 of the 16 moved to a higher regulated status, 4 to a lower status, and 8 remained in the same status.

The WRLURI values change for the Detroit metropolitan area between 2006 and 2018 point to the well-documented narrative of the efforts to stem the decline in its population from a high in 1970 and nurture the (ongoing) revival of its urban core. There have been innovative efforts, such as the urban agriculture zoning enacted in 2013, which added urban gardens and other agriculture activities as allowed principal uses in most land-use categories. As described on the City of Detroit website, another example is a project named "Mix Tape Zoning Detroit" that sought to transform Detroit's complex land-use regulations into a positive force for neighborhood revitalization.[21] This project was set up to provide better mixing of the land uses along commercial corridors. Moreover, the city continues in its efforts to improve ordinances. As recently as August 2020, amendments to existing Traditional Main Street Overlay Area regulations were implemented without requiring a hearing.

Cleveland-Elyria, OH

Even when compared to the other MSAs of the industrial heartland, the Cleveland metropolitan area has performed weakly in terms of employment, unemployment, population, and real per capita personal income levels (Schweitzer, 2018). Indeed, the FHFA All-Transactions annual house price appreciation averaged 2.2 percent from first quarter 2010 to first quarter 2020. HAE affordability measures of owner-occupied accessibility were at 85, 82, and 73 respectively for median-, low-, and very low-income households in 2011, fell slightly to 82, 78, and 66 in the first quarter of 2018 (similar in magnitude to the Detroit area). Furthermore, as seen in exhibit 14, the distributions of costs to incomes moved upward from 2011 to 2019 for those households that spent less than 40 percent of their incomes on housing expenses.

The 2006 WRLURI data for the Cleveland MSA includes 31 communities for which a WRLURI score is computed. Of these, 10 were lightly regulated, 15 average regulated, and 6 heavily regulated. The mean WRLURI was -0.14. The 2018 survey data include 19 communities for which a WRLURI score is computed. Of these, seven were lightly regulated, nine were average regulated, and three were heavily regulated. The mean WRLURI for 2018 is -0.28.

Furthermore, six Cleveland metropolitan area communities were in both the 2006 and 2018 WRLURI surveys. As shown in exhibit 15, all had WRLURI scores that were less than zero in both surveys except for the community of Broadview Heights, which had a highly regulated score of 1.51 in 2006 but a lightly regulated -0.77 in 2018.

According to the U.S. Census Bureau Building Permit Survey data, there were 289 residential permits given in 2003 in Broadview Heights. This decreased to 50 permits in 2006 (an 83-percent decrease), while the decrease was 32 percent (from 1,920 permits in 2003 to 1,297 in 2006) for all Cuyahoga County. In 2018, there were 21 residential permits given in Broadview Heights, a level consistent with recent years as the strong community growth slowed after the Great Recession (and even became negative in the last decade). The community is currently in the process of updating

[21] See: https://detroitmi.gov/departments/planning-and-development-department/design-and-development-innovation/zoning-innovation/mix-tape-zoning (accessed on October 9, 2020).

its zoning code to foster “consistent, walkable, and high-quality developments” in the face of a shrinking regional population.[22]

Philadelphia-Camden-Wilmington, PA-NJ-DE

Following the Great Recession, the Philadelphia metropolitan area experienced relatively slow house price growth through mid-2016. However, since then, the FHFA All-Transactions House Price Index has increased by an average of 5.9 percent year-on-year. The HAE affordability measures of owner-occupied accessibility were at 73, 67, and 49 respectively for median-, low-, and very low-income households in 2012 and fell to 66, 61, and 45 in the first quarter of 2018. On the other hand, as seen in exhibit 14, the percentage of housing burdened households decreased modestly from 39 percent in 2013 to 38 percent in 2015 and then decreased sharply to 32 percent in 2017 and 28 percent in 2019.

The 2006 WRLURI survey included 53 communities for the Philadelphia metropolitan area.[23] Of these, only 2 were lightly regulated, 17 were average regulated, and 34 were heavily regulated. The average WRLURI in 2006 was 1.03. In 2018, of the 49 communities surveyed (that had WRLURI scores), 5 were lightly regulated, 24 average regulated, and 20 heavily regulated. The average WRLURI in 2018 was 0.48.

Furthermore, 10 Philadelphia metropolitan area communities were in both the 2006 and 2018 WRLURI surveys (see exhibit 15). The average WRLURI for these communities decreased from 1.04 to 0.74 over this period, and the standard deviation increased from 0.59 to 0.70. Out of the 10 communities, only 1—Radnor, Pennsylvania—moved to a higher regulated status (average to highly regulated), and 3 moved to a lighter regulated status (highly to average regulated).

Observations on Case Studies

Our approach at this stage is to look within metropolitan areas, focusing on the differential levels of regulatory change that have actually happened between the two observation periods, with all the caveats that apply to this measurement. By doing so, we control for several factors (state and metropolitan-level constraints and economic patterns, most importantly), leaving primarily local development patterns and regulatory changes as the prime movers.

We certainly cannot ascribe the regulatory change as a causal impact on housing costs. There are many confounding forces at play. It is certainly plausible that the regulatory changes were a result of faster growth in a prior period. However, identifying these communities that experienced either more or less regulatory constraints over this period shines the flashlight on the object of interest. When it comes to formulating policies to increase the supply of affordable and safe housing, we need to be clear concerning the direction of the causality and be mindful that some of the regulatory changes are likely endogenous. However, we do see value in illustrating the empirical correlations between regulatory changes and affordability.

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[22] See the community’s Master Plan at https://www.countyplanning.us/wp-content/uploads/2020/08/BH_Full-Plan_Final.pdf.

[23] We include the following counties in Pennsylvania and New Jersey in the 2006 and 2018 WRLURI analysis: Bucks, Burlington, Camden, Chester, Delaware, Montgomery, and Philadelphia.

At Mortgage Bankers Association (MBA), we have recently launched an effort to advance affordability in selected metropolitan areas by bringing together community leaders, lenders, housing counselors, and others to identify the key obstacles impeding the purchase financing of affordable housing. This effort, named CONVERGENCE, is beginning in Memphis, Tennessee, and Columbus, Ohio, and is particularly focused on identifying and reducing barriers to Black homeownership in these markets. Not unexpectedly, while some of the challenges in these markets are related to local or state regulation, others are due to insufficient information regarding the homebuying process that keeps potential buyers hesitant and market conditions that lead to appraisal and other operational challenges. With this effort, MBA is hoping to identify strategies or tactics that are effective in one market that could be usefully exported to other markets around the country while understanding that some of the most difficult challenges will often be market-specific.

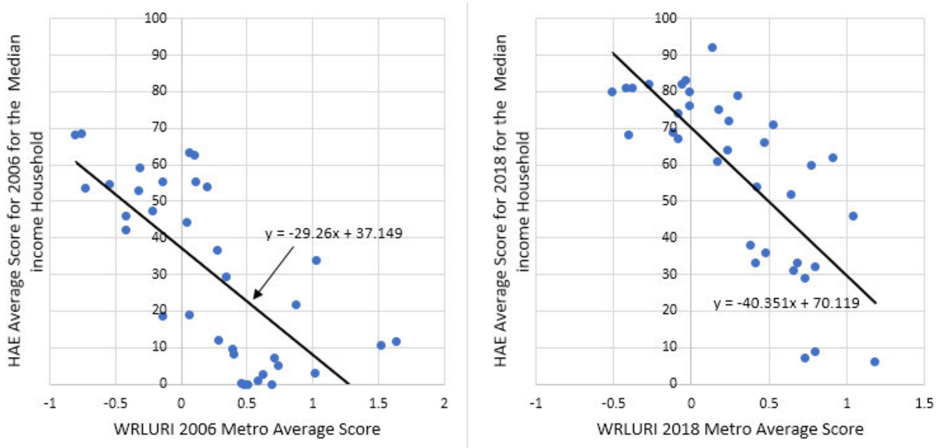
Differences Across Metropolitan Areas

The case studies we examined in the empirical section beg the question as to what the WRLURI and affordability data look like across metropolitan areas. That is, are higher (more restrictive) WRLURI indexes associated with less affordable metropolitan areas? As noted previously, this exercise is purely to stimulate discussion, and there are no causal empirical inferences that should be assumed. As such, we have placed this in the discussion (and not the empirical section) of the report.

Taking the average of the quarterly HAE data for 2006 and the same HAE data for the first quarter of 2018, we plot these against the contemporaneous WRLURI scores for the metropolitan areas for which there is a WRLURI index in both surveys and HAE scores (36 observations). Exhibit 16 shows these scatter plots for 2006 (in the left panel) and 2018 (right panel). A simple regression using the 2006 data shows that for these 36 metropolitan areas, an increase in the WRLURI 2006 index of one standard deviation is associated with an HAE score that is (a statistically significant) 29.3 points lower. In 2018, the synonymous exercise had an associated (significant) 40.4 decrease in the HAE score.

Exhibit 16

Metropolitan Level Wharton Residential Land-Use Regulatory Index Scores Versus Home Affordability Estimate Scores for Median Income Households in 2006 and 2018



HAE = home affordability estimate. WRLURI = Wharton Residential Land-Use Regulatory Index.
Sources: Federal Housing Finance Agency; WRLURI

Thus, observing these areas on a cross-sectional basis at these two points in time, we can say that metropolitan areas with higher levels of regulation have less affordable housing.

However, that may not be the right question to ask. San Francisco residents are unlikely to make a wholesale change in their regulatory framework (or other aspects of living in the Bay area) to achieve the level of housing affordability in other metropolitan areas. Similarly, Detroit residents are unlikely to adopt land-use practices of higher cost areas to increase housing value. Further, even if San Francisco residents made wholesale changes to their regulatory framework, it is highly unlikely that such changes would lead them to other areas' affordability levels.

The relevant question for a given metropolitan area is, how will changes in land-use regulation at the margin impact housing affordability? While cross-sectional analysis could provide information regarding the sign of the relationship, it is unlikely to be insightful regarding the magnitude or even the specific levers that could be changed to impact affordability.

Moreover, as Gyourko, Hartley, and Krimmel (2019) noted when they compare the communities in both WRLURI surveys, the fundamental nature of the local regulatory environment at the metropolitan level has not changed much. This is true of these 36 metropolitan areas. The linear relationship between the WRLURI 2006 and WRLURI 2018 values gives a non-significant intercept of -0.03 and a slope of 0.90 (that is not significantly different from unity, with a p-value of 0.56). If the intensity of regulation has not changed, how could this variable be driving a large decline in affordability in many metropolitan areas?

Taking this one step further, we ask whether the metropolitan area changes in WRLURI from 2006 to 2018 is associated with a change in the HAE. We regress the metropolitan level differences in HAE scores for different periods on the metropolitan level change in WRLURI and find that the slope is not significantly different from zero for all regressions. In other words, for these 36 metropolitan areas, on average, changes in land-use restrictions had a negligible association to changes in HAE. The conundrum is that the evidence for regulatory change being the primary driver of metropolitan-level changes in affordability seems weak, abstracting from the clear difficulty of econometrically identifying the direction of causality.

However, the thought process outlined previously could be extended. The marginal changes in land-use regulation that we are looking for do not seem to be occurring at the metropolitan level. Metropolitan-level averages can mask local changes. Perhaps we are looking in the wrong place.

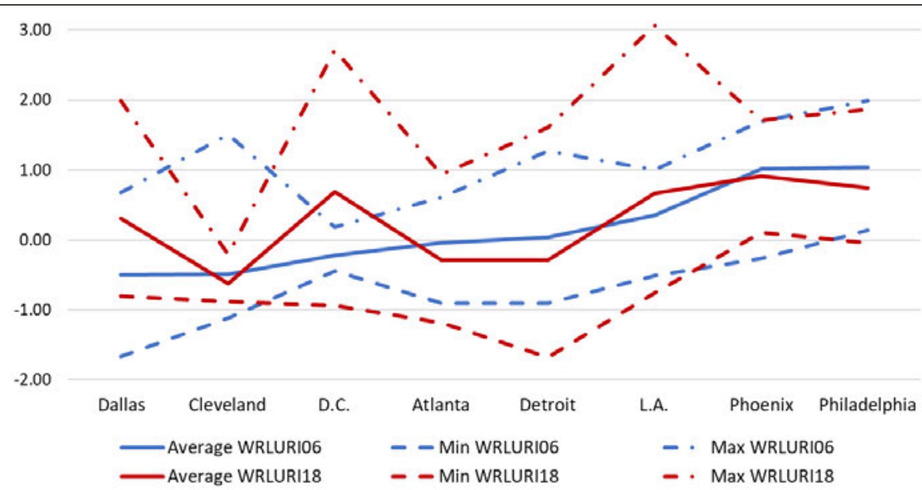
Observations

Taking a deeper dive into the WRLURI data, we know that while the metropolitan areas may not be exhibiting large changes, certain communities within these metropolitan areas do show notable shifts over these dozen years. We need to drill down to communities within metropolitan areas to look at changes. Gyourko and Krimmel (2020) offer an example of how to approach the patterns within metropolitan areas. Moreover, while we have not narrowed our focus within the WRLURI subindexes, this is a promising way to expand the case studies from this report.

Exhibit 17 highlights eight metropolitan areas for which we have data on multiple communities for both 2006 and 2018. They were rank ordered by their average WRLURI in 2006. The solid lines show the average WRLURI for these 2 years for these cities, while the dashed lines show the minimum and maximum community values at each date. The main takeaway is that while the averages have not changed more than moderately between the two surveys, there is a community-level change.

Exhibit 17

Metropolitan Area Average, Minimum, and Maximum Wharton Residential Land-Use Regulatory Index Values for Communities Included in Both of the 2006 and 2018 Surveys



WRLURI = Wharton Residential Land-Use Regulatory Index.
Source: Authors' tabulations of WRLURI data

WRLURI had 11 subindexes in 2006 and 12 in 2018. Two of these were state level (The State Political Involvement Index and The State Court Involvement Index), but most of the subindexes were based on local land-use restrictions. In other words, as the WRLURI authors designed the surveys, they understood that local restrictions matter. This is illustrated by Pinto and Peter (2020) using a land-use restriction case study in Bergen County, New Jersey. The impacts on housing supply and affordability in the community of Palisades Park differed from its neighboring communities due to less restrictive up-zoning policies.

The question we set out to address, whether and how the extent of regulation impacts affordability for renters and owners, is not a new question. Many have struggled to both clearly define what is being asked and to apply the right data and techniques to uncover the underlying relationships. We reviewed much of the extensive research that has been done in this space because the prior work illuminates many of the challenges.

First, because defining affordability by a single measure is an impossible exercise, we focus on two alternative measures to obtain a more plausible range of affordability and provide a complete picture.

Second, while theory would clearly predict that artificially restricting housing supply should put upward pressure on home prices, *ceteris paribus*, the available data find relatively little change to regulatory constraints during a period in which home prices and housing costs have increased substantially relative to income, thereby impinging on affordability, at least by some of the measures.

If regulatory changes were not a primary cause of this upshift in the cost of housing, is it a false promise that removing regulatory constraints would lead to improved housing affordability? The conceptual experiment of simulating the impact of reducing the regulation level in a highly regulated metropolitan area to a less regulated metropolitan area may provide the right indication of the effect but is unlikely to be a reasonable guide to the actual impact.

While there are many efforts to think big about addressing the lack of affordability in many parts of the country, the data indicate that to be impactful, the analysis needs to think small, at least concerning the size of the market area that is the right unit of analysis. Comparing metropolitan areas across the country can be broadly indicative, but future research on these topics should focus on within metropolitan area analysis. Such research holds constant commuting patterns, employment bases, amenities, and other important drivers of housing values and operates more on the same scale as housing markets and land-use decisions. As a result, it is likely to be more illuminating when examining the impact of different regulatory approaches.

Data below the metropolitan-level will be harder to obtain and may not have the same depth of transactions that can be achieved at higher levels of geography. However, the results are much more likely to be applicable for informing local policymakers regarding the impacts of their potential actions, thus better bridging the divide between analysis and practice.

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Density Control, Home Price Appreciation, and Rental Growth in the United States

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Abstract

This article examines density control in the top 50 U.S. metropolitan areas using National Longitudinal Land Use Survey (NLLUS) data from 1994, 2003, and 2019. Small- and low-density jurisdictions have typically tightened density controls over this period, while large and populous places have loosened them, accommodating high-density development. Linking these changes to the house price appreciation, we find that greater price appreciation is positively correlated with the relaxing of the density regulation, on the surface a counterintuitive negative relationship. However, in the multifamily sector, we find that the relationship between density control and rent growth is positive: rents are rising faster in areas with tight density controls, consistent with supply constraints. Results also hold in cross-metropolitan area comparisons concerning house appreciation. The different impacts on home prices and the rental sectors may be due to civic engagement differences between homeowners and renters.

Introduction

As the housing market recovered from the 2008–2009 financial crisis in the United States, house price appreciation has outpaced household income in many markets. Concurrently, asking rents on market-rate units in major metropolitan areas have taken an increasing share of median household income. Together these trends have contributed to reduced housing affordability. Given the well-documented lack of supply in many markets, many argue that local restriction on new construction is a major obstacle. Given the rising demand driven by employment growth and demographic factors, the limited housing supply will put a premium on the price of residential spaces in single-family neighborhoods and multifamily rental sectors. Hence, we expect high housing prices and apartment rents and faster price appreciation and rental growth. Many initiatives have been put together to address housing shortages and consequent affordability challenges; not surprisingly, land use regulation is often the target of such efforts.[1]

While such policy rhetoric is heard repeatedly in the mass media and elsewhere, few empirical studies have examined the relationship between zoning strictness and prices, particularly across multiple areas and over a long period. One likely reason is that it is hard to measure land-use regulation quantitatively, not to mention consistently across jurisdictions over time. With about 38,000 local sub-county jurisdictions and over 3000 counties in the United States, local variation is vast.

While the land-use ordinances are hard to summarize and measure collectively, it is possible to focus on a few typical requirements, some of which may be correlated. For example, a jurisdiction that imposes a one-half-acre minimum lot size requirement is unlikely to allow apartment buildings to be built by right. Gyourko, Saiz, and Summers (2008) find that many of the subindexes are highly positively correlated when constructing the Wharton Residential Land Use Regulatory Index (WRLURI). In this article, we focus on two common zoning restrictions to develop a quantitative measure in order to be able to evaluate the association with local housing market prices and rents.

More specifically, we use the responses to questions on local density controls from the National Longitudinal Land Use Survey (NLLUS)[2] to assess how the local regulatory environment has evolved. The 2019 NLLUS data set contains survey responses from about 1,500 jurisdictions with a governmental body responsible for planning and permitting, including cities, towns, and villages. We have three broad observations.

First, we find that over the past 25 years, density control regulations have become more bifurcated. Namely, there has been an increase in the percentage of jurisdictions whose land use is to favor low-density single-family housing and the percentage of those that allow high-density multifamily developments, with those in the middle density reduced substantially. By investigating this issue further, we discover that the small and less populous jurisdictions, most of which already have a tight density requirement, become even more restrictive; these large and populous places, mostly quite accommodating to multifamily development, continue to relax their density control over time.

Second, we find that the empirical correlation is negative, a somewhat surprising result on the relationship to home price appreciation. However, that is consistent with the fact that across the United States, large and populous areas are witnessing fast house price appreciation, and in response to this trend, many places have loosened the density restrictions. On the other hand, when we look at the rent growth across jurisdictions, the traditional supply restriction theory holds up: rents are growing faster in areas with tight density restrictions and slower elsewhere.

Third, when we look at the correlation across metropolitan areas, we again have a negative correlation. This is largely because of the difference in demand-side factors: metropolitan areas

[1] For example, the city of Minneapolis has recently eliminated the restrictive single-family zoning across all residential land parcels in 2019.

[2] For more details on the survey, please see Gallagher, Lo, and Pendall (2019) and the Urban Institute website: https://www.urban.org/policy-centers/metropolitan-housing-and-communities-policy-center/projects/zoning-insights-explore-data-national-longitudinal-land-use-survey.

have responded to the high and rapidly rising housing and rent prices. Because of this pressure, most populous areas feel the need to satisfy the demand for more housing. It is worth noting that this is not a refutation of the supply story, as we illustrate our findings through a simple theory on the demand and supply curve.

Generally, these results are broadly in line with those in the literature. Gyourko and Molloy (2015) provide a review of the effect of housing supply regulation on housing affordability. In general, it finds that regulations restricting the use of land raise average house prices and rents. This is true for our multifamily rent growth and can be reconciled in our demand and supply framework.

The rest of the article is organized as follows. The next section describes the relevant literature and our data. The third section describes how density control regulation has changed over time based on 1994, 2003, and 2019 NLLUS results. The fourth section assesses the linkage of such regulation to home price appreciation and rental growth at the jurisdiction and the metropolitan level. The fifth and final section briefly summarizes and concludes.

Literature Review and Data

Related Literature

This study is related to several topics in the literature. The first is the issue of how to measure land use regulation. Ever since zoning laws were first enacted in the United States in the early part of the twentieth century, land use regulation has been controlled by local governments. In part as they rely on the property taxes for funding, local jurisdictions have played a significant role in developing zoning laws, and, over time, have adopted a wide range of measures to manage residential development. This heterogeneity of regulations, while beneficial for the local planning departments, make it challenging to define the degree of land use restrictiveness across jurisdictions. Due to an absence of uniform and comprehensive data sets of land regulation across the United States, researchers often have to conduct their own surveys to document the extent of variations across the nation. There are many studies that focus on a large number of jurisdictions within a particular area, such as Boston in Glaeser, Schuetz, and Ward (2006) and Glaeser and Ward (2009). Other nationwide studies look at data from a select number of jurisdictions across the United States. Well known nationwide studies include the Wharton Residential Land Use Regulation Index (WRLURI) developed by Gyourko, Saiz, and Summers (2008), the updated index in Gyourko, Hartley, and Krimmel (2019), as well as the estimate of the land-use elasticities by Saiz (2010). Puentes, Martin, and Pendall (2006) and Pendall et al. (2018) are two examples of studies that employed the 1994 and 2003 NLLUSs for a national view. Of course, there are some methodological critiques of the survey-based method in the literature, but these national studies are widely quoted in the mass media and public policy discussions. The NLLUS data we use follows the survey-based approach, and its response rate is comparable to the survey instrument used in the creation of WRLURI. Moreover, because of the longitudinal nature of the data, in addition to the cross-section variation, we also have the time-series variations, of particular interest is a subset of jurisdictions that responded to two or more surveys. We understand that because of the heterogeneous nature of local land use regulation, restrictions on development come in many forms such as: minimum lot size, urban growth boundaries, impact fees, and public facility ordinance, among many others. Hence in this exploration will focus on density control only: both cross-section variation and changes over-time.

The second topic in the literature relevant to this article is the relationship between land-use regulation and housing supply, as discussed for example in Gyourko and Molloy (2015) survey article. Glaeser, Gyourko, and Saks (2005) estimate the gap between housing price and production cost and attribute this gap as a measure of the stringency of the regulatory environment. Similarly, Gyourko and Krimmel (2020) note that zoning tax on vacant land parcels follows a similar fashion, such as the difference between land values on the extensive and intensive margins. There is not much discussion on a measure of regulation with a subsequent estimate of the correlation: partially that is because of the measurement issue discussed previously, so most of the investigations are the indirect inference. Several studies have focused on national housing markets, yet these examinations are mostly cross-sectional and not longitudinal.

The final relevant topic is the political economy underlying the creation and updating of land use controls. Being a homeowner, as is often argued, leads to a positive externality for the community. DiPasquale and Glaeser (1999) argue that homeownership increases social capital and may encourage people to volunteer, get involved in local government, or join civic organizations; they further suggest that areas with more homeowners have lower government spending but spend a large share of the budget on education and highways. Homeownership is, of course, encouraged by federal tax incentives such as the mortgage interest deduction and limitations on capital gains taxes for owner-occupied housing. On the other hand, renters are allegedly less active in local civic life, partly because housing for them is a short-term consumption good only; there is not much long-term wealth effect from the local amenities or disamenities, and renters tend to be highly mobile.

Fischel (2001)'s homevoter hypothesis is to capture this incentive in the formulation of local regulations; and formally Ortalo-Magne and Prat (2014) develop a theoretical model of local residents' impact on zoning. There are certainly negative externalities associated with the indiscriminate mixing of residential, industrial or commercial land use, and zoning ordinances are considered an effective means to mitigate these concerns (Quigley and Rosenthal, 2005). On the other hand, such non-residential land uses can also bring benefits to local residents, through job creation, shopping convenience, etc. Hence local residents may welcome such developments within convenient proximity or some other parts of town, but not in their immediate neighborhood.

Data Sources

National Longitudinal Land Use Survey

We assess the local residential land-use regulation using the NLLUS. Pendall (1995) and Puentes, Martin, and Pendall (2006) conducted the first two waves of surveys in 1994 and 2003; in 2019, the Urban Institute, with support from Fannie Mae, conducted the third wave. The survey targets the planning or land-use department within a jurisdiction, a local government agency at the county, city, town, township, or village level within the top 50 metropolitan areas. For each wave, we have between approximately 1,000 to 1,500 valid responses (with a response rate between 58 and 78 percent). While there have been some changes to the survey questionnaires through time, the zoning and density questions are relatively consistent. We can observe responses at the jurisdiction level and, in some cases, from a group of repeated jurisdictions.

For each of the survey years, we focus on two specific questions regarding density control. The first is about the highest residential density category. In the 2019 NLLUS, the question was asked as follows: "According to your zoning ordinance, what is the maximum number of dwelling units that may be constructed per net acre in your jurisdiction?" There are five choices: (a) Fewer than 4, (b) 4–7, (c) 8–15, (d) 16–30, and (e) More than 30. The smaller the number of allowable units, the tighter the land-use regulation. The two previous surveys contain the same question, with the only difference being that the density category (a) and (b) were collapsed into "less than 8" in 1994.

The second question addresses a hypothetical multifamily project. In the 2019 survey, the question was as follows: "Assume your jurisdiction has a vacant 5-acre parcel. If a developer wanted to build 40 units of 2-story apartments and was flexible with planning, landscaping and building configuration, would there be an existing zoning category that would allow such development?" There are three choices: (a) "No," (b) "Yes; by right," and (c)"Yes; by special permit, PUD [Planned Unit Development] or other special procedure." Choice (b) represents the least restrictive policy toward such development, choice (a) is a strict ban, and choice (c) is a policy in between. The same question also appeared in the 2003 survey but not in the 1994 survey.

Historical Home Price Indexes from the Federal Housing Finance Agency

The Federal Housing Finance Agency (FHFA) has published repeated sales home price indexes (HPI) at different frequencies. Since we look at land-use regulations at a differing geographic level, we utilize the HPI data in a similar way. The cross-metropolitan area comparison is the easiest as we adopt the indexes for Core-Based Statistical Areas (CBSAs). Similarly, the county-level HPI is also directly available. For smaller geographic units, the linkage is done through the ZIP-Code-level HPI; for the villages or towns, we approximate their jurisdictions as the postal city of the same name, or the postal city where the government buildings are located if the names do not match. For the ZIP-Code-level data, sometimes we can find more than one ZIP Code under the same postal city, in which case we will take the average to find the HPI growth for that jurisdiction. These local FHFA indices are described in Bogin, Doerner, and Larson (2019) and are publicly available on the FHFA website.[3]

Multifamily Rental Data from CoStar

Our rental data, including asking rent per unit/per square foot and a rental index, are from CoStar Group, a leading commercial property data provider. CoStar has divided each metropolitan area into submarkets, as determined by CoStar in consultation with local real estate experts. For example, the whole Los Angeles area is divided into 30 submarkets. A few places like downtown Los Angeles and Westlake all fall under the jurisdiction of the City of Los Angeles, while a few others like Santa Monica are separate jurisdictions. For large jurisdictions, we aggregate the data from submarkets; for small jurisdictions, the submarket will be roughly the same as the jurisdiction itself. If a submarket spans across two or more smaller jurisdictions, we are not linking it to any

[3] https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#mpo.

jurisdiction, and they are excluded from the sample. Finally, CoStar metropolitan definitions may not be precisely the same as the official CBSA boundaries, but we treat them interchangeably for cross-metropolitan area comparison.

Changes in Density Control Regulation From 1994 to 2019

Density Control Follows Two Distinct Paths

This section examines the landscape of land-use regulations in 1994, 2003, and 2019 through the two density questions specified previously. As in exhibit 1, we see that the nationwide sample points to a gradual yet consistent shift over the years on the maximum residential density question. In the low-density category (fewer than eight units per acre), the percentage of all jurisdictions increases from 17 percent in 1994 to 28.4 percent in 2003 and 34.2 percent in 2019. This means that, overall, more jurisdictions are moving to the low-density category. Similar trends are also observed in many metropolitan areas in our sample. For example, in the New York metropolitan area, an area well above the national average in terms of density control, the corresponding statistics are 26.8 percent in 1994, 37.6 percent in 2003, and then a slight dip to 31.6 percent in 2019. We define the high-density category as those responding with "more than 30 units per acre." The percentage of jurisdictions in this category also increases substantially. In the New York metropolitan area, the statistics show 16.9 percent in 1994, dropping to 12.8 percent in 2003, and then rebounding to 29.5 percent in 2019. For the nationwide sample, there is a similar drop from 1994 to 2003. However, the level of 2019 is comparable to that in 1994, meaning more jurisdictions are allowing the construction of mid- to high-rise residences in 2019 compared to 2003.

Exhibit 1

Distribution of Maximum Density in 1994, 2003, and 2019 (1 of 2)

	1994		2003		2019	
	NObs	Percent	NObs	Percent	NObs	Percent
(a) All Jurisdictions						
1) Fewer than 4	190	17.0%	253	15.1%	293	19.9%
2) 4–7			223	13.3%	211	14.3%
3) 8–15	264	23.6%	445	26.6%	300	20.4%
4) 16–30	369	33.0%	422	25.2%	294	19.9%
5) More than 30	296	26.5%	333	19.9%	376	25.5%
Total	1,119	100.0%	1,676	100.0%	1,474	100.0%
(b) Three-Wave Repeated Sample						
1) Fewer than 4	57	15.0%	18	4.7%	39	10.3%
2) 4–7			37	9.8%	44	11.6%
3) 8–15	84	22.2%	99	26.1%	72	19.0%
4) 16–30	122	32.2%	126	33.2%	87	23.0%
5) More than 30	116	30.6%	99	26.1%	137	36.1%
Total	379	100.0%	379	100.0%	379	100.0%

Exhibit 1

Distribution of Maximum Density in 1994, 2003, and 2019 (2 of 2)

	1994		2003		2019	
	NObs	Percent	NObs	Percent	NObs	Percent
(c) Repeated Sample Between 1994 and 2003						
1) Fewer than 4	104	15.3%	47	6.9%		
2) 4–7			70	10.3%		
3) 8–15	150	22.1%	159	23.4%		
4) 16–30	224	33.0%	214	31.5%		
5) More than 30	201	29.6%	189	27.8%		
Total	679	100.0%	679	100.0%		
(d) Repeated Sample Between 2003 and 2019						
1) Fewer than 4			103	12.0%	157	18.3%
2) 4–7			94	11.0%	114	13.3%
3) 8–15			235	27.4%	168	19.6%
4) 16–30			248	28.9%	176	20.5%
5) More than 30			178	20.7%	243	28.3%
Total			858	100.0%	858	100.0%
(e) Repeated Sample Between 1994 and 2019						
1) Fewer than 4	85	15.3%			61	11.0%
2) 4–7					68	12.2%
3) 8–15	128	23.0%			104	18.7%
4) 16–30	184	33.1%			126	22.7%
5) More than 30	159	28.6%			197	35.4%
Total	556	100.0%			556	100.0%

NObs = Number of responding jurisdictions.

Note: Numbers may not add to 100 percent due to rounding.

Source: Authors' calculation based on National Longitudinal Land Use Survey data

To control for variation in the responding jurisdictions, it is better to look at these changes through the repeated sample over time. Among the approximately 1,500 jurisdictions, about 400 have responded in each of the 3 survey years. Within this matched group, the low-density percentage is 15 percent in 1994, stays relatively flat at 14.5 percent in 2003, and then increases to 21.9 percent in 2019. The fraction allowing the highest density had evolved from 30.6 percent in 1994 to 26.1 percent in 2003 and 36.1 percent in 2019. We can also observe changes over two survey waves, which increases the sample size substantially. We have 679 jurisdictions that responded both in 1994 and 2003, from which we find the low-density category increased from 15.3 percent in 1994 to 17.2 percent in 2003, with a slight drop high-density category. From 2003 to 2019, among the 858 matched jurisdictions, the increase in both categories is more pronounced: from 23 to 31.6 percent in the low-density category[4] and from 20.7 to 28.3 percent in the high-density category. The repeated sample between 1994 and 2019 with 556 jurisdictions shows a similar pattern.

[4] We also see the increase in "less than 4" category (from 12.0 to 18.3 percent) and in "4–7" category (from 11.0 to 13.3 percent).

As jurisdictions migrate to either the low- or high- density category, the number of jurisdictions in the middle (those allowing 8–30 units per acre) has consistently declined over the years. In aggregate, this category declines from 56.6 percent in 1994 to 51.8 percent in 2003 and 40.3 percent in 2019. In the matched sample, the corresponding statistics are 54.4 percent in 1994, 59.3 percent in 2003, and 42.0 percent in 2019. Within the matched pair between 2003 and 2019, we see the biggest decline in the middle-density category: from over 60 percent in 2003 to around 40 percent now, a 20-percent decline over 16 years.

We compare the responses to a hypothetical multifamily project in exhibit 2 to provide a second perspective. Recall that the three choices are "Not allowed" on the restrictive side, "By permit" in the middle, and "By right" on the permissive side. In 2019, only 14.7 percent of the jurisdictions would ban such development, while about 40.8 percent would allow them by right, with the remaining 44.5 percent requiring a special permitting process. Between 2003 and 2019, from both the total and the matched sample, we see two consistent patterns: first, there is a universal decline in the share of "Not allowed," and second, the percentage of "By right" stays almost the same. There is a corresponding increase in the portion of "By permit." These patterns point to a somewhat[5] improved environment for multifamily construction in 2019 compared to 2003.

Exhibit 2

Distribution of Multifamily Project Approval in 2003 and 2019

	2003		2019	
	NObs	Percent	NObs	Percent
(a) All Jurisdictions				
0) Not Allowed	342	20.1%	228	14.7%
1) By Right	701	41.1%	635	40.8%
2) By Permit	662	38.8%	692	44.5%
Total	1,705	100.0%	1,555	100.0%
(b) Repeated Sample				
0) Not Allowed	161	17.5%	124	13.5%
1) By Right	379	41.2%	387	42.0%
2) By Permit	381	41.4%	410	44.5%
Total	921	100.0%	921	100.0%

NObs = Number of responding jurisdictions.
Note: Numbers may not add to 100 percent due to rounding.
Source: Authors' calculation based on National Longitudinal Land Use Survey data

We note that the single-family residential density and multifamily questions are positively correlated, as is shown in exhibit 3 for the 2019 survey year. The overall distribution in 2019 is roughly equal in the low-, mid-, and high-density categories, with slightly more for the mid-density category at 40.3 percent. However, if we look at these jurisdictions that ban such development outright, their residential density is very low: 79.2 percent belong to the low-density

[5] However, we do not know whether the new permitting process will be costly, either in terms of direct financial cost or time.

category,[6] while only 4.2 percent of them belong to the high-density category. In contrast, among these least restrictive jurisdictions, 39.1 percent allow the highest density ("more than 30 units"), and another 25.5 percent in the "16–30" category.

Exhibit 3

Correlation Between Maximum Density and Multifamily Project in 2019

(a) Distribution of Maximum Density by Multifamily Project Approval

	Multifamily Project Approval							
	0) Not Allowed		1) By Right		2) By Permit		Overall	
	NObs.	Percent	NObs.	Percent	NObs.	Percent	NObs.	Percent
1) Fewer than 4	122	56.5%	33	5.5%	127	20.1%	282	19.5%
2) 4–7	49	22.7%	62	10.3%	97	15.3%	208	14.4%
3) 8–15	27	12.5%	118	19.6%	150	23.7%	295	20.4%
4) 16–30	9	4.2%	153	25.5%	127	20.1%	289	19.9%
5) More than 30	9	4.2%	235	39.1%	131	20.7%	375	25.9%
Total	216	100.0%	601	100.0%	632	100.0%	1,449	100.0%

(b) Distribution of Multifamily Project Approval by Maximum Density

Maximum Density	Multifamily Project Approval							
	0) Not Allowed		1) By Right		2) By Permit		Total	
	NObs.	Percent	NObs.	Percent	NObs.	Percent	NObs.	Percent
1) Fewer than 4	122	43.3%	33	11.7%	127	45.0%	282	100.0%
2) 4–7	49	23.6%	62	29.8%	97	46.6%	208	100.0%
3) 8–15	27	9.2%	118	40.0%	150	50.8%	295	100.0%
4) 16–30	9	3.1%	153	52.9%	127	43.9%	289	100.0%
5) more than 30	9	2.4%	235	62.7%	131	34.9%	375	100.0%
Total	216	14.9%	601	41.5%	632	43.6%	1,449	100.0%

NObs = Number of responding jurisdictions.
Note: Numbers may not add to 100 percent due to rounding.
Source: Authors' calculation based on National Longitudinal Land Use Survey data

Now looking at the other side, these high-density jurisdictions are rarely likely to ban the project (2.4 percent) and are, on the contrary, more likely to require no permit (62.7 percent). Finally, as Pendall (2020) points out, for jurisdictions that adopt a low-density mode, while their "Not allowed" rate is very high at 43.3 percent, there is still a 45-percent chance to have the project go through the permit process, and 11.7 percent to not require any approval. According to this, whether the project can be approved by right or be banned seems to be a more precise classification criterion than residential density.

The sharp drop in housing prices that preceded the global financial crisis of 2008 is, in general, considered to have been caused by a combination of demand and supply factors. Arguably too much new construction occurred in places with less restrictive zoning rules, such as Las Vegas and

[6] We have over 56.5 percent in the "fewer than 4" category, with another 22.7 percent in the "4–7" category.

Phoenix. Price declines later led to large increases in foreclosures. While removing their ban on multifamily development, these jurisdictions may also decide to tighten their residential density for single-family homes. In other places, with not much new supply, the pre-crisis credit expansion just led to ever-higher house prices. These places may have since taken steps to be more welcoming to new home construction or higher density uses of existing parcels.

Differences by Jurisdictions Population Size

Over time, we see a shift to both the low- and high-density zoning categories, with the middle-density portion shrinking sharply as a result. But it is not clear what kind of jurisdiction is driving these changes. In exhibit 4, we look at the distribution in 2019 by the jurisdiction population. The overall sample is roughly equally distributed among the low-, mid-, and high-density types; however, that aggregate hides what is true for each sub-sample. If we focus on the less populous jurisdictions (defined as those with a population smaller than 20,000), 53.6 percent are in the low-density category, while only 10.6 percent are the high-density type. On the other hand, for those with a population greater than 100,000, the pattern reverses: only 16.3 percent fall in the low-density category, but 55 percent are in the high-density category. In fact, even among this populous group, the distribution is more skewed toward high-density as we divide the sample even further into the top 23 major metropolitan cities, the other 95 cities, and the 84 counties. The percentages of high density among them are 87, 74.7, and 23.8 percent, respectively.

Exhibit 4

Distribution of Maximum Density by Jurisdiction Population in 2019

Maximum Density	Jurisdiction Population							
	a) <20,000		b) 20,000–49,999		c) 50,000–99,999		d) >100,000	
	NObs.	Percent	NObs.	Percent	NObs.	Percent	NObs.	Percent
1) Fewer than 4	194	32.5%	63	13.0%	15	7.9%	21	10.4%
2) 4–7	120	20.1%	62	12.8%	17	8.9%	12	5.9%
3) 8–15	130	21.8%	122	25.2%	28	14.7%	20	9.9%
4) 16–30	90	15.1%	114	23.5%	52	27.4%	38	18.8%
5) More than 30	63	10.6%	124	25.6%	78	41.1%	111	55.0%
Total	597	100.0%	485	100.0%	190	100.0%	202	100.0%

NObs = Number of responding jurisdictions"
Note: Numbers may not add to 100 percent due to rounding.
Source: Authors' calculation based on National Longitudinal Land Use Survey data

We can also break down the changes in allowable density by population of the governing jurisdiction. In that case, the shift to low-density takes place in jurisdictions with a population of less than 50,000, while the migration to the other extreme occurs in the more populous jurisdictions. In exhibit 5, from 2003 to 2019, we see that among the less populous jurisdictions, while there is still bifurcation on both the low and high density, most of the changes is in the low-density category, from 39.5 percent in 2003 to 53.2 percent in 2019. For those with more than 100,000 population, that is a completely different story: the percentage allowing the highest-density development drifted further up from 49.7 percent in 2003 to 58.0 percent in 2019. If we examine allowed density changes over other periods and changes in response to the multifamily question, we once again see the differing change pattern by population size.

Exhibit 5

Changes in Maximum Density Between 2003 and 2019 by Jurisdiction Population

Maximum Density	Jurisdiction Population							
	a) <20,000				b) 20,000–49,999			
	2003		2019		2003		2019	
	NObs.	Percent	NObs.	Percent	NObs.	Percent	NObs.	Percent
1) Fewer than 4	75	26.0%	103	35.6%	15	5.2%	32	11.1%
2) 4–7	39	13.5%	51	17.6%	41	14.2%	40	13.8%
3) 8–15	81	28.0%	58	20.1%	104	36.0%	76	26.3%
4) 16–30	69	23.9%	48	16.6%	90	31.1%	70	24.2%
5) More than 30	25	8.7%	29	10.0%	39	13.5%	71	24.6%
Total	289	100.0%	289	100.0%	289	100.0%	289	100.0%
	c) 50,000–99,999				d) >100,000			
	2003		2019		2003		2019	
	NObs.	Percent	NObs.	Percent	NObs.	Percent	NObs.	Percent
1) Fewer than 4	6	4.9%	8	6.5%	7	4.5%	14	8.9%
2) 4–7	5	4.1%	15	12.2%	9	5.7%	8	5.1%
3) 8–15	27	22.0%	16	13.0%	23	14.6%	18	11.5%
4) 16–30	49	39.8%	32	26.0%	40	25.5%	26	16.6%
5) More than 30	36	29.3%	52	42.3%	78	49.7%	91	58.0%
Total	123	100.0%	123	100.0%	157	100.0%	157	100.0%

NObs = "Number of responding jurisdictions."
Note: Numbers may not add to 100 percent due to rounding.
Source: Authors' calculation based on National Longitudinal Land Use Survey data

Other factors, such as employment growth or foreclosure experience in the crisis period, may be relevant, but we believe the underlying overall pattern remains. Land-use regulations are polarized: smaller and less populous jurisdictions that already have tight controls are restricting their density more, while more populous ones, many of which are already allowing high-density construction, are loosening density restrictions even further.

Metropolitan-Level Summary Shows Gradual Yet Consistent Changes

Now we attempt to aggregate jurisdictions to the metropolitan area based on some admittedly arbitrary rules. If a top 50 metropolitan area has enough responses, which we define as more than 10 responding jurisdictions, we aggregate those to characterize the metropolitan area. We do this in each survey year, and this process produces some rather surprising results.

For the 1994 survey, we classify the metropolitan areas according to their average allowable density. A metropolitan area is labeled as "Accommodating" if the percentage of "more than 30 units per acre" is at least 50 percent, "Moderate" if the share of "less than 8 units per acre" is less than 10 percent, "Somewhat Restrictive" if between 10 and 20 percent, and "Very Restrictive" if more than 20 percent. The ranking is presented in exhibit 6. In 1994, five metropolitan areas were in the "Accommodating" category: Denver, Seattle, San Jose, San Francisco, and Washington. More than 50 percent of jurisdictions in these metropolitan areas allow a density of more than 30 units per acre. Coastal areas, including Los Angeles, San Diego, and Miami, belong to the "Moderate" category. On the other hand, the "Somewhat restrictive" and "Very restrictive" categories include older Northeast metropolitan areas (Boston, Philadelphia, and New York) and mid-sized metropolitans in the Midwest region (Kansas City, Chicago, and Pittsburgh).

Exhibit 6

Classification of Metropolitan Area-Level Density Control in 1994, 2003, and 2019

Category	List of Metropolitan Areas
1994	
Accommodating	*Denver, Seattle, San Jose, San Francisco, Washington*
Moderate	Dallas, San Diego, Tampa, Minneapolis, Cincinnati, Miami, Los Angeles, Riverside, Phoenix
Somewhat Restrictive	*Kansas City, Detroit, Chicago*
Very Restrictive	St. Louis, Atlanta, New York, Philadelphia, Pittsburgh, Milwaukee, Cleveland, Bridgeport, Boston, Akron
2003	
Accommodating	*Dallas, Seattle, Indianapolis, Miami, Washington, Denver, Portland, Detroit*
Moderate	Salt Lake City, San Francisco, Los Angeles
Somewhat Restrictive	*Chicago, Cincinnati, Kansas City, Pittsburgh, Minneapolis, St. Louis*
Very Restrictive	Rochester, Grand Rapids, Buffalo, Columbus, New Haven, Atlanta, Cleveland, Milwaukee, Philadelphia, New York, Boston, Hartford
2019	
Accommodating	*Seattle, Portland, Washington, Kansas City, Miami, Denver*
Moderate	Los Angeles, Dallas, San Francisco, Pittsburgh, Chicago
Somewhat Restrictive	*Minneapolis, St. Louis, Columbus, Grand Rapids, Cleveland, Detroit, Milwaukee, Cincinnati, Providence*
Very Restrictive	Atlanta, New York, Hartford, Philadelphia, Boston

Note: In each category, the order reflects the ranking, from the least to the most restrictive.
Source: Authors' calculation based on National Longitudinal Land Use Survey data

For the 2003 and 2019 surveys, we focus on the response to the multifamily projects.[7] A metropolitan area is "Accommodating" if the share of "By right" is at least 50 percent, "Moderate" if the share of "No" is less than 10 percent, "Somewhat restrictive" if between 10 and 20 percent, and "Very restrictive" if more than the 20 percent. In 2003, there were several metropolitan areas that

[7] This classification is broadly in line with that of Pendall (2020), although he does not explain his criteria explicitly.

relaxed their density requirements and moved to the "Accommodating" category, including Dallas, Indianapolis, and Detroit. On the other hand, the list for the "Very Restrictive" category grows much longer.

In 2019, the "Accommodating" metropolitan areas again declined to only six metropolitan areas, consisting of Seattle, Portland, Washington, Kansas City, Miami, and Denver. Each metropolitan area has more than 50 percent of the jurisdictions that allow the hypothetical multifamily development by right. Not surprisingly, these metropolitan areas[8] also see their share of "No" as less than 10 percent and their high-density share more than 50 percent. The metropolitan areas that belong to the "Very Restrictive" category are Boston, Philadelphia, Hartford, New York, and Atlanta. However, Atlanta and Philadelphia have seen some polarizations: while their share of "No" is more than 20 percent, they also have the "By right" percentage as high as 48 percent. Most of the big metropolitan areas like Los Angeles, Dallas, Chicago, and San Francisco, belong to the "Moderate" category, in that they have around 40 percent of their jurisdictions being "by right" or "by permit," leaving the share of "No" to be less than 10 percent. Again the "Somewhat Restrictive" category contains most big metropolitan areas in the Midwest region.

Across all survey years, we would conclude the following: (a) Seattle, Denver, and Washington are consistently in the "Accommodating" category; (b) New York, Philadelphia, Boston, and Atlanta remain in the "Very restrictive" category; (c) Los Angeles stays in the "Moderate" category; (d) San Francisco and San Jose gradually move from "Accommodating" to "Moderate" category, while Chicago moves in the opposite direction: from "Somewhat Restrictive" in 1994, to "Moderate" in 2019; most of the medium-sized metropolitan areas are moving from "Very restrictive" to "Somewhat restrictive," indicating that a change in attitude toward loosening the high-density development regulations.

Recognizing the admittedly arbitrary aggregation methods, we also experiment with a ranking based on the population-weighted response. In that case, the ranking would be more dominated by the populous urban core rather than smaller suburban cities. Here are the significant changes in 2019: (1) Portland and Kansas City would then be categorized as being "Very Restrictive," as opposed to "Accommodating"; (2) Philadelphia would then be categorized as "Very Accommodating"; (3) most of the restrictive places would be in the Midwest region, (4) big coastal metropolitan areas would now be between moderate and somewhat restrictive, reflecting a very high share of "By Permit" and a low share of the other two responses.

Correlation of Land Density Control, Home Price Appreciation, and Rent Growth

Does Tight Density Control Correlate with Rapid Home Price Appreciation?

From the HPI, we can calculate home price appreciation over the years. We want to link this with the land regulation measure developed previously, which is a supply-side factor. However, it is challenging to include the demand-side elements: metropolitan areas will have different industry

[8] Kansas City may be characterized as a borderline case, as only 28 percent of its jurisdictions allow more than 30 units per acre.

bases and different demand-side dynamics.[9] Accordingly, we run the jurisdiction-level regressions for each major metropolitan area and for the United States. The within-metropolitan regression assumes that the broader demand-side employment or income effect will be similar across jurisdictions within the metropolitan area. Jurisdictions face the same high-level demand factors, and thus the only element differentiating them from each other is individual density control policies.

Of course, specific factors play a role in the housing market across jurisdictions. Like New York City, the typical urban core has seen faster price appreciation that could be attributed to both the land use restrictiveness and the demand-side amenity factors. For example, people might want to live in a good school district or reduce their commute time. We include a dummy indicating whether the jurisdiction is an urban core city to account for this effect. By a similar token, jurisdiction population size may be an influencing factor, too. Populous places may have more amenities like good public schools, cultural institutions, or attractive employment opportunities, so the demand is more robust than a smaller exurban jurisdiction. Finally, we use the nominal index because that factor is common[10] across jurisdictions over the same date range and will be captured in the intercept.

We begin by analyzing the relationship between house price appreciation and the level of land use restrictiveness. Exhibit 7 displays our main results, where the variable of interest is the average annual HPI appreciation between 2003 and 2019. For the regulation measure, we include the zoning density category in 2003 and the change variable between 2003 and 2019. For control variables, we add the jurisdiction population category and whether the jurisdiction is an urban core. We report the regression results for eight populous metropolitan areas and the nationwide regressions, such as aggregating all reporting jurisdictions.

Exhibit 7

Regression of Annual House Price Appreciation (2003-2019) on Land Use Restrictiveness (1 of 2)

Variables	(1) N.Y.	(2) L.A.	(3) Chicago	(4) Dallas	(5) D.C.	(6) Seattle	(7) Boston	(8) S.F.	(9) U.S.
Density in 2003									
1.) Fewer than 4	-0.98***		0.09	-0.34			-0.31		-0.95***
	(0.31)		(0.24)	(0.53)			(0.27)		(0.11)
2.) 4–7	-0.77***	-2.01***	-0.04	-0.94*	-1.17	-0.45	-0.21		-1.01***
	(0.28)	(0.65)	(0.21)	(0.53)	(1.01)	(0.82)	(0.27)		(0.11)
3.) 8–15	-0.72***	-0.99***	-0.08	-0.29	-1.47***	-0.49	0.03	-1.45**	-0.87***
	(0.25)	(0.37)	(0.17)	(0.35)	(0.48)	(0.50)	(0.27)	(0.61)	(0.09)
4.) 16–30	-0.35	-0.27	-0.02	-0.25	-1.28***	-0.14	0.29	-0.93***	-0.11
	(0.29)	(0.17)	(0.21)	(0.31)	(0.42)	(0.32)	(0.30)	(0.25)	(0.09)
5.) More than 30	0	0	0	0	0	0	0	0	0

[9] We do not think that will be solved by including local employment or household income growth.

[10] It should be a minor factor that some jurisdictions may have experienced slightly higher inflation than others, especially within the same metropolitan areas.

Exhibit 7

Regression of Annual House Price Appreciation (2003-2019) on Land Use Restrictiveness (2 of 2)

Variables	(1) N.Y.	(2) L.A.	(3) Chicago	(4) Dallas	(5) D.C.	(6) Seattle	(7) Boston	(8) S.F.	(9) U.S.
Density Change									
1.) Increase	-0.60**	0.19	-0.17	0.10	0.55	-0.03	0.33	-0.02	0.18**
	(0.25)	(0.26)	(0.19)	(0.23)	(0.52)	(0.35)	(0.20)	(0.43)	(0.09)
2.) Stay the same	-0.40*	-0.15	0.09	-0.00	0.06	-0.36	0.34**	-0.21	0.13*
	(0.21)	(0.17)	(0.16)	(0.19)	(0.44)	(0.32)	(0.15)	(0.25)	(0.07)
3.) Decrease	0.29	0.50*	-0.15	-0.03	0.10	-0.56	-0.24	-0.41	-0.13
	(0.31)	(0.29)	(0.23)	(0.21)	(0.59)	(0.45)	(0.19)	(0.59)	(0.09)
4.) No match	0	0	0	0	0	0	0	0	0
Population									
a.) <20,000	-0.28	0.60*	-0.11	-0.01	0.62	-0.57	-1.75***	0.44	-0.79***
	(0.29)	(0.30)	(0.22)	(0.32)	(0.57)	(0.49)	(0.50)	(0.48)	(0.09)
b.) 20,000-49,999	-0.24	0.15	0.02	0.29	-0.01	-0.08	-1.35***	0.38	-0.57***
	(0.28)	(0.19)	(0.21)	(0.21)	(0.55)	(0.30)	(0.49)	(0.32)	(0.09)
c.) 50,000-99,999	-0.20	0.43**	0.22	-0.06	-0.60	-0.03	-0.50	0.09	-0.20*
	(0.33)	(0.20)	(0.31)	(0.23)	(0.48)	(0.30)	(0.51)	(0.29)	(0.10)
d.) >100,000	0	0	0	0	0	0	0	0	0
Urban core		2.03***	0.88	0.28	0.77			1.00	0.36
		(0.59)	(0.66)	(0.52)	(0.66)			(0.60)	(0.24)
Constant	3.18***	4.56***	1.04***	3.71***	3.75***	4.80***	3.72***	4.27***	3.29***
	(0.31)	(0.17)	(0.26)	(0.30)	(0.44)	(0.27)	(0.43)	(0.24)	(0.09)
Observations	105	64	110	34	28	31	100	55	1,578
R-Square	0.261	0.397	0.075	0.254	0.516	0.313	0.446	0.331	0.243

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*
Sources: Authors' calculation based on National Longitudinal Land Use Survey and FHFA data

The regression density category benchmark is "more than 30 units per acre," so the reported coefficients are relative to that benchmark. For most[11] within-metropolitan areas and the national regression, the coefficients on the density category are negative and follow a monotonic pattern. These negative coefficients show that the lower the density category is, the more restrictive the land-use control is, and the slower the HPI appreciation. To put this surprising finding in another way, it means that tighter density regulation is associated with a lower HPI appreciation. This is especially true for the tightest category, "fewer than four units per acre," as well as the next category, "4–7." For example, in the New York metropolitan area, a coefficient of -0.98 means that with other things equal, compared to a 3.2-percent annual HPI appreciation in the most permissive density category, jurisdictions with the lowest density category of "fewer than 4" are seeing a 2.2-percent appreciation, or 1 percentage point lower. This is the annual difference, which translates to a difference between 70 and 44.6 percent in total cumulative appreciation between 2003 and 2019.

[11] The regression using Chicago metropolitan area data has a very low adjusted R-square and seems to be an outlier.

In Los Angeles, the tightest category is "4–7," and it shows a very large impact of -2.01 percent between this density and the permissive category. Again, that means a cumulative appreciation of 113.5 percent in the category of "30 units per acre" versus 53.5 percent in the category of "4–7" over the past 17 years. In the Washington, D.C., and San Francisco metropolitan areas, where the regression sample does not include any low-density jurisdiction, the effect from the middle density is also significantly negative.

The national sample shows quantitatively similar and more robust results that resemble that of the New York metropolitan area. The negative sign in each of the four density categories is preserved and follows a monotonic pattern. The only difference is that now the density "16–30" is not very distinguishable from the benchmark density, reflecting that the two categories may not differ so much for most jurisdictions from a national perspective. Again, these annual differences will be translated to a very large gap in cumulative appreciation between 2003 and 2019.

Turning to the impact of the change in regulation, the results are less clear. There are four categories: increase in regulation (such as allowable density declines), stay the same, decrease in regulation, or cannot compare (jurisdictions that appear in one of the survey years but not both). The mixed results may come from the small sample size in the metropolitan-level regression, where the change in regulation is only defined for less than one-half of the sample. So for the national regression, the coefficients on the decrease in regulation, as well as the "stay the same" category, are positive and significant. In contrast, the coefficient on the increase in regulation is negative, but not significant. So if we use "stay the same" as the benchmark, then the quantitative results will be a small positive coefficient (0.05) for "decrease in regulation" and a relatively large negative coefficient (0.26) for "increase in regulation." That is to say, if regulation decreases, then we expect a faster HPI growth. Simultaneously, if one jurisdiction tightens the density control, it will be associated with a lower HPI growth.

It is reassuring to find that coefficients on the two control variables are what were expected. On the urban core dummy, all show large and positive coefficients, indicating that these urban jurisdictions do experience a faster HPI appreciation than suburban towns. For population size, nationwide as well as within most[12] metropolitan areas, we see a clear monotonic relationship: the smaller the jurisdiction, the slower the HPI appreciation. One exception is the Los Angeles metropolitan area, where the smaller and less populous jurisdictions are seeing a rapid HPI appreciation; that may be due to the unique geography in Los Angeles, where there are a few small towns carved out from or near the urban core, such as Beverly Hills and Santa Monica.

Does Tight Density Control Correlate With Rental Price Growth?

Land-use regulation is not limited to the density of single-family units, of course. How do these restrictions affect multifamily rents? Exhibit 8 presents our findings, where the dependent variable is the annual average growth in asking rent between 2003 and 2019.

[12] For some metropolitan areas like New York, because the City is the only one that has a population more than 100,000 in the sample, the dummy variable is collinear with the benchmark population category, so it is omitted from the estimation.

Exhibit 8

Regression of Rent Growth from 2003 to 2009

Variables	(1) N.Y.	(2) L.A.	(3) Chicago	(4) D.C.	(5) Seattle	(6) Boston	(7) S.F.	(8) U.S.
Density in 2003								
1.) Fewer than 4			-0.726 (1.096)			0.683 (1.165)	0.796 (0.863)	-0.113 (0.444)
2.) 4–7	1.52** (0.24)			-0.109 (0.980)		-0.345 (1.165)		0.685* (0.380)
3.) 8–15	1.12** (0.19)		0.540 (1.096)	0.324 (0.574)		-0.247 (0.881)		0.197 (0.248)
4.) 16–30	1.01* (0.24)	0.543 (0.415)	0.258 (1.387)	-0.0416 (0.450)	0.482 (0.672)	0.696 (0.881)	0.406 (0.343)	0.334 (0.237)
5.) More than 30	0	0	0	0	0	0	0	0
Population								
a) <20,000				-0.269 (0.866)			-0.968 (0.581)	-0.554 (0.408)
b) 20,000–49,999	-0.66 (0.35)	-0.437 (0.634)	-0.609 (1.387)	0.321 (0.513)	-0.206 (1.008)	0.534 (1.079)	-0.600 (0.468)	-0.373 (0.239)
c) 50,000–99,999	-0.00 (0.19)	-0.644 (0.479)		-0.573 (0.475)	-0.352 (0.724)	-0.307 (0.763)	-0.317 (0.435)	-0.0969 (0.228)
d) >100,000	0	0	0	0	0	0	0	0
Urban Core	0.49 (0.27)	0.299 (0.634)		-0.0228 (0.856)		-0.301 (0.763)	-1.462** (0.638)	-0.138 (0.402)
Constant	1.70** (0.17)	3.570*** (0.240)	2.453** (0.981)	1.964*** (0.328)	5.030*** (0.515)	3.006** (0.440)	3.908*** (0.369)	3.309*** (0.175)
Observations	9	13	11	21	15	10	31	196
R-Square	0.97	0.419	0.384	0.197	0.063	0.737	0.246	0.041

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*
Sources: Authors' calculation based on National Longitudinal Land Use Survey and CoStar data

Enough rental data are needed for CoStar to define a submarket; hence many small and less populous jurisdictions are not in the sample. Therefore, most within-metropolitan-area regressions suffer from a small sample size. In this case, we can look at the national regression, where the coefficients on each density category are positive, indicating faster rental growth. For example, compared to the benchmark density category of "more than 30 units per acre," jurisdictions in the "4-7" category see their rents growing at 3.98 percent rather than 3.3 percent in the benchmark category. Over the 16 years between 2003 and 2019, that means that rent in the less dense jurisdictions is growing at 94.5 percent cumulatively, as compared to 73.9 percent in the reference density category. This gap is not as large as that reflected in home price appreciation,[13] but it is still economically meaningful.

[13] In addition to the flow of housing service as measured in rents, home price appreciation also reflects its value as an investment good.

While this result differs from the HPI appreciation story discussed previously, it is consistent with a supply-side story. The interpretation is that in areas of low residential density, the inventory and potential new addition to the inventory will be limited, giving landlords greater market power to raise rents over time. We should note again, however, that less populous jurisdictions are excluded from the data. Overall, these confirm that the key determinant of rent cost is the supply of apartments for rent, which in turn relies heavily on the local land-use ordinance.

What Can We Learn From The Cross-Metropolitan Area Comparison?

The previous jurisdiction-level story is interesting as it clearly depicts the local density control and the housing market performance. Yet, metropolitan areas are often the focus of many policy discussions, so it is natural to see if the story can be carried to an aggregate level. To do this, we rely on the classification of metropolitan areas in each of the three survey years as in exhibit 6. We look at HPI appreciation, rent growth, and rent in dollars per unit on housing market indicators. We look at a 9-year average around it for each survey year, an annual average between, and an accumulative appreciation 10-years prior.

First, for home price appreciation, the impact of regulation points to a similar message as in the jurisdiction-level result: the more restrictive a metropolitan area is, the lower is the rate at which its housing appreciates. This is particularly true in the long run. For example, under the 1994 classification, there is not a clear pattern on the HPI 5 years before or after 1994, nor between 1989 and 1999; the pattern begins to emerge around 2003, or the period between 1999 and 2008; and finally, it becomes very clear when we look at 5 years before 2019. And the pattern is that the "Accommodating" and "Moderate" metropolitan areas are experiencing higher HPI appreciation than metropolitan areas in the two restrictive categories. For instance, using the HPI appreciation between 2015 and 2019 as an example, "Accommodating" metropolitan areas are seeing an annual appreciation of 7.08 percent, compared to 6.47 percent among "Moderate" metropolitan areas, 4.99 percent among "Somewhat Restrictive" metropolitan areas, and 3.96 percent among "Very Restrictive" metropolitan areas (exhibit 9).

Alternatively, across the three survey years, the impact of the regulatory environment in 1994 is somewhat apparent over the period from 1994 to 2003, but more so over the longer period from 2003 to 2019. Lastly, the cumulative HPI appreciation during the 10-year period between 2010 and 2019 is 42.0 percent among "Accommodating" metropolitan areas, as compared to 5.58 percent among "Very Restrictive" metropolitan areas, and anywhere between 10 and 25 percent for these metropolitan areas that are either "Moderate," or "Somewhat Restrictive." If we examine the classification in 2003 and 2019, we see a similar although smaller difference in HPI appreciation, because we have a short time horizon to look at its impact. The overall conclusion is that density restrictions do matter; they have a cumulative effect that can be large, especially in the long run.

Exhibit 9

Average Home Price Index Appreciation by Metropolitan Area Regulation Tightness

	Range	Accommodating	Moderate	Somewhat Restrictive	Very Restrictive	Overall
(a) By Metropolitan Classification in 1994						
Around the survey year	1990–1998	3.06	1.86	3.80	2.28	2.66
	1999–2007	8.81	8.49	4.13	5.50	6.17
	2015–2019	7.08	6.47	4.99	3.96	5.27
Between the survey year	1994–2003	6.26	5.01	5.01	4.55	4.13
	2003–2019	3.90	3.38	1.18	1.70	2.60
	1994–2019	4.81	3.87	2.58	2.69	3.12
Prior to the survey year	1985–1994*	71.06	34.87	56.15	61.75	46.57
	1994–2003*	79.34	53.06	62.60	53.09	47.72
	2010–2019*	41.99	25.35	10.11	5.58	14.85
(b) By Metropolitan Classification in 2003						
Around the survey year	1990–1998	4.08	2.92	3.15	1.35	2.66
	1999–2007	6.27	9.53	4.75	5.44	6.17
	2015–2019	6.90	6.95	4.44	4.27	5.27
Between the survey year	1994–2003	5.04	5.74	4.49	3.98	4.13
	2003–2019	3.16	4.27	1.70	2.00	2.60
	1994–2019	3.86	4.77	2.71	2.66	3.12
Prior to the survey year	1985–1994*	47.60	65.96	44.68	65.76	46.57
	1994–2003*	64.10	67.36	54.93	43.75	47.72
	2010–2019*	30.50	34.66	9.23	9.56	14.85
(c) By Metropolitan Classification in 2019						
Around the survey year	1990–1998	4.23	1.82	3.36	0.71	2.66
	1999–2007	7.73	7.19	4.37	6.77	6.17
	2015–2019	7.10	5.62	5.08	4.12	5.27
Between the survey year	1994–2003	5.47	4.52	4.78	4.64	4.13
	2003–2019	3.61	3.12	1.53	2.31	2.60
	1994–2019	4.29	3.58	2.69	3.08	3.12
Prior to the survey year	1985–1994*	47.51	59.65	53.65	59.09	46.57
	1994–2003*	69.78	48.37	57.98	50.52	47.72
	2010–2019*	28.44	29.08	11.54	10.91	14.85

*Note: * This is the cumulative appreciation.*

Source: Authors' calculation based on National Longitudinal Land Use Survey and FHFA data

Secondly, we look at multifamily rents as in exhibit 10. The rental growth seems to follow the same pattern as the HPI appreciation, especially in the long run. So that is no longer the same as the supply story as in the jurisdiction level analysis. The messages are less consistent on the rents per unit and per square foot (not shown). This is because there are several Northeast metropolitan areas (New York, Boston, and Philadelphia) in the "Very Restrictive" category, and their level of rent is high, although their rent growth is slow. Hence the most prominent contrast is between the "Accommodating" and the "Somewhat Restrictive" metropolitan areas.

Exhibit 10

Multifamily Performance by Metropolitan Area Regulation Tightness in 1994

	Range	Accommodating	Moderate	Somewhat Restrictive	Very Restrictive	Overall
(a) Rent Growth						
Around the survey year	1990–1998	3.65	3.13	3.99	2.76	3.10
	1999–2007	2.29	2.87	1.91	1.79	2.15
	2015–2019	3.09	3.66	2.77	2.44	3.08
Between the survey year	1994–2003	3.26	3.27	3.02	2.68	2.74
	2003–2019	2.32	2.12	1.47	1.37	1.75
	1994–2019	2.96	2.63	2.14	1.95	2.32
Prior to the survey year	1985–1994*	28.61	6.22	14.58	14.82	12.88
	1994–2003*	48.06	41.40	36.08	34.57	35.92
	2010–2019*	29.83	23.93	18.49	16.00	20.06
(b) Rent Per Unit ($)						
Around the survey year	1990–1998	1,074	743	694	988	811
	1999–2007	1,483	983	878	1,227	1,018
	2015–2019	2,087	1,308	1,091	1,418	1,138
Between the survey year	1994–2003	1,319	862	794	1,121	923
	2003–2019	1,745	1,136	976	1,284	1,004
	1994–2019	1,594	1,037	909	1,264	1071
Prior to the survey year	1985–1994	900	659	670	1095	802
	1994–2003	1,278	835	771	1,092	906
	2010–2019	1,850	1,169	1,003	1,312	1,034

*Note: *This is the cumulative appreciation.*
Sources: Authors' calculation based on National Longitudinal Land Use Survey and CoStar data

The overall message is that if regulation in a metropolitan area is already tight, its future growth potential is limited and may not accommodate future development needs. Over the following 10 to 20 years, home prices may not grow as much as otherwise would be the case. On the other hand, if the approach by a metropolitan area toward growth is initially accommodating, it will tend to relax its density requirement, allow for multifamily development, and attract more growth in the next decades. As a result, home price growth will be robust due to income and employment growth, at least during economic expansion.

Why the Negative Correlation, and How do Homeowners and Renters Differ?

The relationship between land-use regulation and the housing market is obviously highly complex. The different responses from the single-family market and the multifamily rental sectors are intriguing. Moreover, once we make a cross-metropolitan area comparison, the same pattern we observe in both the single-family and rental sides is puzzling. The explanation may lie in the different roles homeowners and renters play in the local political process.

Without any demand-side influence, in a tightly regulated environment, one would expect rents to be higher or grow faster. That will benefit the multifamily landlords, who may have lobbied for tight regulation. Renters are, on the other hand, negatively affected, even after controlling for the neighborhood amenities that arise with new development.[14] However, their willingness or incentive may not be as strong as homeowners to lobby in favor of more housing.

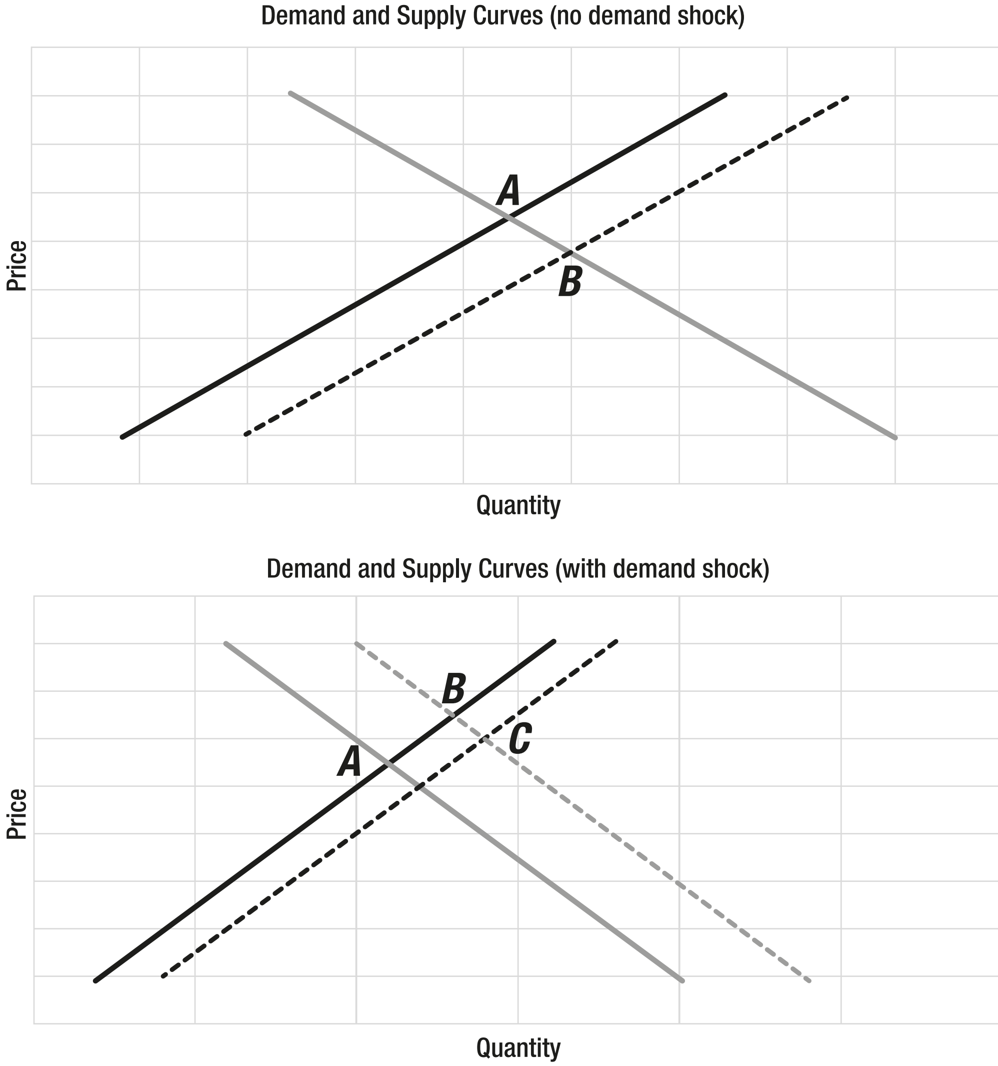
For homeowners, if there is no change in the demand side, the supply side is unlikely to change. However, if there is a positive demand shock, under the existing land use regulations, there will be faster price appreciation, implying more equity for existing homeowners, which would most likely be welcomed by them. However, several negative effects may also be present. Their property tax bills may be increasing. The existing regulation may also affect the competitiveness of the local economy, from which their employment opportunities may be limited. The high housing price may create an affordable housing crisis, too. So if homeowners care about these potential negative impacts, they could stay active in their local politics, such as in the recent YIMBY (yes in my backyard) movement. Local elected officials will consider the concerns of the local homeowners. These are the feedback loops that lead to a relaxation of the land-use regulation.

To explain this graphically, we resort to the classic demand and supply curve. As in exhibit 11a, the demand curve (the gray line) is downward sloping while the supply (the black line) is upward sloping. Hence if two jurisdictions are located nearby and thus face a similar market environment, the place that has a better regulatory environment for new apartment construction will have a lower market-clearing price level and a higher supply. That corresponds to Point A (the equilibrium for the tightly regulated market) and Point B (the less restrictive equilibrium). If we have cross-sectional data on the price and regulation measure, then we will see a positive correlation: places with more restrictions on land use will produce less housing and see higher prices and faster appreciation. This framework can be used to explain our jurisdiction-level rent growth result.

[14] That is to say, increased urban amenities do not fully justify the higher rent. For example, Li (2020) shows that new market-rate housing in New York City lowers nearby rents and housing prices, despite also attracting new amenities.

Exhibit 11

A Simple Theory to Explain the Differing Correlations



Note: (a) Without Demand Shock (Point A is the old equilibrium point between the demand and the old supply curves; Point B is the new equilibrium after a shift in supply curve). (b)With Demand Shock (Point A is the old equilibrium point between the demand and the old supply curves; Point B is the hypothetical equilibrium after a shift in demand when there is no shift in supply curve; Point C is the new equilibrium between the demand shock and the newly shifted supply curve).

However, we also see a negative correlation between regulatory restrictions and home price appreciation. That can be explained using exhibit 11b, where the local markets experience a demand shock (such as when a big employer like Amazon.com, Inc. or Walmart, Inc. moves into town). In this case, the demand curve will move from the solid gray line to the dashed gray one, resulting in a higher price at point B. The rapid price appreciation will cause concerns from elected officials, affordable housing advocates, and conscientious homeowners. Because of this, efforts will be made to relax the land-use restrictions. Hence, the supply curve will also shift to the right from the solid black line to the dashed black one. The new equilibrium will be Point C, which as compared to point B, means a lower price is associated with the more relaxed regulation as the supply effect. However, Point B is a hypothetical point that indicates the equilibrium between the new demand curve (the dashed gray line) and the old supply curve (the solid black line), such as in the absence of the feedback effect. Hence the price level for Point B is not observed. Instead, a time series or cross-section data will tell that Point A has a lower-price level of appreciation and a restrictive land-use policy, while Point C has a higher price and less restrictive density control. Hence the correlation between land-use restrictiveness and home price appreciation is negative. However, that does not contradict the fact that land-use regulation is the ultimate determinant of housing supply. That supply curve, with everything else being controlled, is still upward sloping. Here this distinction between the absence of demand shock and a shift in the demand curve (which is downward sloping) is critical to understanding the negative correlation.[15]

The same story can be carried over to the cross-metropolitan area comparison because there will always be a difference in shocks to the demand curve across metropolitan areas, which is applicable for the description in exhibit 11b on both markets. Moreover, as we see in the prior section, such a feedback mechanism, such as the push to relax density controls to accommodate more growth, becomes more obvious over a longer horizon. It is not politically easy to change these regulations, so it takes a long time; moreover, even the relaxation of density control will not fully compensate for the enhanced demand; hence the housing price will stay high. Note that we see in the “Differences by Jurisdictions Population Size” section that these large and populous jurisdictions, whose density controls are on the low side nationwide, continue to relax regulations. It is exactly these places that witness faster home price appreciation and economic growth. One may ask why these metropolitan areas can still expand with the high level of home price. According to Krugman (1991) and Krugman (1992), that is because of the agglomeration effects: once New York becomes the dominant force in the financial service industry, it will attract more and more banks even with its high wages, commercial rents, and congested traffic, so is the case of the semiconductor industry in Silicon Valley.

This contrasts with the other side of the spectrum, where the less populous places, which already have strict low-density requirements, continue to tighten their density. These jurisdictions are experiencing fewer positive demand shocks, less economic growth, and a slower home price appreciation trend. That big picture is why we have observed a largely negative correlation.

Finally, this feedback loop also means that the long-horizon time series of regulation measure, as well as the true empirical relationship between regulation and home price, may be an inverse-U shaped curve: first positive and then negative. Suppose initially that no place has any zoning or density regulation, the situation in place through the 19th and early part of the 20th centuries. As the economy gradually develops, there is a huge demand for scarce land, and existing homeowners do not want to suffer from negative externality associated with incompatible uses, and enact zoning and land-use restrictions. Local jurisdictions have incentives to pass various land-use restrictions

[15] In theory, it is possible to have a positive relationship between regulations and home price. However, as seen in the graph, that means the shift in supply response needs to dominate the demand shock. What we usually see is that the affordability problems led to pressure to loosen, but such governmental intervention was usually insufficient to lower price appreciation as caused by rising demands in the market.

that limit the housing supply, which pushes the housing prices higher. However, when the economy develops further, the sustained demand will push the housing market to the brink of an affordable housing crisis in the short run. Note that there are also some adverse effects of a high housing price, even to homeowners. At that point, the local jurisdiction may tend to relax some of the restrictions a bit. This is what is happening in the most populous metropolitan areas today. On the other hand, many small suburban towns are faced with the declining demand side, and there is no need for them to allow more high-density development.

Conclusion

This article uses data from the National Longitudinal Land Use Survey conducted in 1994, 2003, and 2019, to look at changes in density control over time and across different jurisdictions. We find that overall, there is an increase in the percentage of jurisdictions that are classified as low-density or as high-density, which means correspondingly the share of middle-density jurisdictions are consistently shrinking over time. On the willingness to allow multifamily development, between 2003-2019, we observe that there is a decline in “not allowed” responses, a corresponding increase in “by permit” responses, while the “by right” responses remain similar. We also find that jurisdictions with smaller and less dense population are tightening their density restrictions while more populous places tend to be more accommodating toward high-density and multifamily developments.

The relationship between land-use regulation and home price or rent appreciation is a heated topic in public policy discussion. The common narrative is that regulation will increase land and building costs and thus make housing appreciate more. Our empirical investigation, using both home price appreciation and the multifamily rental information, tells a more nuanced story. The supply constraint story holds well when we look at the multifamily rental section at the jurisdiction level: if there are multifamily units in a jurisdiction, the tighter the density control, the faster rental growth. However, we also find evidence for the other side of the same story. In these populous jurisdictions, demand for housing is ever increasing because of a large influx of migration and economic expansion during the time covered in this analysis. In response to growing affordability issues, density control regulations in these jurisdictions are generally now less restrictive, and the attitude toward multifamily development is more accommodating. Therefore, on the housing price appreciation at the jurisdiction- and metropolitan-level, we find they are negatively correlated. This is precisely because of the feedback loop: high demand in large and populous places will cause prices to increase *more* than they would otherwise and the supply to rise *less* if the regulatory environment stays tight relative to less populous areas. By changing the attitude to be more welcoming to high-density developments, these populous places can induce more production and relieve but not wholly compensate for the pressure from a rapid price increase. At the metropolitan level, this is also true, as gradually in the long run, households and business have incentives to find places that are more accommodating to the rising housing demand and are working to relax the regulations in response to keep rental, and in some cases, home price from rising as quickly.

Finally, we would like to point out a concerning trend on the policy implication: land-use density control followed a bifurcated path over the past quarter-century. While high-density places have relaxed their rules further, this is not the case across the board: the low-density jurisdictions are tightening their density and becoming more restrictive toward the multifamily developments. The country is becoming more cohesive in these large populous places, yet at the same time more fragmented in these small and less populous places. We conjecture this is because of the slow productivity growth, but it also could be that residents in some jurisdictions located in the fast-growing metropolitan areas are more concerned about the negative externalities of developments, so there is a within-metropolitan-area sorting across jurisdictions. Although we know from census data that America has become more urbanized over time, such rising inequality across jurisdictions or between urban and suburban places may have far-reaching implications to the housing market.

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Building Codes: What Are They Good For?

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Abstract

This article presents an economic framework for evaluating the net benefits or costs of building code regulations through their effect on housing markets, accounting for distributional impacts. The role of building codes can primarily be classified into three scenarios: (1) An industry standard that reduces transaction costs; (2) An isolated quality standard; or (3) A quality standard with spillover effects. To holistically evaluate the impact of a particular building regulation, we propose three major guidelines: (1) Correct market failures; (2) Estimate market impacts; and (3) Account for distributional considerations. This framework is applied to energy efficiency regulations and solar panels in particular. Energy efficiency codes reduce negative environmental externalities and information asymmetry and promote high-quality long-term affordable housing stock; however, the willingness to pay for energy efficiency varies with income. Policymakers must consider how policies intended to promote the welfare of low-income housing residents might create exclusionary impacts due to increasing the cost of supplying housing.

Building Regulations and Regulatory Barriers

Building code regulations are intended to ensure a certain level of housing safety and quality, but there can be a tension between mandating high-quality housing and ensuring affordability. To find the right balance, it is important to consider the costs of exclusionary market effects and weigh this against the benefits of raising the welfare of the lowest-income housing users. This article offers guidelines to assist the planner with the difficult task of ensuring public health and safety without creating an additional burden on low-income residents of a community.

There are a large number of regulations that can potentially impact housing affordability. Researchers and practitioners often point to land use regulations as a major source of regulatory barriers. In addition to land use and zoning regulations, industry stakeholders have identified building regulations as potential barriers to affordable housing.[1] Many developers have expressed that building codes have become more aspirational rather than strictly safety-oriented and have pointed specifically to energy efficiency standards as an example of overreach. Some posit that building codes generate industry inefficiencies by promoting wasteful construction practices whereby previously utilized materials are rendered obsolete prematurely, creating waste down the supply chain (Kelly, 1996). It can often take longer than 3 years—the time between International Code Council updates of internationally adopted building code standards—to develop new building materials or products, over which time building and energy efficiency codes may have changed in ways that render the goods no longer usable. This may slow innovation in the building industry and overall development timelines (Kelly, 1996). Building codes may also be less flexible in allowing for the use of recycled construction materials (Volokh, 1996). Finally, building codes may hinder the rehabilitation of existing buildings if they have to be retrofitted to current-day standards (Schill, 2005). An earlier study (Oster and Quigley, 1977) found that wealthier communities tended to shy away from adopting newer codes that included cost-saving features. It is important to understand some of these unintended and potentially exclusionary consequences of building regulations.

The exclusionary effects of overregulation can be intentional or unintentional. Although the Supreme Court banned racial housing covenants in 1917 and the 1968 Fair Housing Act banned housing discrimination based on race and other protected classes, many communities enacted regulations that were not racial in language but had the same effect of excluding Black residents from living in the area. These regulations included zoning only for single-family owner-occupied housing, which de facto excluded the majority of Black Americans, who, through generations of discrimination, had not accumulated the capital needed to access this type of housing (Rothstein, 2017). Evaluating the disparate impacts of housing policies on protected classes and other vulnerable groups is one way to determine whether housing and its associated opportunities are equally accessible across differently regulated areas.

Building codes should not be rejected outright because there may be associated costs. On average, building codes might not have added to construction costs. Annual data from 1890 to 2018 show that construction costs, unlike home prices, have not changed significantly since the early 2000s as the international I-codes were introduced (exhibit C-1). Still, home prices have increased substantially. Gyourko and Molloy (2015) determined these price increases are influenced much more by land costs than building costs, which are relatively uniform no matter where construction is happening.[2]

Effective building codes can promote industry efficiency and improve both housing and neighborhood quality. Ideally, building codes correct market failures. However, overregulation can

[1] From roundtables held by the White House Council on Eliminating Regulatory Barriers to Affordable Housing in 2019 and 2020.

[2] Land costs are in turn highly affected by land use and zoning regulations, which have a much larger effect on restricting the supply and affordability of housing.

stifle competition, innovation, and general market efficiency. In the U.S. housing market, more tightly constrained markets, where the housing stock is not keeping up with population growth, are criticized by many as being overregulated. Artificial impediments to housing production or operation can reduce housing affordability, disproportionately limiting economic opportunities for the poor (Glaeser, Gyourko, and Saks, 2005). The affordability of housing should be an overriding policy goal. Flexible and low-cost housing markets allow job seekers to move to high-productivity cities (Duranton and Puga, 2019; Ganong and Shoag, 2017; Glaser and Gyourko, 2018; Herkenhoff, Ohanian, and Prescott, 2018; Hsieh and Moretti, 2019). Other costs to consider arise from limiting families' access to high-opportunity areas (see Chetty, Hendren, and Katz, 2016).

Purpose of Building Codes

Building codes regulate the characteristics of a structure by specifying the requirements needed to adequately protect the safety, health, and welfare of occupants. The original purpose of codes was to establish standards to protect buildings and their inhabitants from natural disasters and fires. Codes are also intended to ensure a building's structural integrity and the reliability of electrical, plumbing, and mechanical systems, as well as improve accessibility and energy efficiency.

Building code regulations were first developed at the local and state level to protect safety and public health, particularly regarding fires and crowded tenement living. At the turn of the 20th century, it became clear that the existing state of U.S. housing development had led to unsafe living conditions and that construction needed to be more tightly regulated. The insurance industry was instrumental in establishing the first National Electrical Code in 1897. In 1900, the National Housing Association was established to advocate for housing reforms regarding health and sanitation in response to widespread unhealthy living conditions in tenement housing (Veiller, 1910). The National Board of Fire Underwriters published the first U.S. model building code in 1905 (Listokin and Hattis, 2005).

Energy efficiency regulations have been pursued historically during energy shocks. In 1950, before the existence of the U.S. Department of Housing and Urban Development (HUD), the Housing and Home Finance Agency developed residential energy efficiency requirements in response to defaults on federally backed mortgages arising from excessive energy bills. In 1977, the U.S. Department of Energy (DOE) was created in response to the price shocks of the Arab Oil Embargo. Energy conservation was a key component of the DOE's original mission. Federal energy efficiency programs exist across agencies, including the DOE's Low Income Weatherization Assistance Program; the Department of Health and Human Services' Low Income Home Energy Assistance Program; energy-efficient mortgages under Fannie Mae, Freddie Mac, and the Federal Housing Administration; and the Environmental Protection Agency's ENERGY STAR Certified Homes; among others. These programs demonstrate the public interest in energy efficiency due to the resilience and social welfare generated by energy savings.

Optimal Building Codes and Potential Housing Impacts

To evaluate the impact of a building code on the housing market, we review three potential roles of a building code: (1) a mutually beneficial guideline for industry and consumers that, by establishing agreed-upon rules, lowers transaction costs; (2) a minimum quality standard without neighborhood effects; and (3) a minimum quality standard with spillover effects to neighboring structures. Understanding the potential market impacts of implementing a building code helps estimate and later evaluate the building code's overall desirability and whether the net benefits will differ by income group.

Building Codes as an Industry Guideline

A model building code serves as a guideline for builders as to what is a safe and durable structure. There are returns to scale for uniform industry standards. Builders and local governments can avoid the costs of research and learning through trial and error. Lenders can be more certain of the underlying value of the collateral if it is built to a code with which they are familiar.[3] Insurance companies, landlords, and homebuyers will spend less on building inspectors if the task is to verify that the structure meets a well-known code, rather than gauging the risk inherent in a less familiar construction style. With such advantages, building standards would be adopted by industry without being compelled.

A voluntarily adopted building code could favor affordability. Costs should fall in the middle of the housing market. The cost savings will be passed on to renters and owner-occupants. Lower-cost housing in the middle of the market would eventually filter down to low-income households. One author offers the possibility that minimum quality standards could enhance price competition among producers if quality becomes less variable (Ronnen, 1991). For housing at the upper end of the market, prescriptive building codes could slow innovation (Maxwell, 1998). While limiting the spectrum of housing available to the top of the income distribution, this potential effect could expand affordability by leading to more homes produced in the middle of the market.

Alternatively, an independently chosen building code could also reduce affordability. Leland (1979) explains that an industry may have an incentive to set quality standards higher than the level desired by consumers. Restricting production through higher standards allows producers to raise industry profits as long as the associated price increase is sufficient to offset the cost of the standard. This would lead to negative consequences for lower-quality housing producers and low-income consumers.

Whether a building code is voluntary or mandated, a housing market could function better in the presence of minimum quality standards. Building codes could, under certain circumstances, deter an undersupply of decent and affordable housing. If any producer is willing to supply inferior construction, and buyers cannot accurately ascertain the quality level, quality is driven out of the market (Akerlof, 1970). A building code instills trust in the housing market. In the absence of building codes, buyers lower their willingness to pay for a given home due to the uncertainty concerning the quality of construction. Lower sales prices would lead to fewer homes built, creating an under-supply of housing and quality, even for low-income homebuyers. The existence of minimum quality building standards diminishes information asymmetry and fosters a market where buyers can more easily assess a given home's true value. It is difficult to know how

[3] The Federal Housing Administration introduced its earliest version of Minimum Property Standards in 1935 to mitigate the risk of insuring debt collateralized by housing assets of uncertain quality.

pervasive this type of market failure is and whether it requires a regulatory response. However, that information asymmetry exists is proven by the existence of building inspections and 10-year construction warranties. Even if the quality standard leads to an overall expansion of consumer and producer surplus, however, households unable to afford more expensive housing could be harmed by an optimal quality standard (Shapiro, 1983).

One study concluded that asymmetric information does not inhibit optimal building patterns by finding that mandated participation in the National Flood Insurance Program and establishing a building code for coastal areas reduced the vacant land value on Florida's barrier islands (Dehring, 2006). While it is possible that the code was stricter than optimal, it is also possible that the decline in land values stems from owners being required to internalize the costs of risk. Federal, state, and local governments provide an implicit subsidy to low-quality housing through resources spent on rescue and reconstruction after a natural disaster. Instead of viewing the empirical result as showing that building codes necessarily inhibit profitability, it can be viewed as evidence that the lack of standards provides an inefficient subsidy to low-quality housing. Considering only private costs would lead to an incorrect evaluation of a policy that raises the long-run cost-effectiveness of providing a built environment. For example, the National Institute of Building Sciences' (2019) multi-year study on natural hazard mitigation has found that designing buildings to meet the latest International Residential Code and International Building Code can generate as much as $11 in national benefits for every $1 of investment.

The arguments for the stabilizing influence of building codes is undermined if there is a confusing diversity across jurisdictions. The unevenness of state and local building codes may be a greater source of compliance costs than their existence in general (IBHS, 2018; Koebel et al., 2004; Vaughan and Turner, 2013). As compared to other developed countries, the United States is unique in its mix of voluntary and mandatory requirements, which makes standardization for builders and developers across geographic jurisdictions challenging, creating inefficiencies that would be passed on to consumers in the form of higher housing costs (Young, 2014).

Minimum Quality Standard as Consumer Protection

A standard argument for building codes is that a minimum quality standard is required to protect consumers from their own ignorance of the risks from living in an unsafe structure. Such an approach can seem overbearing but may be justified for certain characteristics of housing. Examples include safety features, such as self-tripping Ground Fault Circuit Interrupter (GFCI) outlets, which reduce electrical shocks, and railings along stairs, which prevent occupants from falling. A carbon monoxide detector is required in homes in most states because tenants are not fully informed of the dangers of carbon monoxide poisoning. These features provide greater benefit to risk-averse households.

If there is sufficient evidence that markets are self-regulating, then imposing a minimum quality standard would harm consumers who knowingly and willingly choose to consume less of the required safety attributes. The loss would be equal to the difference between the price of a home with the minimum supply of the regulated attributes and what the household is willing to spend (Rosen, 1974). Because lower-income households consume less of most goods, those who might suffer from a minimum quality standard may also be low-income. One study proposes that building codes intended to promote health and safety may also contribute to health risks by adding to the cost of supplying housing (Hammitt et al., 1999). Hedonic wage research reveals similar insights: risky occupations are often low-wage ones, not because there is no hazard premium, but because safety, like any other good, is a normal one—demand increases with income (Viscusi, 2018). The willingness to pay for a better situation is restricted by income and wealth, whereas the willingness to accept detrimental situations is not.

Relying on the market to solve public health and safety concerns is questionable when the product involved is complex, difficult to evaluate, and the consequences of consumer or producer error are grave and irreversible. Mandating that households pay for healthier housing may be merited when some occupants do not have freedom of choice (Breyer, 1993). Children suffer most from exposure to lead but are not the ones deciding whether to inhabit a dwelling with lead-based paint. Insisting on safety features at construction may be more efficient for features that are prohibitively expensive to add after a home has been built. The government's challenge is to balance the perceived gains from better housing with direct and indirect costs. In general, the most effective policy may be to deter the production of extremely hazardous features rather than attempt to eliminate risk completely (Oi, 1973).

The effect of safety provisions on housing production is ambiguous. Consumers who are less risk-averse may not value these safety features and may be less willing to pay for them. However, if most home buyers see these provisions as adding value, demand for homes with these features, which would primarily be newer construction, would increase. Households that would have consumed housing of an equal or greater quality than the minimum would not be adversely affected.

Minimum Quality Standard to Promote Positive Externalities

Building codes can serve to reduce negative externalities that otherwise exist in the housing market. For example, homeowners and landlords have an incentive to prevent fires from starting on their own property but less of an incentive to prevent a fire from spreading to neighboring properties, as the costs are borne by the neighbors. The development of building codes in the United States was a direct response to catastrophic fires that spread quickly and destroyed neighborhoods and large sections of cities. The prohibition of wooden chimneys and fire walls in Boston is an early example. Anchoring standards in HUD's Manufactured Home Construction and Safety Code exist to prevent manufactured homes from being lifted from their foundations and causing damage to other properties during storms with high winds. Most of the benefits from these provisions accrue to neighboring property owners rather than to the owner and occupants. The reduction of the negative externalities justifies the costs of these provisions, which are borne solely by the owner. This type of building code also increases the value of all homes as the risks from neighbor inattention are reduced.

Raising the quality of a building through minimum quality standards has positive effects on neighboring homes. A positive neighborhood effect would be one that lowers the cost of operation of nearby homes or creates amenities in the area. Such external effects would increase the demand for the location by landlords pursuing profits and tenants seeking quality of life. Market pressure for those units will impact the affordability of shelter in the affected area, with potential spillovers to other submarkets. Building codes would directly and immediately affect only the neighborhoods where there is a clustering of new construction and rehabilitation. Newly built units are generally in proximity of one another because most of the homes in an area follow a similar lifecycle (Mieszkowski and Mills, 1993). This geographic separation creates areas where the positive externality exists and where there is a premium. Even as the minimum level of quality spreads throughout the entire stock, variation will remain if different types and vintages of housing impart and receive the externality at different intensities. Initially, the neighborhood effects would be limited to high-income areas where there is a more substantial level of new construction.

Consider the effect on affordability of a building code that creates an amenity enjoyed by neighbors. Safety may be the most obvious example. Because fires spread, lowering the chance of a fire in one home reduces the risk of damage to its neighbors. A fire code would increase the supply of safety in the affected neighborhoods, and raising the supply of public safety makes it less expensive. A greater supply of amenities would reduce the price differential between locations with different amounts of safety (Bartik, 1988).[4] Making safety more affordable could attract low-income households to the affected area. Dense areas where there is less housing separation would benefit the most from positive neighborhood effects.

HUD's experience in building regulations is in the realm of manufactured housing.[5] Additions to the safety standards included more stringent wind standards in 1994 as a response to the disproportionate damage to manufactured homes during Hurricane Andrew. An analysis of the increased cost of production and resulting deadweight loss compared to the averted public and private damages from a hurricane predicted significant net benefits of the rule (benefit-cost ratio of 8 to 5).[6] Ten years later, during another difficult hurricane season for Florida, homes built to the 1994 standard performed significantly better than pre-1994 homes (IBTS, 2005). Despite the success of the engineering standard, the economic benefits may not be directly realized by all residents of manufactured housing built to the new standard. Much of the benefit of the rule was to reduce disaster assistance for displaced residents and limit damage to neighboring properties. The rule removed an implicit social subsidy of manufactured housing in vulnerable areas. The long-term benefits are to promote a lower depreciation of the housing stock. However, there is no immediate way of transferring this gain in efficiency to low-income residents.

Whether low-income households benefit depends partly on the response of high-income households. If enhanced safety makes dense areas more desirable, then high-income households may outbid low-income households for those locations that improved more than average. Affordability of housing will decline in this case. The net welfare effect on low-income households will depend on whether the safety benefits are great enough for them to sustain the increase in rents. There are locational characteristics for which low-income households possess a willingness

[4] Many insights discussed in this section regarding neighborhood amenities were derived from Bartik (1988).

[5] In 1974, Congress passed the National Manufactured Housing Construction and Safety Standards Act, which authorized HUD to establish and enforce construction and safety standards for factory-built manufactured housing.

[6] For a brief description, see Housing Impact Analysis, prepared for U.S. Department of Housing and Urban Development (Dacquisto and Rodda, 2006).

to pay.[7] If the price of housing were to rise more than the willingness to pay, then in the long run, households would be displaced.[8]

Framework for Evaluating Building Regulations

With an understanding of the different market roles a building code plays, we develop a framework to evaluate building regulations more holistically. The framework includes the following guidelines: (1) Rely on a strong market failure argument; (2) Account for the impact of the code on the housing market; and (3) Account for distributional impacts. Following this framework will allow a practitioner to develop a nuanced perspective of whether a regulation or code is a regulatory barrier to affordable housing. Finally, enforcing compliance is essential to realizing the desired outcome of the planner. Rather than responding to complaints, proactive enforcement will be costly and must be accounted for in any benefit-cost analysis.

Rely on a Strong Market Failure Argument

We have considered several helpful economic roles of a building code: (1) a mutually beneficial guideline for industry and consumers that, by establishing agreed-upon rules, lowers transaction costs; (2) a minimum quality standard isolated with no neighborhood spillover effects; and (3) a minimum quality standard with spillover effects to neighboring structures affecting either the cost of operation (supply-side) for a given type of housing or neighborhood amenities that improve the desirability of any structure. The first role reduces uncertainty concerning construction quality and fosters a well-functioning housing market. The second role provides safety benefits to the occupants of the home. The third role reduces negative externalities, which benefits neighboring property owners and occupants. Whether any of these justifications are valid for a specific regulation will depend upon how a building code is designed and the nature of the local housing market.

To justify a regulation, there should be strong evidence that the housing market fails to provide an essential amenity for which there is a willingness to pay. A lower level of quality is not necessarily a sufficient justification: the characteristics of the housing stock may be such that all inhabitants cannot be made better off. Policy intervention is recommended only when there appear to be genuine threats to public health and safety or a level of quality uncertainty that restricts the availability of credit. Before proceeding with a market failure argument, ask whether the private market has already provided solutions, even imperfect ones, to resolve undesirable outcomes. Negative externalities could be remedied through bargaining between neighbors (Coase, 1960), residents self-selecting into small communities (Tiebout, 1956), or large developers building an entire neighborhood with the profit-maximizing level of public amenities. Potential harm to residents of unsafe buildings could be curbed through information campaigns or liability. The information required for direct regulation may be greater than the knowledge needed for these more decentralized strategies (Spence, 1977). Transaction costs may be a barrier to the success of options that have the allure of requiring less intervention by government, and as a result, are exclusionary.

[7] For example, low-income households place more value on locations which enjoy low costs of transportation (Daniere, 1994).

[8] The discussion of demand-side amenities and the impact on housing submarkets is described in more detail in appendix B.

Suppose that a planner has determined that mandatory standards are the best way of supporting an inclusive community. Remaining skeptical of the benefits of their own policy is an effective approach for ensuring that the code does not impose an excessive cost. For example, if a research study finds a high benefit-cost ratio, planners should investigate the barriers to achieving such a favorable outcome. Perhaps addressing the root cause of the failure, if possible, would be more effective than a stricter building code. Planners are still more likely to find themselves in a world where the options available to them are second-best (Lipsey and Lancaster, 1956). Markets will respond to regulatory intervention as its participants adjust to minimize costs.

Make use of policy studies judiciously. Be suspicious of hedonic studies that find very high premiums for any feature of a building or its location. Hedonic analysis is difficult to do correctly; the theory, data requirements, and empirical methods are challenging.[9] It is helpful to double-check results by determining if they make economic sense. For example, if an energy efficiency certification has been determined to raise the value of the building, ask whether the expected reduction of utility bills is within a similar realm. Use estimates of benefits and costs calculated by architects and engineers, but consider how human behavior could alter the predicted outcome. A study of federal product safety regulations (Viscusi, 1985) found that "technological solutions to safety problems may induce a lulling effect on consumer behavior."

Account for the Impact of the Code on the Housing Market

Housing markets have unique characteristics that influence how a minimum quality standard will affect affordability. These include price and income elasticity of demand for housing, the responsiveness of supply, heterogeneity of the housing stock, topographical constraints, and the localization of regulations. The impact of a building regulation on all income groups will ultimately be determined by its impact on the profitability of offering housing. Affordability and availability of housing will be improved only if the cost of producing declines as a result of the building code. Typically, economists measure any adverse impact by the net decline of economic impact (Harberger, 1964). Analysis of the housing market is made more difficult by some of its unique aspects.[10]

First, shelter is a necessary good. Low-income households have little flexibility in adjusting to the cost of housing because there is no substitute for shelter. If building codes raise the cost of shelter, then low-income households will either have to sacrifice other goods or leave the community to seek affordable shelter elsewhere. Being forced to move excludes low-income households from access to essential economic opportunities. The gravity of artificially raising the cost of housing should encourage the planner to carefully consider the most cost-effective building codes.

Second, housing structures and locations vary by characteristics and quality. When a household consumes housing, it buys multiple attributes in addition to shelter. Households bid more for high-quality housing, providing an incentive for landlords and builders to meet the demand for valued attributes. Demand for particular features will vary with a household's preferences and income, just as for any other good. In a well-functioning market, a household will be able to choose the level of quality and type of housing that matches its own willingness to pay with a producer's profitability.

[9] See Palmquist (2005) for a review of empirical property value models.

[10] For an in-depth review of housing impact analysis, see Dacquisto and Rodda (2006).

Third, housing is durable. Most of the housing stock has already been produced. After construction, housing depreciates, a process that can be decelerated through regular maintenance. Eventually, housing is redeveloped. Altering the building code will affect only new construction and rehabilitation. The immediate effect is inconsequential. The economic impact on the housing market will not be realized until the new quality standards have diffused throughout a significant portion of the housing stock. The longevity of housing structures poses a unique challenge to the planner wishing to implement a building code: making the correct policy decision will yield returns for a generation, but an error is relatively irreversible.

The durability of housing makes real estate an asset. The treatment of real estate as an asset can make benefit-cost analysis more complex. A large share of the financial flows that result from changes in asset values may represent transfers between buyers and sellers (a zero-sum gain) rather than benefits that expand economic welfare or costs that reduce it. Double-counting benefits or costs can also be difficult to avoid. Changes in costs of operation, the lifetime of the building, and rental revenue are embodied in the change in real estate value and should not be counted as a separate impact.

Fourth, housing is spatially fixed. For producers, spatial fixity makes it impossible to escape the costs of inefficient regulation. For consumers, choosing a home is equivalent to choosing a location and its associated advantages and disadvantages. The value of the location will be reflected in the price of housing and the land upon which it is built.[11] The willingness to pay to avoid the adverse health and quality of life consequences, if known and significant, will be embedded in the price of housing.[12] Studying home prices is one way to uncover the value of nontraded goods such as environmental quality.[13] The capitalization of spatial externalities into property values provides a compelling motivation for regulation.

Understanding the market effects of goods that are not explicitly priced, like the implicit market for housing, requires the estimating of revealed preference using methods like hedonic analysis, which average the price differential between comparable housing units that differ on the variable of interest, holding other structural and neighborhood characteristics constant. The challenge is that hedonic price estimations differ by market segment. Examples of housing market characteristics by which hedonic pricing varies are detailed in exhibit 1.

Exhibit 1

Selected Examples of Housing Variables by which Hedonic Price and Willingness-to-Pay Vary

Variable	Supporting Studies
Tenure (owner-occupied vs. renter-occupied)	Hyland et al. (2013)
Building type (single-family vs. multi-family)	Im et al. (2017)
Population density (rural vs. urban neighborhood)	Hyland et al. (2013)
Average neighborhood housing prices	Hyland et al. (2013)
Use (commercial vs. residential building)	Popescu et al. (2012)
Energy efficiency rating	de Ayala et al. (2016)

[11] The impact on vacant land values would be immediate.

[12] Knowledge affects the evaluation of risk fundamentally. See Gayer, Hamilton, and Viscusi (2000).

[13] For a review, see Chay and Greenstone (2005).

Some studies estimate that building codes, through technological and administrative barriers, increase the cost of housing by 1 to 5 percent (Listokin and Hattis, 2005). A study of 1,100 localities in 1970 found that building codes raised housing values by $1,000 on average (Noam, 1982). In addition to the effect of codes on housing values, housing values simultaneously influence the strictness of building codes. A study investigating the effect of the 1994 South Florida Building Code for homes sold between 2000 and 2007 in Miami-Dade County found that, all else equal, homes built under the newer code were 10.4 percent higher in price, with higher premiums in coastal areas with greater storm risk (Dumm, Sirmans, and Smersh, 2011). These safety premiums were also greatest following a damaging hurricane. Bartram (2019) finds that resolving building code violations increases rents. While this empirical literature shows that the value of building codes are capitalized into housing prices, this is not enough to conclude that building codes have net benefits across all housing segments. To do so, we must consider the distributional impacts of building regulations.

Account for Distributional Impacts

Standard cost-benefit analyses ignore distributional impacts. The implicit assumption is that aggregate net benefits can be redistributed from winners of a policy change to compensate any losers. Because this redistribution does not occur in practice and low-income groups will bear a disproportionate burden, we urge policymakers to consider as detailed a distribution as possible. An evaluation of the effects of a public policy change on different income groups should account for the indirect effects on a household's budget of a change in housing costs. Lower-income households face a tighter budget constraint and cannot outbid higher income households in the implicit market for quality, so will be excluded from the most desirable areas. The hedonic premium for a desirable feature of a community reduces the affordability of shelter and will have the indirect impact of excluding lower-income households.[14] This creates tension between resolving market failures and ensuring affordability. Recognizing housing market impacts and considering how demand for a policy varies by income contributes toward progressive public policy.

Any external neighborhood effects should reduce costs by more than the direct cost of building to code. One suggestion for limiting the direct cost to builders of affordable housing is to apply a less strict standard for the rehabilitation of existing buildings than for the construction of new ones (Galvan, 2005). An increase in demand in a particular neighborhood will reduce affordability but act as an incentive to expand the supply of housing and even alter the type of housing being built. Reducing the external costs of proximity stimulates density of construction. Walden (1987) finds that housing codes, which set operating standards for housing, lead to higher density but have no impact on housing expenditures. Other regulations that restrict builders, such as minimum lot size zoning, can inhibit realizing the gains from building codes.

It is hard to know whether the impact on affordability will outweigh the public benefits of a building code. We can only say for certain that affordability will not be harmed when the building code results in lower costs of building and maintaining homes across all submarkets. A more or less equal distribution between different types of housing ensures that lower income households

[14] Builders and landlords resolve this challenge by offering the type of housing that is easily marketable and best matches consumers' tastes.

will not be outbid and displaced from their neighborhoods. The spatial scale of markets regulated by the same building code also affects the costs borne by producers that are passed on to housing consumers. The unevenness of building codes across jurisdictions can create comparative disadvantages for housing markets subject to more stringent or disparate standards, artificially inflating housing costs. Because regions do not compete in perfectly competitive markets for their residents, many residents have limited choice in responding to additional housing costs, with disproportionate impacts on the least mobile and poorest households.

Application: Energy Efficiency Regulations

Motivated by industry concerns that energy efficiency codes may represent a regulatory overreach, we investigate their impact on housing affordability using our proposed evaluation framework. While building regulations are more uniform than land use regulations, building codes do differ by state and locality. Nelson attempts to understand energy code adoption in the contiguous United States as related to factors like climate, political ideology, gas prices, population growth, educational attainment, and professionalism in legislatures. He concludes that cost-benefit analysis is not a factor behind adoption. One or more of these other underlying factors may be the real driver for variation in local code usage (Nelson, 2012).

Energy Efficiency and Market Failures

In the case of energy efficiency codes, market failures indicating a potential need for public intervention include negative environmental externalities and information asymmetry in housing markets. The broadest public benefit of limiting residential energy consumption is potentially slowing climate change by reducing greenhouse gas emissions. Housing is a major consumer of energy, which has global implications, as the United States is the second largest energy consumer in the world. In the United States, 39 percent of energy use and 72 percent of electricity use originates from buildings, more than one-half of which is attributed to residential buildings (Im et al., 2017). Residential buildings contribute to between 20 and 25 percent of total greenhouse gas emissions (Im et al., 2017). About half of the energy used in homes is from space conditioning (heating and cooling). While different types of energy may be “cleaner” or “dirtier” to produce, all energy production creates externalities either in the manufacturing of the equipment needed to capture energy or in the capturing of energy itself. These externalities come in the form of damage caused by greenhouse gas emissions and other air pollutants, including reduction of agricultural productivity, sea level rise and the accompanying infrastructure cost of mitigation, adverse health effects, storms and extreme weather events, increased residential energy expenditures to maintain comfort, and the loss of ecosystems (Auffhammer, 2018).

The social cost of carbon is widely dispersed. Energy inefficiency in housing contributes to negative externalities through excessive energy production that has uneven and disproportionate health and safety impacts on poorer, more vulnerable populations with less capital to move away from energy production sites and power plants. The American Lung Association has found that 150 million Americans are exposed to unhealthy levels of air pollution, much of which is from power plants (American Lung Association, 2020). According to the U.S. National Climate Assessment, losses will not be distributed equally because the most vulnerable populations have a lower capacity to prepare for and adapt to the challenges introduced by climate change (Reidmiller et al., 2017). If lower-income communities are less resilient, then pursuing a cost-effective climate change policy will confer benefits that are pro-poor. Preventative measures that protect the safety, health, and the land itself can be considered necessary for sustaining the economy. The hedonic value of reducing risk will make housing less affordable, but the net impact could be inclusive.

A market characterized by information asymmetry is a classic justification for public intervention. In the case of housing markets, do homebuyers and renters care about energy efficiency, and would they be able to acquire housing suited to their preferences without the widespread adoption and use of energy efficiency codes? While some energy-efficient features, like energy-efficient appliances with EnergyStar labels, may be noticeable to a home seeker, others would need hired expertise, like an independent assessor, to assess accurately (Palmer et al., 2013). This is true for structures like walls and insulation. There is the possibility for “lemons” in the rental market if landlords are not incentivized to rent out energy-inefficient units at any lower rate than more energy-efficient units. If market asymmetries exist, they could result in the prevalence of fewer energy-efficient buildings than socially optimally desired.

Attention may be better focused on standardizing codes and mass production methods for energy retrofits, which represent the bulk of the housing stock and are arguably more sustainable than building new housing (Frey et al., 2011). Retrofitting sees a greater need for prices to be lowered to increase take-up and may face greater challenges concerning regulatory barriers (Gerarden, 2008). Similarly, another option on top of energy efficiency codes for new construction relates to the density of housing constructed. Glaeser and Kahn (2010) argue that the bulk of environmental savings come from building in places with a lower carbon footprint and fewer per capita carbon emissions. These are places with higher-density housing requiring shorter and less energy-intensive commutes and more efficient, cost-effective supplying of utilities (Kurvinen and Saari, 2020).

Energy Efficiency and Housing Market Impacts

Enhanced energy efficiency would be worth a hedonic premium at least as high as the accompanying reduction of utility bills. Less expensive energy could also spur greater energy consumption and so would yield a comfort dividend. Households that consume energy relatively intensively would be willing to pay more for energy-efficient units. Given the incentive to producers, the housing market should provide the level and variety of energy efficiency to satisfy the private demand for energy-efficient housing. Any energy-efficiency policy motivated by the creation of private savings should be based on evidence that there are market failures or barriers to the provision of energy-efficient housing.

Looking specifically at the International Energy Efficiency Code (IECC), Koirala, Bohara, and Berrens (2014) find that housing rents increased 23.3 percent due to capitalization of the value of the IECC. A hedonic study of the American Housing Survey used differences in fuel bills to estimate that homeowners capitalize energy efficiency into home prices at a rate of 4 to 10 percent (Nevin and Watson, 1998). Another empirical study found that income sorting did not occur in response to a local environmental change (Greenstone and Gallagher, 2008). The income sensitivity of the willingness to pay for environmental quality will have implications for whether improvements that raise the cost of housing will have an exclusionary impact. Empirical measurements of the income elasticity of demand are positive but less than one, indicating that environmental quality is a necessary good (Barbier, Czajkowski, and Hanley, 2017; Pearce, 2006).

An issue that could prevent the alignment of housing producers' and users' incentives is timing. If energy savings only net out over the lifespan of the housing, then housing developers' and users' economic incentives to invest in energy efficiency can be lessened if neither plan to retain ownership or tenure long enough to realize these savings. This scenario would result in deadweight loss, or net societal costs due to less energy-efficient housing being produced than is optimal. Through case studies of green affordable housing projects, New Ecology and the Green Community Development Corporations Initiative have found that the length of a developer's ownership interest affects whether they realize net benefits or net costs (Bradshaw et al., 2005). On average, they found that green affordable housing developments generate a 2.4 percent "green premium" in total development costs. However, using a lifecycle approach and accounting for lower utilities, operating expenses, and maintenance, along with unquantified effects, allows green housing to be more cost-effective.

The income elasticity of demand for energy in the residential sector has been estimated to be below one, indicating that energy is a necessary good and that enhancing its availability could be favorable to low-income households (Fouquet, 2014). Energy costs represent 26 percent of total housing costs for very low-income households (Lee, Chin, and Marden, 1993). Sixty-seven percent of low-income households at or below 200 percent of the federal poverty level are energy-burdened, meaning they spend six percent or more of their total household income on energy costs. According to the Residential Energy Consumption Survey administered by the U.S. Energy Information Administration (last administered in 2015), 31 percent of U.S. households report facing a challenge in paying their energy bills or in sustaining adequate heating and cooling, 14 percent say they have received a disconnection notice, 20 percent report having to forgo necessities like food or medicine to pay an energy bill, and 11 percent say they have had to keep their home at an unhealthy temperature (U.S. Energy Information Administration, 2018). Energy insecurity can cause stress, mental health degradation, and shame in one's home, whereas having energy security results in positive consequences, including increased productivity and better child development outcomes (Hernández, 2016).

The fact that energy insecurity negatively affects a significant number of housing users means that households are making tradeoffs to live in homes that are bad for them. Their budget constraints may hinder them from being able to make true choices when it comes to energy-efficient homes. If this is the case, then regulation can ensure that private markets meet this otherwise unmet need. Requiring homes to be energy-efficient protects the large number of energy-insecure households in the United States from adverse health and social consequences that they may be unable to avoid based on their limited market power.

In long-run housing markets, of utmost importance is the turning of newly built housing today into the housing of lower-income residents in the future, also known as filtering (Rosenthal, 2014; Zuk and Chapple, 2016). Data from the American Community Survey shows that the loss rates of older housing stock are low and are continuing to decrease to unsustainable levels (less than 0.1 percent in the Northeast and West regions) as new production has waned (Emrath, 2019). While energy expenses play a major role in low-income households' housing decisions, lower-income households pay on average 11 percent more per square foot for energy and live in housing that is 10 years older on average than other households (Lee, Chin, and Marden, 1993). Older housing is more energy-inefficient, has poorer quality, and wears down sooner. Without the capital to make upgrades, poorer and more vulnerable households may resort to risky behavior to improve habitability, like using stoves or ovens to heat their homes, which could kill them through carbon monoxide poisoning. Replacing old energy-inefficient infill housing with higher-density energy-efficient new housing would expand the long-run supply of high-quality housing. Ensuring that buildings constructed today are of as high quality as can be reasonably achieved by manufacturers, builders, and developers helps to add better affordable housing stock for the future.

Energy Efficiency and Distributional Considerations

Measuring willingness to pay is important for understanding the potential for market premiums that would generate incentives for developers to invest in energy efficiency. While there is generally a positive willingness-to-pay (WTP) for energy efficiency, it varies across different user and market segments. Research on Building Energy Ratings (BER) in Europe using discrete choice experiments has shown that marginal WTP is positive for improved energy efficiency, although the marginal WTP diminishes for each higher BER (Carroll, Aravena, and Denny, 2016). Said another way, the disutility at the lower end is larger than the utility gain at the higher end. Literature valuing Energy Performance Certificates across different European Union countries has found that the premiums and discounts for energy efficiency ratings are much more pronounced for owner-occupied housing than rental housing (Marmolejo-Duarte and Chen, 2019). Segmented hedonic models of Energy Performance Certificates in Barcelona found a "brown discount" for energy inefficiency in cheaper housing segments and a smaller valuation of energy efficiency in the newest dwellings (Marmolejo-Duarte and Chen, 2019). The most energy-efficient "A" rating was found to have a 12.2 percent impact on price in the central expensive housing segment but an impact of 33.2 percent on price in working-class neighborhoods with older housing. This shows that residents may expect a certain level of energy efficiency in new housing, but they more highly value information about energy efficiency in older stock. It also means that the same regulations may have different consequences, even for neighborhoods within the same jurisdiction.

Surveys have also found variation in how much residents value energy efficiency. The Consumers Union and Buildings Codes Assistance Project (which produces Consumer Reports) surveyed 5,000 adults and found that 82 percent of homeowners felt that they had a right to housing with minimum energy efficiency standards, and 79 percent would pay more to have more affordable and predictable energy bills and overall operational costs (Vaughan, 2012). A 2019 survey by the National Association of Homebuilders found that 16 percent of millennials would pay more for an environmentally friendly home, while 33 percent want an environmentally friendly home but would not pay more; the others do not take into account environmental considerations in buying a home (NAHB, 2019). For an energy-efficient home that would save a resident $1000 per year in utility costs, 34 percent of millennials would be willing to pay an extra $10,000 or more upfront, while 35 percent would pay between $1,000 and $10,000 extra. On average, buyers are willing to pay an extra $8,728 upfront to save $1,000 per year in utilities, or $5,000 for the median buyer.

This shows a large range in WTP that is not driven by energy savings alone. This literature supports the justification for public incentives if building more energy-efficient homes is societally optimal but the private market would not produce these on its own.

Application: Solar Panels

For the next application of our evaluation framework, we examine the justification behind regulations around residential solar panels. This is motivated by California's residential solar mandate, which was passed in 2018 and took effect at the beginning of 2020. Solar panels are a visible, high-tech symbol of energy efficiency and environmentalism. Because their installation costs are expensive and they are an external add-on structure instead of an upgrade of an existing structure, they may be perceived as more of a luxury product and less of a necessity than other types of weatherization-focused energy efficiency improvements. We are interested in analyzing whether this is the case.

Solar Panels and Market Failures

There are multiple market failures at play in the world of energy utilities that might warrant a need for a solar mandate. These include the failure of prices for fossil fuel-derived energy to reflect negative externalities and the monopolistic nature of energy distribution markets, which can alternatively prevent solar seekers from being financially incentivized to install solar or can shift utility cost burdens onto lower-income non-solar users.

First, energy derived from non-renewable sources is currently not priced at a level that captures the negative externalities caused by the production of this energy. Thus, using price alone to make choices about residential energy use does not lead to societally optimal outcomes.

Second, energy distribution is largely a natural monopoly or oligopoly because, by the nature of the industry, with its high fixed costs, distributors need very high coverage in order to operate with economies of scale, which creates high barriers to entry (Body of Knowledge on Infrastructure Regulation, 2012; O'Neill, Whitmore, and Veloso, 1996). Grid infrastructure is largely centralized, and states must borrow large amounts of money to invest in grid upgrades. While grid modernization is a widespread strategy, not all local or regional grid systems have shifted to accommodate distributed energy resources, which would lower the need to build systems for peak capacity. All of this is to say that customers making one-off decisions to invest in solar panels or other nontraditional energy sources may not save as much money as would be expected because of rates that they as residents would still need to pay for the state's continued investments in grid infrastructure (Silverstein, 2014). An example of perverse outcomes can be seen in California, where the overgeneration of energy through solar homes and other renewables has sometimes led California to have to pay neighboring states to take California's excess energy (Penn, 2017). The negative pricing is used to compensate a state like Arizona for restricting its own energy supplies during times of oversupply.

Depending on how rates are set, incentives to promote individual solar panel installation can burden poorer non-solar users with increased bills, generating issues of equity (Cardwell, 2016; Johnson, et al., 2017). In total, these phenomena show that, in a monopolized market like residential energy utilities, there may be a need for state intervention to align the incentives of consumers and producers with what is socially optimal.

Solar Panels and Housing Market Impacts

To understand the potential impact of residential solar mandates on housing prices, we use the American Housing Survey to create a hedonic model of single-family owner-occupied homes with and without solar panels. We use a pooled metro sample from the 2017 AHS Metropolitan Public Use File, which includes one metropolitan area in California (San Jose-Sunnyvale-Santa Clara). This is useful because California has enacted a wide range of policies around solar panel use, allowing for a comparison of areas with and without residential solar regulations.

Descriptive statistics for the sample are reported in Appendix 1. The pooled sample includes 10 metropolitan areas[15] comprising 10,354 single-family owner-occupied detached homes without solar panels and 403 with solar panels. On average, the estimated market values of homes with solar panels were almost twice as high as those without (approximately $675,000, compared to $339,000). A preliminary analysis by the authors finds a premium as high as 10 percent of the reported value for some homes. Our estimates are on the high end compared to results found by other literature estimating the capitalized value of solar panels.[16] Other researchers' estimates include average premiums of $15,000 across eight states (Hoen et al.; 2017), $35,000 in Hawaii (Wee; 2016), $45,000 (or a 15 percent premium) in Arizona (Qiu, Wang, and Wang, 2017); and a 3.5 percent premium in San Diego (Dastrup et al., 2012).

There may be behavioral factors influencing the overvaluation of solar panels. Conspicuous consumption, a form of virtue signaling through the types of consumption in which one participates, has been applied to the field of environmentalism through what is known as conspicuous conservation. Social experiments have found that individuals are willing to pay more for green products in order to signal altruistic qualities (Griskevicius, Tybur, and Van den Bergh, 2010). It may be the case that environmentally motivated households, or households in environmentally signaling neighborhoods, are willing to pay more for solar panels than they would receive in energy savings and other benefits for motivations around personal status (Fuerst, Oikarinen, and Harjunen, 2016; Kahn and Kok, 2014). This may be an issue if these other factors raise the demand curve for solar panels above the price that lower-income households would be willing to pay.

[15] The metropolitan areas surveyed in the 2017 American Housing Survey include: Baltimore-Columbia-Towson, MD; Birmingham-Hoover, AL; Las Vegas-Henderson-Paradise, NV; Minneapolis-St. Paul-Bloomington, MN-WI; Oklahoma City, OK; Richmond, VA; Rochester, NY; San Antonio-New Braunfels, TX; San Jose-Sunnyvale-Santa Clara, CA; and Tampa-St. Petersburg-Clearwater, FL.

[16] The major difference is that this study uses respondent estimates of home market values rather than more objective sales price data. Research has found that homeowners may overestimate the value of their homes as compared to appraised values by up to 8 percent (Harney, 2015).

Solar Panels and Distributional Considerations

Using the same hedonic model, we investigate whether the WTP for solar panels differs for lower-income and higher-income households. Splitting the sample by the median income of solar households ($110,080) finds no statistically significant correlation between solar panels and home prices for either segment. There may not be enough households with solar panels in the sample to produce sufficient power for this estimator when broken into these segments. If the model had found different estimators for higher-income and lower-income households, it would shed light on whether solar panels could be interpreted to be a luxury good. Although low-income households may appreciate having a solar panel, it is not necessary for the production of shelter. If this were the case, requiring solar panels on all housing might have no perceived benefits for a significant portion of homeowners, and requirements to install solar panels on all housing without subsidies may not be justified and could potentially place an undue burden on the lowest-income households.

Conclusion

The role of housing policy should be to create vibrant and inclusive communities. Building codes can promote decent and affordable housing by providing mutually beneficial industry guidelines, consumer safety, and regulating externalities. We have also found that the implementation of building codes could, under certain conditions, reduce the affordability and availability of housing. Adding homes of high quality to the housing stock is essential for creating long-run affordable housing that is safe, habitable, and affordable to maintain. Building codes and energy efficiency programs have arisen naturally as a resilience strategy in response to environmental and economic shocks and the need for energy conservation, but what is their effect on housing markets? We advise that the ultimate goal of the planner not be limited to raising quality but to expanding choice, opportunity, and diversity of the housing stock. The explicit consideration of the distributional impact of a proposed building code is key to understanding whether the policy constitutes a regulatory barrier. Building regulations that correct market failures but create exclusionary impacts through their effect on housing markets may warrant public subsidy or other public policies to confer benefits that do not disproportionately exclude poor residents.

We considered energy-efficiency and solar panel requirements and concluded that prioritizing retrofitting of existing homes that were built under less rigorous energy codes and building more densely are effective ways of increasing the affordability and energy efficiency of the housing stock. We found that solar panels are associated with an economically significant increase in the reported price of detached homes but do not have sufficient power to determine how this varies by household income. Initial analysis indicates that solar panels are a luxury good that a lower-income household would not value as highly as it would other energy efficiency upgrades. If the net benefits of solar panels are positive due to the mitigation of environmental externalities, they may deserve subsidization to increase production and ensure that lower-income households can afford to live in areas endangered by climate change.

Appendixes

Appendix A. Solar Panels in the American Housing Survey

We use the 2017 AHS Metropolitan Public Use File, which includes one metropolitan area in California (San Jose-Sunnyvale-Santa Clara). This is useful because California has enacted a wide range of policies around solar panel use, allowing for a comparison of areas with and without residential solar regulations.

The metro with the most homes with solar panels in the sample is San Jose-Sunnyvale-Santa Clara, with 150 such homes, representing 6.4 percent of its stock (exhibit A-1). This is followed by Las Vegas-Henderson-Paradise, NV, with 101 homes (4.3 percent of homes); Baltimore-Columbia-Towson, MD, with 77 homes (3.6 percent of homes); San Antonio-New Braunfels, TX, with 66 homes (2.7 percent of homes); and Tampa-St. Petersburg-Clearwater, FL, with 57 homes (2.6 percent of homes). Most of these metropolitan areas, except Baltimore, are located in the southern part of the United States—areas with higher solar insolation.

Exhibit A-1

Solar Panels by Metro, American Housing Survey 2017 Metropolitan Sample

Metro	N, homes with solar panels	N, total homes	Percent of homes with solar panels
Baltimore-Columbia-Towson, MD	77	2,124	3.6%
Birmingham-Hoover, AL	21	2,159	1.0%
Las Vegas-Henderson-Paradise, NV	101	2,367	4.3%
Minneapolis-St. Paul-Bloomington, MN-WI	21	2,314	0.9%
Oklahoma City, OK	18	2,483	0.7%
Richmond, VA	13	2,213	0.6%
Rochester, NY	22	2,181	1.0%
San Antonio-New Braunfels, TX	66	2,488	2.7%
San Jose-Sunnyvale-Santa Clara, CA	150	2,332	6.4%
Tampa-St. Petersburg-Clearwater, FL	57	2,187	2.6%
TOTAL	546	22,848	2.4%

Sources: U.S. Department of Housing and Urban Development. (2019). American Housing Survey (AHS) 2017 Metropolitan Public Use File (PUF)

In the 2017 metro sample, 448 of 546 homes with solar panels (or 82 percent) are single-family detached homes. Additionally, 429 of 518 homes with solar panels that are owned or rented (83 percent) are owner-occupied as opposed to rented. Thus, we focus our sample on owner-occupied single-family detached homes (N = 403). There are implications for focusing on specific housing tenure and building types; incentives for saving energy and investing in energy efficiency are aligned for owners because they must pay for their own utilities, unlike some renters. Additionally, households in detached single-family homes typically use more energy than those in attached homes and multifamily housing because of the urban heat island effect and the greater proportion of energy used for heating than cooling (Obrinsky and Walter, 2016).

Examining homes with and without solar panels across the pooled metro sample shows some differences (exhibit A-2). Estimated market valuations of homes with solar panels were almost twice as high as those without (approximately $675,000, compared to $339,000). The household income reported by households with solar panels was also higher than that reported by those without—about $149,000, compared to $106,000. Homes with solar panels were on average 6 years newer. Homes with solar panels reported higher quality amenities and neighborhood characteristics on average compared to those without, except in terms of the number of floors, the lot size, and the neighborhood quality based on nearby schools and petty and serious crime; this may indicate that homes with solar panels are located in more urban areas with higher density and more expensive land.

Exhibit A-2

Descriptive Statistics of Owner-Occupied Detached Homes by Reported Presence of Solar Panels from American Housing Survey 2017 Metropolitan Sample (1 of 2)

Variable	No solar panels (N = 10,354)		Solar panels (N = 403)	
Market value (reported $)	339,217	(504,196)	675,135	(951,917)
Household income (annual $)	106,184	(105,258)	148,833	(161,779)
Number of occupants	2.58	(1.37)	2.87	(1.48)
Age of home (years)	47.81	(24.42)	41.89	(20.89)
Total number of rooms	6.80	(1.56)	7.32	(1.54)
Lot size				
Less than 1/8 acre	9.0%		8.7%	
1/8 up to 1/4 acre	40.2%		54.2%	
1/4 up to 1/2 acre	25.1%		16.2%	
1/2 up to 1 acre	8.9%		5.2%	
1 up to 5 acres	11.5%		11.9%	
5 up to 10 acres	2.5%		2.0%	
10 acres or more	2.7%		1.7%	
Unit size				
Less than 500 sq ft	0.2%		0.3%	
500 to 749 sq ft	0.5%		0.0%	
750 to 999 sq ft	3.0%		1.1%	
1000 to 1499 sq ft	19.9%		13.4%	
1500 to 1999 sq ft	27.3%		26.0%	
2000 to 2499 sq ft	20.9%		22.0%	
2500 to 2999 sq ft	11.5%		14.5%	
3000 to 3999 sq ft	11.2%		14.7%	
4000 sq ft or more	5.4%		8.0%	

Exhibit A-2

Descriptive Statistics of Owner-Occupied Detached Homes by Reported Presence of Solar Panels from American Housing Survey 2017 Metropolitan Sample (2 of 2)

Variable	No solar panels (N = 10,354)		Solar panels (N = 403)	
Central AC (reported central air conditioning system)	85.5%	(35.3%)	90.3%	(29.6%)
Adequacy (reported adequate)	97.0%	(17.1%)	99.3%	(8.6%)
Neighborhood rating (1 to 10)	8.52	(1.53)	8.68	(1.40)
Utility cost (monthly $)	267.25	(111.27)	294.84	(134.16)
Electricity cost (monthly $)	145.10	(76.20)	154.84	(82.50)

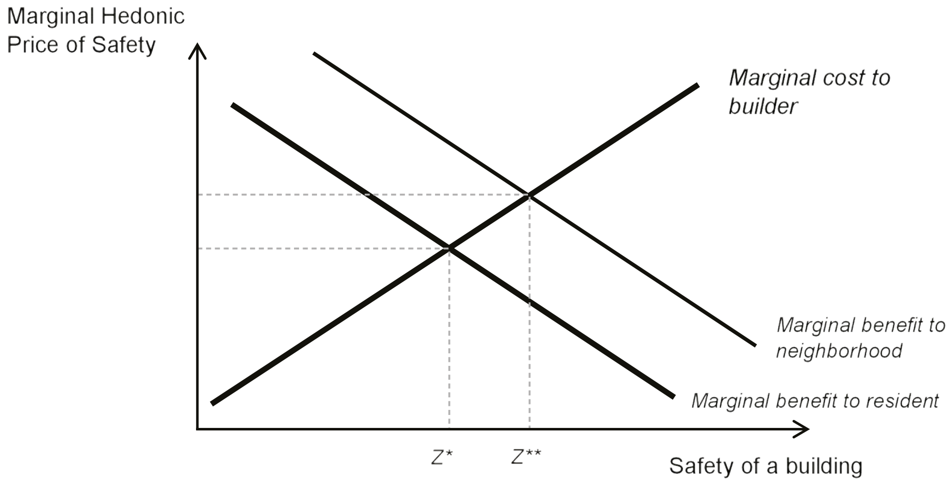
Sources: U.S. Department of Housing and Urban Development. (2019). American Housing Survey (AHS) 2017 Metropolitan Public Use File (PUF)

Appendix B. Illustration of Optimal Regulation

Market prices match consumers who want different levels of a housing attribute to producers willing to supply those features. In this example, the attribute is safety. The household and the builder agree to an exchange when the level of safety provided maximizes the builder's profits and the household's utility given the price for that particular type of building. In exhibit B-1, the level of safety determined by the market is z^*. Every home can be at a different level of safety; a market-wide hedonic price function would connect these individual outcomes. For the builder, the incremental cost of producing one more unit of safety is represented by the upward sloping line *Marginal cost to builder*. Reducing risk is achievable, but producing a building in which no risk is present is infeasible. For the consumer, the additional satisfaction derived from reducing risk is represented by a downward sloping curve, the *Marginal benefit to the resident*. Every additional unit of safety increases well-being, but by less than the previous unit. The diminishing marginal utility of a good is explained by the tradeoffs a consumer makes when facing a limited budget. Spending more on one good necessitates giving up another good. The marginal benefit of the safety curve would be shaped differently for households with different preferences, incomes, and knowledge or experience. Lower-income households are likely to consume less safety. Risk-averse households would choose more.

Exhibit B-1

Supply and Demand Diagram for a Building Safety Code: Optimal Safety of an Individual Building



Z = level of safety determined by the market. Z** = optimal level of safety.*
Source: Diagram is derived from Marshall, A. (1890). Principles of Economics

Government policy is justified when there is strong evidence that the market outcome is suboptimal for society. If there are positive spillovers from safety, then a household would gain from their neighbors consuming housing with safety features, such as fireproofing. If the positive externalities are significant, then free riding is a possibility: one neighbor can reduce their own safety expenditures to the other's detriment. This externality can be represented by adding the marginal benefits to the community of a safe building to the marginal benefits to the individual resident to derive the *Marginal benefit to the neighborhood*. The socially optimal level of safety would be indicated by z^{**}. The role of the building code would be to require this higher level of safety.

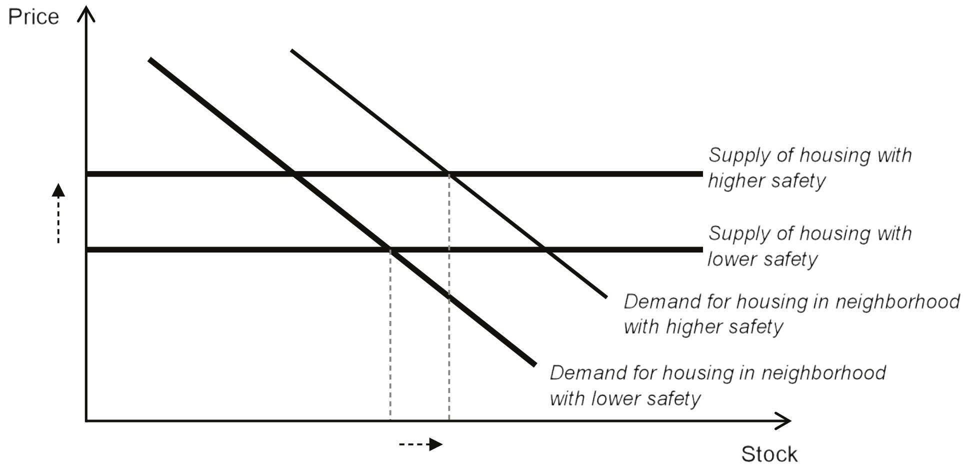
The challenge is knowing the optimal level of safety, z^{**}. How much greater the socially optimal level is than the market outcome will depend upon the types of buildings (dense or not), the incomes and preferences of residents, building technologies, and legal liability. Instead, imagine that positive spillovers were lower than estimated. The cost imposed upon the resident of the building, forced to buy more safety than desired, would be measured by the area between the private marginal benefit and marginal cost above the optimal outcome. This concept of the cost of excessive regulation can be similarly applied to evaluating multiple regulations providing a similar benefit.

Consider the impact on a housing submarket. Raising the required level of safety increases the cost of supplying a home by the amount of the increased level of safety. This is shown as an upward shift of the supply curve, shown in this diagram as perfectly elastic for ease of exposition. The supply of housing is more likely to be upward sloping because the easiest land to develop will be used first, and height becomes increasingly more expensive with every floor.[17] Regulations can also reduce the flexibility of builders. With a more inelastic supply, some of the costs will be shared by builders.

[17] The supply of a housing can be likened to a jagged "S": a vertical middle represents the fixed stock of housing; the upward sloping portion for higher prices represents the increasing cost of adding to the stock, and for lower prices the abandonment and demolition of housing.

Exhibit B-2

Supply and Demand Diagram for a Building Safety Code: Neighborhood Benefits of Safety in the Long-Run Equilibrium



Source: Diagram is derived from Marshall, A. (1890). Principles of Economics

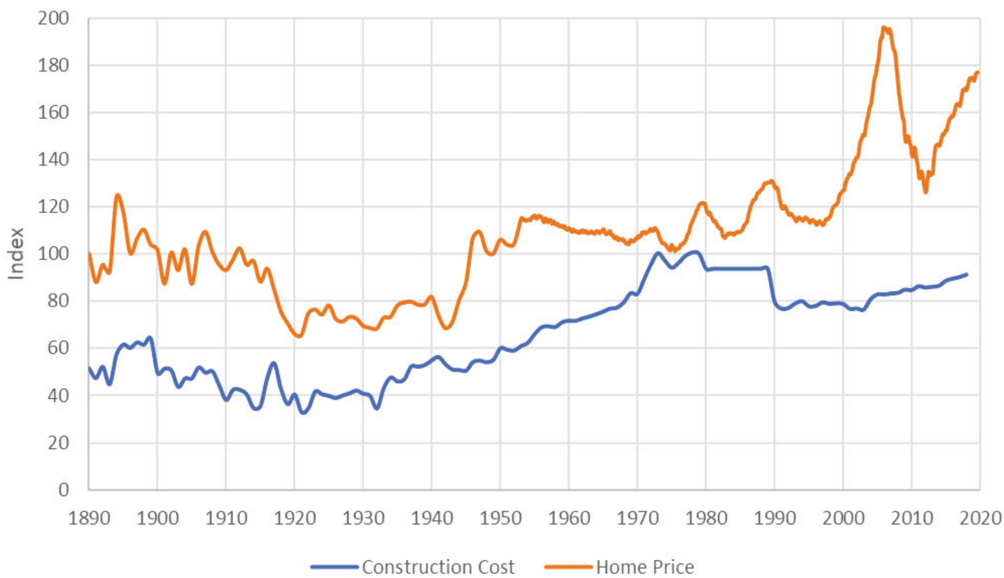
On its own, the increase in cost reduces affordability and the long-run supply of housing. The extent of the cost increase depends on the difference between the cost of providing the regulated and unregulated level of safety. An increased level of safety throughout the building stock increases the demand for housing. Inhabitants will be willing to pay more to live in a neighborhood in which externalities are efficiently regulated.[18] The demand shift determines the response by builders. Exhibit B-2 shows the situation for which the public benefits of the building code to consumers is a significant improvement from the unregulated outcome. In this ideal case, although prices increase, people will be better off because the benefits of public safety offset the cost increase. As a result, the housing stock expands. However, there is no guarantee that the availability of housing would increase. If the regulator overshoots the optimal level of safety and imposes an excessive standard, then the demand curve for housing would shift out by less than the supply: the long-run stock of housing would decline, and net affordability would be adversely affected. Another factor to consider is that, in the long run, households will move. The expansion of demand could stem from new occupants attracted by enhanced safety. Even if the regulation were determined to be optimal for the average households, many residents could be displaced to areas without the same post-regulation level of amenities.

[18] There will also be a slight outward shift of demand because individual units will be of higher quality. This shift is not shown to avoid clutter and because it is not the motivation for the regulation.

Appendix C. Real Home Prices and Real Construction Costs (United States 1890-2018)

Exhibit C-1

U.S. Real Home Prices and Construction Costs, 1890 to 2019



Source: Robert Shiller, http://www.econ.yale.edu/~shiller/data.htm

Exhibit C-1 shows trends in U.S. construction costs and real home prices over the last century. Some researchers attribute the gap between the price and cost of a new addition to the housing stock to land use regulations. However, the gap between housing and construction costs cannot be attributed to regulations alone. The divergence between prices and construction costs could arise from a speculative demand for housing or demographic trends. Higher interest rates could reduce the difference. A well-functioning land market could result in a wedge between the price of newly developed residential land and construction costs from opportunity costs of development such as rents from agricultural land, the value of other potential land uses, uncertainty concerning future prices, and even anticipated economic growth. A higher cost of land acquisition could also be attributed to prior building activity that already developed the most cost-effective sites. The importance of the unique features of the natural and built environment in determining the impact of regulations makes metro-level studies more revealing than estimates derived from national data. An analysis at such an aggregate level will not reflect disproportionate burdens on specific areas, income groups, or demographic groups.

Regardless, the housing industry is restricted in productivity growth relative to other sectors that rely less on immobile production factors such as land, making inefficient regulation of that factor more difficult to overcome.

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Los Angeles’ Housing Crisis and Local Planning Responses: An Evaluation of Inclusionary Zoning and the Transit-Oriented Communities Plan as Policy Solutions in Los Angeles

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Abstract

Los Angeles has a housing crisis. As a result, in 2016, Los Angeles County voters passed a local ballot measure, Measure JJJ, which created a new inclusionary zoning program near rail transit stations. That program has since performed substantially better, in terms of building permits and time for review, than the previously existing density bonus program. In this paper, the authors will present two analyses. First, evidence indicates that the inclusionary zoning program that flowed from Measure JJJ (called Transit Oriented Communities, or TOC) resulted in almost as many building permits over its shorter life than the longer-lived density bonus program. Second, detailed financial analyses of a hypothetical new residential development across a range of neighborhoods in Los Angeles demonstrate that the combination of density increases and affordability requirements in the TOC program is financially more attractive than exclusively market-rate development in many of the same neighborhoods that saw the largest use of the TOC program. The authors conclude that the TOC program can be a successful method of inclusionary zoning, and they draw policy lessons that can apply elsewhere.

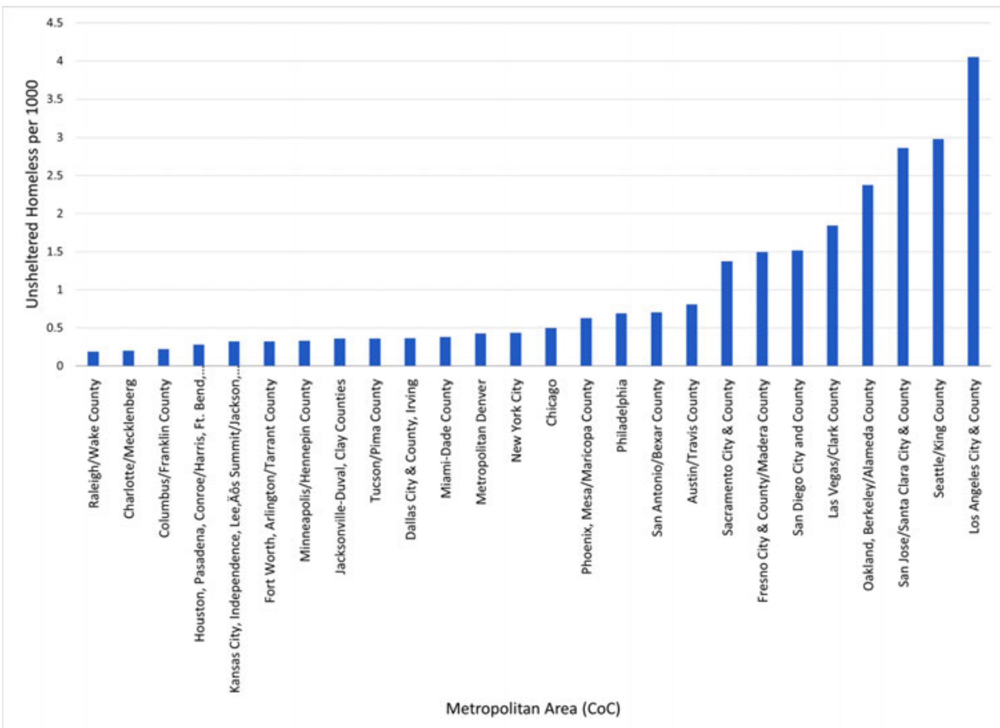
Introduction

The Affordability Crisis in Los Angeles

By every available measure, Los Angeles performs badly concerning housing. The most visible housing failure in Los Angeles involves homelessness in general and unsheltered homelessness in particular. The area's Continuum of Care geography, which almost entirely overlaps Los Angeles County, has by far the largest per capita unsheltered homeless population in the United States (exhibit 1).[1]

Exhibit 1

Homelessness Rates Across Metropolitan Statistical Areas



CoC = Continuum of Care.
Sources: U.S. Department of Housing and Urban Development 2018 Point in Time Estimates of Homelessness in the U.S. and authors' calculations

Underlying this dismal performance is a housing market that is among the most expensive—relative to income—of any in the nation. Although homelessness has many sources, expensive housing is among them (Quigley and Raphael, 2004). Consider where Los Angeles ranks in terms of how much an individual at the 25th percentile of the renter income distribution would have to pay for a rental unit at the 25th percentile of the gross rent distribution. Among the 50 largest

[1] Authors' calculations of U.S. Department of Housing and Urban Development 2018 point in time estimates of homelessness in the United States (https://www.hudexchange.info/resource/5783/2018-ahar-part-1-pit-estimates-of-homelessness-in-the-us/).

metropolitan statistical areas (MSAs), Los Angeles ranks as the ninth worst[2] in affordability, with a 25th-percentile rent to 25th-percentile income ratio of 53 percent.[3]

A household at the 25th percentile of the renter income distribution in Los Angeles County earns $24,000 per year.[4] Using the standard measure of affordability (i.e., households should not spend more than 30 percent of their income on rent), a household at the bottom quartile can afford to spend $7,200 per year, or $600 per month, on rent.[5] However, American Community Survey (ACS) data show that Los Angeles County has 151,000 units with gross rent of less than $600 per month and 462,000 households with incomes of $24,000 or less. These estimates mean that, at a minimum, Los Angeles County has 311,000 fewer housing units than it needs to affordably house people at the bottom quartile of the rental distribution.

Doing the same exercise at the median, the median renter household in Los Angeles County has an income of $50,000. Using the same standards as before, the median renter can afford a rent of $1,250 per month. The county has 670,000 units with rents at $1,250 and below, and it has 925,000 households at the median or below. These estimates show the county is 255,000 units short of what those at the median need. Hence, again at a minimum, Los Angeles County is currently short 566,000 units that households can afford using the 30-percent standard.

Inadequate Housing Supply

Before examining the city's Transit-Oriented Communities (TOC) program, it is important to document how much of the housing problem in Los Angeles is indeed a supply problem by assessing three dimensions: vacancy, overcrowding, and new construction.

Los Angeles has the second lowest vacancy rate of any MSA in the United States (exhibit 2).[6] Although the housing in Los Angeles could be better matched to the needs of Los Angeles households (the area has plenty of bedrooms and floor space, but much of it is concentrated in relatively few houses), housing in Los Angeles is not going to waste. Some advocates have embraced the idea of a vacancy tax in Los Angeles, but it would have little effect.

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[2] Authors' calculations of 2018 one-year American Community Survey (ACS) data.

[3] The Los Angeles MSA includes the more affluent Orange County. When excluding Orange County from the analysis, the affordability ratio in Los Angeles remains high at 53 percent. Orange County has higher incomes than Los Angeles County, but has higher rents, making it just as unaffordable.

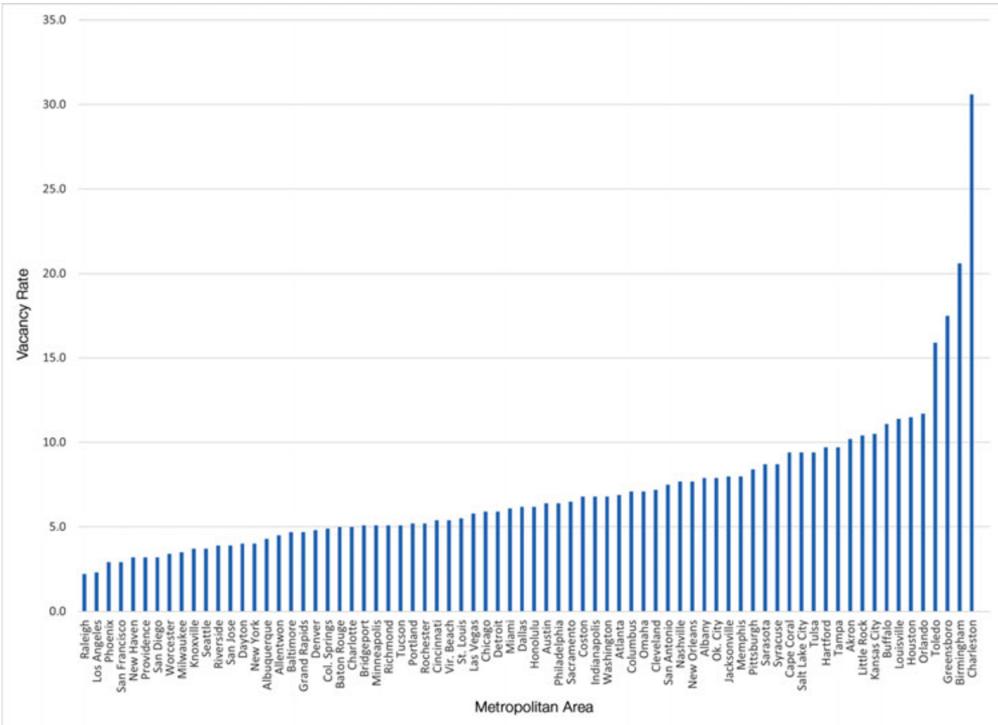
[4] For a discussion using quintiles as affordability measures, see Schwartz et al. (2016).

[5] Such units qualify as Naturally Occurring Affordable Housing (Urban Land Institute, 2016).

[6] Authors' calculation of 2020 Q1 U.S. Current Population Survey Housing Vacancies and Homeownership historical tables (https://www.census.gov/housing/hvs/data/histtabs.html).

Exhibit 2

Vacancy Rates Across Metropolitan Statistical Areas, First Quarter 2020



Source: U.S. Current Population Survey Housing Vacancies and Homeownership Report, First Quarter 2020

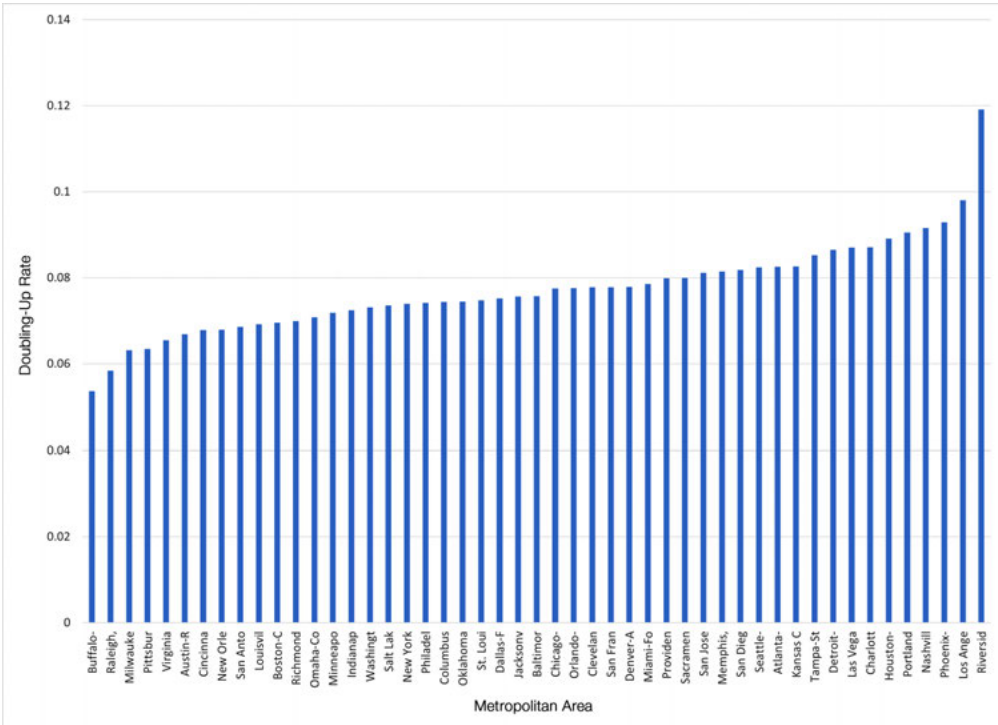
The effect of vacancy on rent was first modeled formally by Rosen (1974). The University of Southern California (USC) Lusk Center for Real Estate uses Rosen's modeling technique to determine the "natural" vacancy rate (i.e., the rate at which inflation-adjusted rents neither rise nor fall). The Lusk Center model estimates that the natural vacancy rate for Los Angeles County is 5 percent, or 2.8 percentage points higher than it currently is. That vacancy rate implies that the county needs to build about 56,000 multifamily units to prevent multifamily real rents from rising further.

Second, by one measure, Los Angeles is among the most overcrowded of MSAs. Considering subfamily (or doubling up) rates among renters by MSA, Los Angeles is second only to its neighbors in the Inland Empire—a metropolitan area immediately inland of Los Angeles (exhibit 3)[7]. This high doubling up rate is yet another indicator of insufficient housing supply. The Los Angeles Metropolitan area has a rate of doubling up 2 percentage points higher than the average of the 50 largest MSAs. The rate is even 2.8 percentage points higher in Los Angeles County.

[7] Authors' calculations of 2018 1-year American Community Survey (ACS) data.

Exhibit 3

Doubling-up Rates Across Metropolitan Statistical Areas



Source: Authors' calculations of 2018 1-year U.S. Census American Community Survey Data via IPUMS

Finally, considering new construction, Los Angeles has among the worst performances of any MSA in the United States. Over the past 5 years, the nation has permitted one housing unit for every 1.8 jobs added. The Los Angeles MSA has permitted just one unit per 3.2 jobs, meaning that, relative to job growth, Los Angeles is building 44 percent more slowly than the nation. In 2019, the Los Angeles metropolitan area permitted 30,554 housing units of all types, a small uptick from 2018 but also considerably lower than in 2015 (permitting activity in the metropolitan area declined every year from 2015 through 2018 before the small rise in 2019). Los Angeles County permitted 21,500 units in 2019, of which 15,600 were multifamily units. Even with no increase in housing demand and no demolitions, the number of planned multifamily buildings is insufficient to alleviate rent increases.

Voter Response to the Los Angeles Housing Crisis

In response to these severe housing issues, the voters of Los Angeles in 2016 passed three housing-related initiatives: Measure H, Proposition HHH, and Measure JJJ. Measure H raised the sales tax throughout Los Angeles County by 0.25 percent for the specific purpose of funding homeless services and short-term shelters. Proposition HHH was a City of Los Angeles initiative that allowed the city to use bond funding to pay for supportive housing and build "10,000 units for homeless

Angelinos." To date, evaluating the effectiveness of those measures is hard—only 47 HHH units have come online. Over the years since voters approved H and HHH, homelessness has risen sharply in Los Angeles (Los Angeles Homeless Services Authority, 2020).

Measure JJJ was different in that it tackled the issue of Los Angeles' in-place zoning, which prevented dense construction in vast swaths of the city. Measure JJJ had two parts. The measure required that developments needing a new entitlement (a zoning change or an amendment to the general plan) build affordable housing or pay an in-lieu fee. To this point, the upshot of this feature of Measure JJJ has been to substantially reduce the number of requests for re-zonings or amendments to the general plan. Los Angeles' zoning code has only been revised piecemeal in the past several decades and has been subject to down zonings that have reduced its zoned capacity by more than one-half since 1960 (Morrow, 2013: 3). As a result, the city's zoning code is incompatible with the market pressures that have arisen with the doubling of Los Angeles' population since 1960.

Measure JJJ had another noteworthy feature, however. The measure required the city's planning department to develop a by-right inclusionary zoning (IZ) program, the TOC program. Under that program, developers received by-right development rights to build more densely near designated transit stations than zoning allowed before Measure JJJ in exchange for providing affordable housing. Specifically, Measure JJJ increases the allowable floor area ratio (FAR) in transit-rich areas. Different levels of transit richness, as defined by the city, allow for different FARs. To give a specific example of how it works, a parcel that under current zoning has a FAR of 1.5—meaning that for every 1,000 square feet of land, a developer is, by right, permitted to build 1500 square feet of floor area. If the developer received a density bonus (DB) of 50 percent (which is one of the TOC allowances levels), the FAR would increase to 2.25, meaning that the developer would be permitted to produce 2,250 square feet of floor space for every 1,000 square feet of land.

This Article's Contribution

This article investigates the value proposition to developers of a FAR or density increase. On the one hand, increasing FAR means that developers may reduce their land cost per housing unit. Land in Los Angeles is, by national standards, expensive, so reducing land costs is key to reducing the total construction costs for new units. On the other hand, affordability requirements mean that developers lose rental revenues, relative to the market, on some of the units that they build. Therefore, a developer will compare the internal rate of return (IRR) for a project that has more units but with affordability restrictions to the IRR for a project that contains fewer units but has no such affordability restrictions.

The main analysis performs financial calculations using development proformas of TOC projects' feasibility in different parts of the city. Different construction cost estimates, land values, development fees, and rents are used to compute the IRRs for non-TOC and TOC projects across Los Angeles. The analysis is limited to eligible areas for the TOC program and model differences in TOC allowances. TOC allowances are functions of transit richness—for example, a parcel near a local bus stop is eligible for TOC, yet it receives a density bonus that is smaller than a property near a Los Angeles Metro rail line.

The financial simulations on the TOC program's feasibility suggest that in several markets in Los Angeles, developers would prefer to build some affordable units in exchange for FAR rather than 100-percent market-rate development. The financial simulations match the observed construction patterns of TOC projects. More specifically, developers find building TOC units in moderate-to-low markets more attractive compared to moderate-to-strong markets. Developers take advantage of the lower construction costs in less affluent markets because such markets tend to have three- to four-story buildings constructed from wood. Furthermore, developers find building 100-percent market-rate projects in moderate-to-strong markets more attractive. This pattern flips in very affluent neighborhoods. In expensive neighborhoods, the cost savings from using less land per unit exceed the income losses from the required affordable units.

The TOC program's empirical assessment in this article supports the findings of the financial simulations and provides insights into additional benefits for developers. Analysis of TOC building permits and entitlements suggests that developer takeup of the TOC program is indeed high. Despite being a recent program, TOC projects have entitled and approved almost as many affordable units as the comparable but longer running DB program. This high takeup is consistent with our financial simulations that suggest that developers should prefer, in some instances, the TOC program to pure market-rate development. However, the entitlement data show an added benefit not captured by our simulations: decreased entitlement costs and risks. The TOC program provides a tenable solution by allowing for by-right and expedited discretionary entitlement processes, which enable developers to eschew the risky and lengthy process of entitling a project.

One feature of TOC projects is that developers can tradeoff between the depth of affordability and the share of required affordable units. In general, we find that developers earn higher returns by catering to extremely low-income households, given that the difference in rent between the income tiers is not as crucial to determining returns as the difference in units set aside for affordable housing. The main factor that affects the feasibility of inclusionary housing programs is the affordability share. The proforma analyses show that land values and market rents are quantitatively small in their influence on project profitability. Regarding affordability tiers, projects that provide affordable units to extremely low-income households exhibit a much higher IRR than projects that target low-income households.

The Los Angeles TOC program is critical both as one of the most high-profile affordable housing tools in the nation's second largest city and as an example of density bonus programs that trade increased FAR for affordable units. The simulations and data inspections in the article suggest that the TOC program has provided the right type of balance to incentivize private construction of affordable units without giving developers a windfall. However, despite the growing popularity of TOC projects, it is unlikely that TOCs alone will solve the housing supply crisis in Los Angeles.

The article proceeds as follows. The background section follows this introduction and sets out the motivation behind inclusionary zoning programs in Los Angeles City and summarizes the main guidelines. The next section discusses the empirical evidence of TOC efficacy and the empirical patterns to calibrate the financial analysis. The fourth section of the article presents the findings of the TOC program's financial simulation. The final section concludes with policy implications of the TOC program's financial and empirical assessments regarding the larger housing problem in Los Angeles.

Background: Affordable Housing and Inclusionary Zoning Policies in Los Angeles

Affordable Housing in California

The affordable housing crisis in Los Angeles is severe, but affordable housing shortages exist nationwide. Estimates are that subsidized affordable housing provides enough units to house approximately 30 percent of the households in need of housing, defining need as households who would pay more than 30 percent of their income on housing absent affordability subsidies (as cited in Bostic and Orlando, 2016). Of the remaining 70 percent of households who cannot obtain subsidies, about one-half (35 percent of the total) can find housing that is "naturally occurring" affordable—market-rate housing that does not cost burden the household (Boarnet et al., 2017a). Hence nationwide, approximately one-third of the households in need of affordable housing cannot obtain either a subsidized unit or a naturally occurring affordable unit—a gap estimated at approximately 6 million households in the United States (Boarnet et al., 2017b). While sub-national estimates are not readily available, the gap is likely more concentrated in high-cost housing areas, including California's major cities.

Over the past four decades, responsibility for responding to affordable housing needs has shifted from national to local governments. The federal government has traditionally provided affordable housing support both in the form of programs that increase supply (supply-side programs) and programs that supplement consumer income for housing (demand-side programs.) Supply-side programs include public housing and the low-income housing tax credit (LIHTC) designed to incentivize private development of affordable housing. The primary federal demand-side program is the Section 8 affordable housing voucher, which provides funds that income-eligible households can use to pay rent.[8]

Since the early 1980s, funding for both federal housing programs has consistently declined relative to need. As a result, only an estimated 30 percent of income-eligible households can obtain federal housing assistance through a Section 8 voucher or an affordable unit in public or LIHTC housing. As the federal government has withdrawn from affordable housing policy, states and cities have tried to fill the gap.

In California, voters have passed bonds to borrow funds to increase funding for affordable housing at the state level. In 2018, California voters passed Proposition 1, which allows the state to borrow $4 billion to fund affordable housing. News outlets estimate that the funds can help 55,000 families (Lagos, 2018). However, suppose that unmet affordable housing needs in California are proportional to those in the United States. In that case, California has an estimated 720,000 households in need of affordable housing who cannot find either subsidized or market-rate affordable units. While that number likely underestimates affordable housing needs in the state, Proposition 1 can serve about 7.5 percent of that estimated need. As is typical in many places, state activity, while welcomed, is not sufficient to fill the gap left by the declining federal presence in affordable housing.

[8] See Schwartz (2010) for a description of the federal role in affordable housing.

Inclusionary Zoning Programs in Los Angeles

As federal and state efforts have proven insufficient, cities have worked to fill the gap and address affordable housing needs. One of the primary tools of city-level affordable housing policy is IZ. In a typical IZ program, a developer seeking approval for a market-rate rental complex would be either required or incentivized to set aside a fraction of units with rents below market rate to provide affordable units in return for increased development density. The prevalence of IZ programs across major metropolitan areas and their effects vary widely based on the applicable affordability share, the targeted income levels, and the duration of affordability (Schuetz, Meltzer, and Been, 2009).

Some scholars and planning professionals have raised concerns that IZ programs do not incentivize many affordable units. They claim that the increased FAR allowances are insufficient to make a dent in demand. Schuetz, Meltzer, and Been (2011) found evidence that IZ programs had a relatively small effect on the number of affordable units in selected markets, such as San Francisco, Washington, D.C., and suburban Boston.

This article examines the financial feasibility of the TOC program. The TOC program is an IZ program designed by the Los Angeles Department of City Planning to improve previous IZ efforts to develop affordable housing. Both the DB (the predecessor to the TOC) and TOC programs are described briefly below.

Density Bonus Program

The city's DB program (City Ordinance No. 179681), introduced in 2008, is an implementation of California law. Development projects that include affordable units can qualify for additional density levels and development incentives. The structure of the program follows several tiers. For example, projects that set aside 5 percent of their units for very low-income (30 percent or less of area median income, AMI) or 10 percent of units for low-income households (between 30 percent and 50 percent of AMI) qualify for a 20-percent increase in density. Other incentives are also available (such as reductions in the setback or increase in FAR), based on the number of affordable units provided.

Transit-Oriented Communities Plan

The TOC plan, developed in 2017 as required by the voter-approved Measure JJJ, is in many ways a density bonus program focused near transit stations, with higher affordability requirements and larger incentives. There are several tiers within the TOC guidelines corresponding to the service level and access capacities of transit stations. The density increases and requirements for affordable units vary across these tiers. For example, the TOC allows that development projects within one-half-mile of rail stations get a density increase of 70 percent if 10 percent of the housing units are affordable to households earning 30 percent or less of AMI. The standard TOC program also allows the developer to build By-Right projects (i.e., eschew the lengthy and risky discretionary approval process). Moreover, the developer can decide to go through the discretionary entitlement process when applying for additional perks such as reduced setbacks. The main guidelines of the two programs are described in exhibit 4 below.

Exhibit 4

Comparison of Los Angeles Affordable Housing Programs

	Density Implications		Affordability Implications		Other Entitlement Implications	
	Minimum	**Maximum**	**Minimum**	**Maximum**		
Housing Policy	Increase in Development Density (du/acre)	Increase in Development Density (du/acre)	Increase in # of Affordable Units (share of du)	Increase in # of Affordable Units (share of du)	Reductions in Parking Requirements (per du)	Other Entitlement Variances Permitted
Density Bonus Program (City Ord. No. 179681)	20%	35%	10% for LI or 5% for VLI	20% for LI or 11% for VLI	See ordinance for details	Setback + lot width reductions, lot coverage + FAR increases
Transit-Oriented Communities (Measure JJJ)*	50% (35% in restricted density zone)	80% (45% in restricted density zone)	20% for LI or 11% for VLI or 8% for ELI	25% for LI or 15% for VLI or 11% for ELI	For Tiers 1-3, 0.5 spaces or 0 spaces if 100% affordable units For tier 4, 0 spaces	Minimum FAR increase of 40% or at least 2.75:1 in commercial Maximum FAR increase of 55% or at least 4.25:1 in commercial

AMI = area median income. du = dwelling unit . ELI = extremely low income. FAR = floor area ratio. LI = low/lower income. VLI = very low income.
**For the TOC Program, Minimums and Maximums correspond to Tiers 1 and 4 of the Program, respectively.*
Notes: ELI households earn less than 30 percent AMI; VLI households earn less than 50 percent of AMI; LI households earn less than 80 percent of AMI.
Sources: For Density Bonus program: City of Los Angeles Ordinance 179681, amending Los Angeles Municipal Code §§ 12.22, 12.24, 14.00, and 19.01 (2008). https://planning.lacity.org/odocument/e811b5a6-294b-474e-accb-064cb8a4eb4f/DB_Ord.pdf. For Transit-Oriented Communities program: Transit Oriented Communities Affordable Housing Incentive Program Guidelines (TOC Guidelines), added to Los Angeles Municipal Code § 12.22 A.31 (2018). https://planning.lacity.org/ordinances/docs/toc/TOCGuidelines.pdf

Transit-Oriented Communities Takeup

This study uses building permit and entitlement data provided by the City of Los Angeles to establish empirical facts on TOC's takeup to provide context for the financial simulations. The key takeaways from the empirical analysis are as follows. TOC permits seem to have generated a lot of developer interest; despite the program's recent inception, its takeup in terms of number of permits and units provided by TOC has caught up with older programs, such as the city's DB program. This high takeup may be due to numerous reasons, as revealed in the data and financial simulations. TOC permits are, by design, by-right permits, suggesting that developers going through the TOC permits can eschew the lengthy and risky entitlement process. Even if a developer does not take the TOC permit as is, however, but seeks additional program benefits—which puts the developer through the entitlement process—entitling a TOC project still takes less than one-half the time of a regular DB project. As a result, aside from generating project-related profits, the TOC programs' takeup has yielded cost-saving and risk-reducing incentives. Another key empirical fact is that TOC projects tend to provide extremely low-income units primarily in lower-income neighborhoods—a difference from the pre-existing DB program in Los Angeles.

Data Description

The source data register entitlement and building permit information on projects with DB and TOC permits. Data on building permits with TOC and DB projects current through April 23, 2020, were provided by the Los Angeles Department of City Planning (LADCP). The data enumerate projects and the number of affordable and market-rate units at various project approval stages. Besides, the TOC building permits data distinguish between by-right and discretionary projects. The annual progress reports (APRs) from LADCP provide the total number of units by affordability tier that received building permits.

Several steps were followed to operationalize the data. For both TOC and DB projects, only new building projects were considered, excluding rehabilitation and other project types. In each data set, projects had multiple dates associated with them. When tallying building permits, the year listed corresponds to the year when the building permit was issued; the issue date is consistent with the City of Los Angeles's APRs, which tabulate the issued number of building permits. The year used for proposed entitlements refers to the year when the project was filed, whereas for approved projects, the date used was the year of completion. In each data source, up to nine projects had invalid date entries and were excluded.

Because this study examines the private supply of TOC projects, all projects with a share of affordable units greater than 25 percent were excluded. That cutoff was chosen because TOC rules mandate the maximum share of affordable units to be 25 percent, though, in some instances, the required share is much smaller (such as when providing units for extremely low-income households). For entitlements, a few observations where housing type was unclear or not pertinent were dropped. For example, nonpertinent observations for workforce housing and a few unclear projects with an "affordable" designation or no delineation of affordability tier were removed.

To make sure the counts are representative and accurate, the authors validate the data they received from LADCP against APRs assembled by the state of California's planning commission. There were some minor discrepancies between the raw building permit data and the APRs that were hard to reconcile. Nonetheless, study relies on the best available data on TOC building permits available.

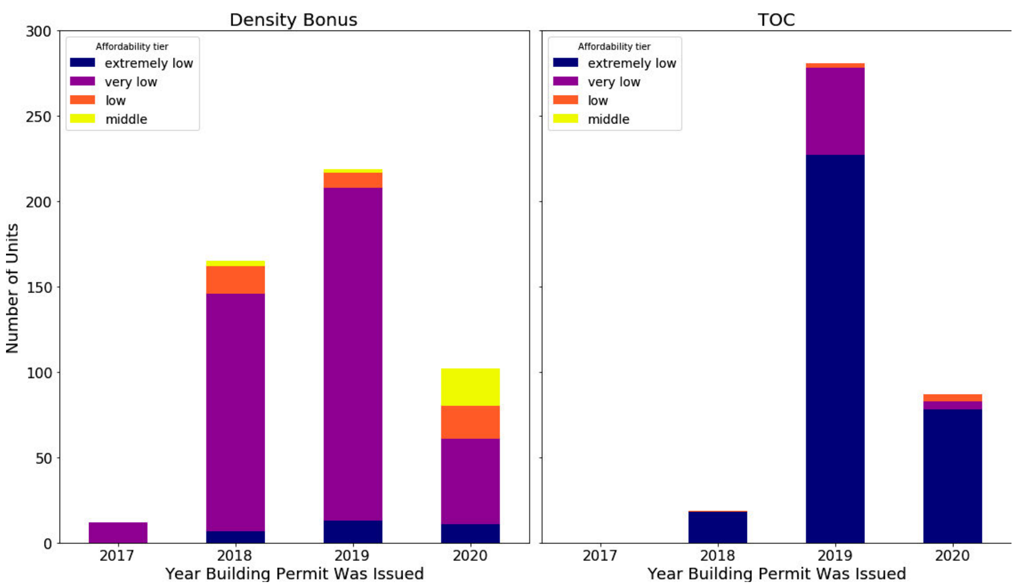
Empirical Patterns

A central element of the TOC program is that it can allow developers to build by-right. Namely, data from Los Angeles Department of Building and Safety (LADBS) suggest that of 464 approved TOC building permits, only 257 went through the entitlement process—that means that 45 percent of developers skip the risky and lengthy entitlement process altogether with the TOC program. However, fifty-five percent of TOC projects still go through the entitlement process, and the data herein suggest why. According to O'Neill, Gaulco-Nelson, and Biber (n.d.), getting a project entitled takes 11 to 22 months on average, with more extended periods for larger projects and an average time of 13 months across all projects in Los Angeles. By contrast, TOC projects take just over 6 months to get approved on average. As a result, even if a developer opts for extra benefits, it still takes about one-half the time of a regular project to get approved. This benefit may have a few outcomes. Because entitlement costs are not insubstantial, cutting entitlement times may make TOC programs less costly to entitle and, hence, more profitable. Moreover, the entitlement process is a risky endeavor, so that a shorter entitlement period may decrease the developer's risks, thus reducing the uncertainty of the project's profitability. The combination of lower costs and less risk may explain why more TOC developers opt for additional benefits (and go through the entitlement process) than by-right projects.

Building permit data reveal that TOC projects supply primarily extremely low-income housing. Exhibit 5 compares TOC building permits to those of the comparable DB program. Unlike the DB projects that supply mostly very low, low, and middle-income units, TOC projects supply primarily extremely low-income projects. That fact suggests two things. First, the mechanism by which TOC offsets profit losses incurred by providing extremely low-income units works, as evidenced by the large take-up for the program. Second, developers prefer to provide fewer affordable units as a share of total units. The TOC program is designed to be mostly tier-neutral in terms of affordability levels. For example, to provide very low-income units at a tier-4 location, a developer must make 15 percent of units affordable. To provide extremely low-income units, a developer needs only 11 percent of units to be affordable. As a result, Exhibit 5 implies that TOC developers prefer to provide a smaller share of affordable units by offering extremely low-income units.

Exhibit 5

Number of Approved Units for Density Bonus and TOC Affordable Units

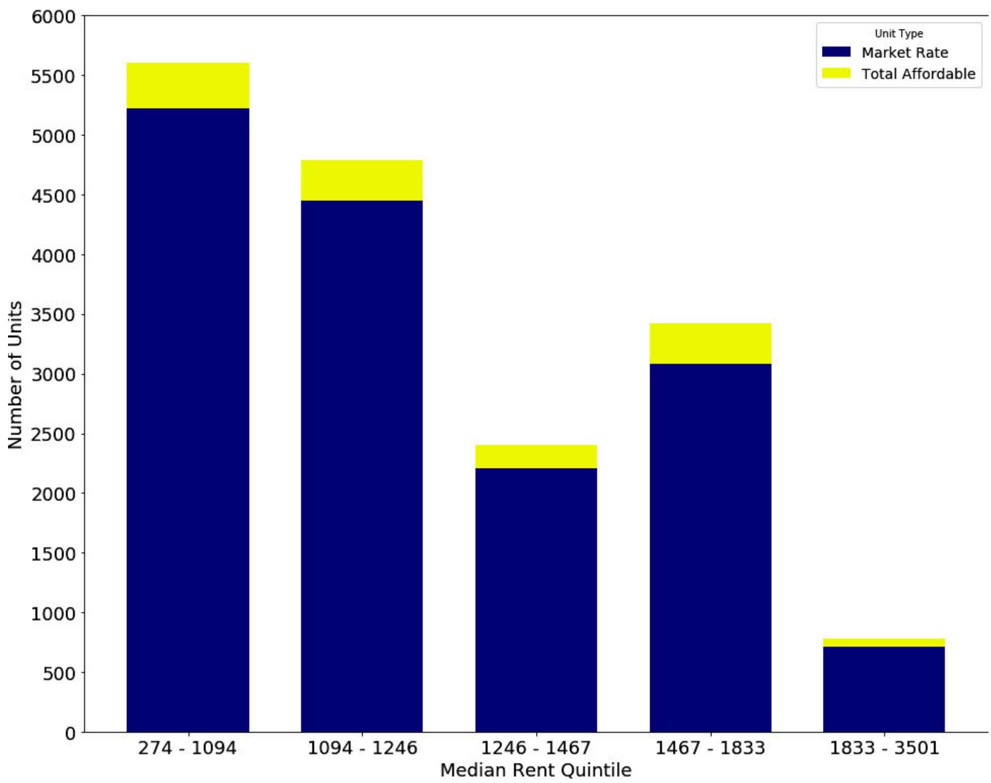


Source: Building Permit data on TOC and DB from LADCP

Exhibit 6 examines the sorting of projects across rent segments. The geocoded addresses in the building permit data are spatially matched to census block groups. Data on median gross rents come from the 2017 American Community Survey (ACS) 5-year data, available at the census block level. Median rents for all census blocks are classified into quintiles. The lowest rent segment pays median monthly rents between $274 and $1,094, while the most affluent segment pays much higher rents between $1,833 and $3,501. Exhibit 7 shows that developers mainly build projects that include affordable units in the two lowest rent segments (with median rents below $1,246). They also tend to build in the second richest rent segment, with rents between $1,467 and $1,833. The most affluent rent quintile receives the least number of projects and affordable units.

Exhibit 6

Total Number of Units Approved for TOC Projects by Rent Segment

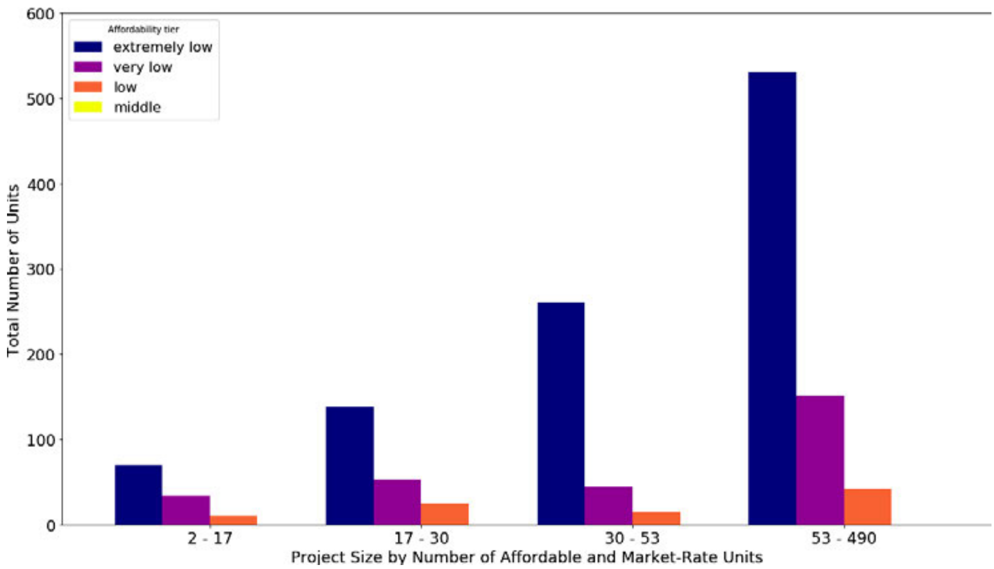


Sources: Building Permit data from LADCP and rent data from 2017 ACS 3-year

Although in the study's financial simulations, projects do not vary by size, the choice of the simulated project size is verified by checking the TOC empirical size distribution. Exhibit 7 shows that larger TOC projects provide the highest number of extremely low-income units. Also, TOC projects in the third quartile of size provide the most extremely low-income units as a share of total units. Of course, this result is not surprising. The number of affordable units is allotted as a share of market-rate units, so larger projects will provide more affordable units. Given the high number of affordable units provided by large projects, we focus our financial simulation analysis on projects of 50+ units.

Exhibit 7

Number of TOC Affordable Units by Project Size



Source: Building permit data from LADBS

Financial Analysis

The TOC affordable housing program seeks to incentivize affordable housing by changing developers' financial payoffs.[9] How well does it work? More specifically, can the TOC program incentives provide additional developer profit that would make it more likely that developers would choose to participate? This section models a typical developer's decision problem to understand how the tradeoff between increased FAR and increased affordable housing requirements works in the Los Angeles context. On the one hand, increasing FAR means that developers may reduce their land cost per unit. Land in Los Angeles is, by national standards, expensive, so reducing land costs is key to reducing the total construction costs for new units. On the other hand, affordability requirements mean developers lose rental revenues, relative to the market, on some of the units that they build. Therefore, a developer will compare the IRR for a project with more units and affordability restrictions to the IRR for a project with fewer units and no affordability restrictions.

To obtain the IRR under both scenarios, we conduct proforma analysis on a hypothetical new mid-rise multifamily rental building across 20 diverse locations in the city of Los Angeles. A proforma is a document used to organize and forecast cash flows for a rental property. After determining the cash flows, it is possible to calculate the IRR for a project, whereby the higher the IRR, the greater the investment return. Developers in Los Angeles often use 12 percent as the IRR hurdle rate they need to attain for a multifamily project. Thus, most developers will find it an attractive investment

[9] The analysis here is in the spirit of Collinson, Ellen, and Ludwig (2015).

opportunity if the project delivers an IRR higher than 12 percent. We follow this rule of thumb in the industry and adopt 12 percent as our hurdle rate that determines whether a developer will invest in a project or not.

Without inclusionary housing, our hypothetical multifamily building has 263 market-rate rental units.[10] We assume a typical distribution of apartment types: 20 percent are studios (53 units), 40 percent one-bedrooms (105 units), and 40 percent two-bedrooms (105 units). If a developer decides to participate in an inclusionary housing program, she can trade the right to develop at a higher density in exchange for affordable units. In our analysis, a developer can receive a 65-percent increase in density if she allocates 22 percent of the total units to low-income renters (i.e., those households with earnings between 50 and 80 percent of the AMI).[11] As a result, our hypothetical multifamily building has 434 units in total, of which 338 are market-rate, and 95 are low-income units. We then project the rental revenue, development cost, and operating expenses for the project under both scenarios, with and without inclusionary housing. Using a proforma analysis and comparing the IRRs in both settings, we can assess whether it is more profitable for developers to participate in the subsidy program and trade reduced rental revenue in exchange for a much higher number of units.

It is worth noting that we make our financial simulations for new TOC projects and omit project renovations. Before we present our financial analysis findings, we define some terms and discuss the components of the proforma together with some assumptions we make. We provide additional details on the structure of the proforma in an online appendix.

Simulation Parameters

Locations or Neighborhoods

We create 20 locations in the city of Los Angeles that denote neighborhoods. A location is a combination of market rents and land values. To obtain such locations, we first map all TOC permits since 2017 and identify the 209 census tracts that overlay those projects. Using census data, we calculate the average rent across all units in each of the 209 census tracts and create a rent distribution. Since our hypothetical projects are new construction, we adjust values by the observed citywide rent premium for units built after 2014. We then group rents (adjusted to reflect new construction) in the 209 census tracts into 20 categories or quantiles. Those 20 quantiles cover a broad range of neighborhoods and reflect the variation in market conditions across Los Angeles transit station areas. For instance, the lowest quantile has a monthly rent of $835, the median quantile monthly rent is $1,786, and the highest quantile has a monthly rent of $2,915. We provide examples in our analysis that relate these quantiles to Los Angeles neighborhoods such as Boyle Heights, Koreatown, Silver Lake, or Westwood.

[10] Our selected project size is larger than most TOC projects, as less than 10 percent of all projects have more than 100 market-rate rental units. However, they account for one-third of all units that entered the market under the TOC program. Our results are generally invariant to the project's size since we calculate revenues and costs on a per square foot basis. Government fees are an exception as they are not proportional to size.

[11] The 65-percent increase in density is the midpoint of the 50 to 80 percent DB ratios across the four tiers in TOC guidelines.

To assign land values for each of these 20 locations, we rely on an online property data set provided by the Los Angeles County Office of the Assessor. This data set contains parcel-level information on the parcel's last sale, estimated land size, and assessed land value. To obtain our land value distribution, we first identify all residential parcels within a quarter-mile away from a TOC project that exchanged hands between 2015 and 2020. We then take their assessed value in the current roll year and discount it by 2 percent per year since the property last sold. We then annually inflate the discounted value by 5 percent up to 2020 and divide it by the parcel's square footage.[12] Finally, we drop all land values per square foot below the 12.5th quantile (approximately $11 per sq ft) to discard values unusually low for Los Angeles City and compute 20 quantiles on the remaining values to get our distribution of land values near TOC projects.[13]

Our simulated locations relate to 20 neighborhoods that we can group into four market conditions: weak (locations 1 through 5), moderate-low (6 through 10), moderate-strong (11 through 15), and strong (16 through 20). As we already mentioned, we provide some neighborhood examples that lie within each group below.[14]

Timeline

Our proforma analysis lasts 13 years, a standard time frame in the industry. In year 0, developers purchase the land and spend the following 2 years building the property. In year 3, the building starts generating rental and other revenue. The developer then sells the property at the beginning of year 13.

Revenues and Expenses

Revenue sources are rental income, garage parking, utility income, and commercial income. We use our rent distribution from census data to simulate rental revenue for every location. We rely on our interviews with local developers to assess other sources of revenue. We assume a 2.5-percent annual rent growth and a 4-percent annual vacancy rate for every location.

Operating expenses include management fees, marketing, on-site management, utilities, repair and maintenance, landscaping, property taxes, insurance, and reserves. We calculate dollar amounts for each item based on interviews with real estate developers who have vast experience in multifamily projects and inclusionary housing programs in Los Angeles. We assume an annual 3-percent growth rate for all expenses. We do not let operating expenses vary by location.

[12] California's proposition 13 caps the growth of assessed property values at 2 percent per year. When a property exchanges hands, the new assessed value reflects the market value. We adjust land value growth since the last transaction by 5 percent per year rather than 2 percent. For example, if a property sold in 2017 and its current assessed land value is $100,000, we first deflate it by 2 percent for 3 years, obtaining a land value of $94,232 in 2017. We then inflate this number by 5 percent for 3 years resulting in a land (market) value of $109,086 in 2020.

[13] Land values vary significantly more than rents. While rents in an expensive location (location 18) are 100-percent higher than in a more affordable location (location 4), land values are 500-percent higher when comparing both neighborhoods.

[14] We assign locations to six selected neighborhoods based on rent values. Rent census data have a higher degree of precision than assessed land values that may mask vast heterogeneity. In some instances, land values may be calculated as residuals and result in abnormally low values.

Development Cost

We decompose the total development cost into several major components: land value, direct construction cost, parking, government fees, and permit fees. As noted previously, we rely on data from the Los Angeles County Office of the Assessor to calculate land values.

Direct costs include all necessary costs to construct the building, such as excavation for the foundation, raw materials, labor costs, architectural fees, engineering fees, supervision, and contingencies. We compile data on direct construction costs for multifamily housing projects from the 2019 Los Angeles County Assessor Handbook. We also interviewed experienced developers who provided ranges for specific items. We collect data on government and permit fees from the City of Los Angeles Department of City Planning and real estate developer feedback. More specifically, for a representative mid-rise multifamily building in the City of Los Angeles, we estimate a direct construction cost of $220 per square foot, $55,000 per parking space, $1,000,000 for a building permit for a 434-rental unit project, and $22,000 per unit for the government fee. We also simulate direct construction costs for a high-rise building, which turn out to be much higher at $280 per square foot.

We introduce a discontinuity in building costs whereby developers face less expensive direct construction costs in weak and moderate-low markets. The lower construction costs in less affluent neighborhoods reflect the broader availability of vacant land plots and the increased flexibility for developers to build horizontally. It may also capture the lower quality of materials or finishings that developers may use in such neighborhoods. Therefore, we decrease construction costs by 20 percent in locations 1 to 10 so that direct construction costs drop from $220 to $176 per square foot. Direct construction costs in all moderate-strong and strong markets remain at $220 per square foot.

Financing

During the construction period in years 1 and 2, developers obtain a construction loan from lenders to finance the construction. Once the building is complete, they refinance the property at a 4.5-percent cap rate and transition to a permanent loan starting from year 3. The permanent loan's annual interest rate is 5.5 percent, with a 10-year loan term and a 30-year amortization period. Developers pay annual debt service. In year 13, developers sell the property with a 5.5-percent exit cap rate and pay off all the unpaid principal.

Affordability Tiers

When a developer participates in an inclusionary housing program, she can provide affordable units to groups of households with different needs. To calculate rents for affordable units in our analysis, we use the midpoints of the U.S. Department of Housing and Urban Development (HUD) low-income definitions to set three affordability tiers: low-income (65 percent of AMI), very-low-income (40 percent of AMI), and extremely low-income (15 percent of AMI). The AMI for the Los Angeles metropolitan area in 2019 was $73,100. Thus, to calculate annual rents for low-income units, we multiply $73,100 by the share of income spent on rent, 30 percent, and the selected midpoint, 65 percent. Low-income households pay annual rents of $14,255. We change the corresponding midpoint and calculate annual rents of $8,772 and $3,290 for very low-income and extremely low-income households, respectively.

Based on the TOC guidelines, developers can increase density by 50 to 80 percent in return for providing affordable units. The level of additional density depends on the distance to the nearest major transportation station. We use a 65-percent increase in density, the mid-point of the range, in our simulations. To receive this 65-percent increase in density, developers must allocate at least 20 percent of total units to low-income households, 11 percent to very-low-income households, or 8 percent to extremely low-income households. We define the inclusionary fraction as the share of affordable units out of the building's total number of units. We experiment with a range of inclusionary fractions for different affordability tiers: 20 to 39 percent for projects with low-income units, 11 to 30 percent for projects with very low-income units, and 8 to 27 percent for projects with extremely low-income units. For some simulation scenarios, we further decrease the minimum inclusionary fractions to examine the sensitivity of IRRs.

Baseline Simulations

Once we assess values for rents, land, revenue, operating expenses, development cost, and set an inclusionary fraction, we can project the cash flows in our proforma and calculate the IRR. For every location, we compare the IRR for a project that has 100-percent market-rate units to the IRR for a project that has more units but affordability restrictions. Rent and land values change for every location, while construction costs jump discretely from $176 in locations 1 through 10 to $220 in locations 11 through 20. All other parameters remain fixed across locations. We then examine the responsiveness of the IRR to changes in the inclusionary fraction across different locations.

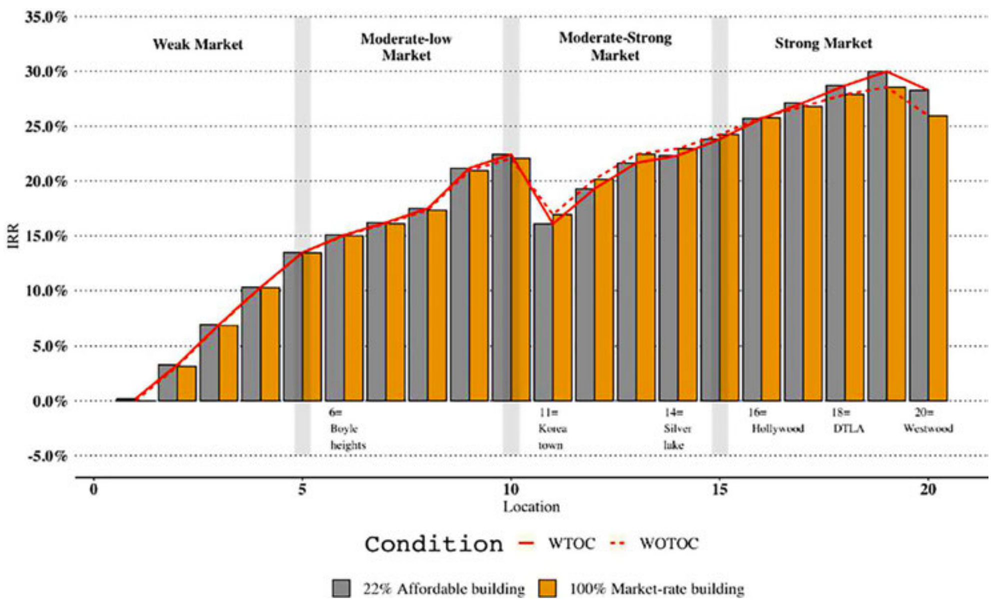
Furthermore, we evaluate how changes in rent, land value, construction cost, government fees, and inclusionary fraction affect the feasibility of inclusionary housing programs, holding other factors constant, across locations and affordability tiers. Our results shed light on the impact of market and policy factors in the provision of affordable housing.

Findings

Exhibit 8 shows the IRRs that developers obtain in each of the 20 locations for projects with and without affordability restrictions. The solid line denotes IRRs for projects with affordable units, and the dotted line refers to projects with only market-rate units. A first impression indicates that IRR differences under both scenarios in most locations are small. Moreover, projects become financially feasible (i.e., they meet the hurdle rate of 12 percent) in all markets except for the weaker ones (locations one through four).

Exhibit 8

IRRs for Projects with and Without Affordable Units Across Locations



DTLA = downtown Los Angeles. IRR = internal rate of return. WTOC = projects with affordable units. WOTOC = projects with 100% market-rate units.
Source: Authors' calculations

The IRR for a project with affordable units is always greater in weak and moderate-low markets. The gap is minimal in weak markets but gradually amplifies in moderate-low markets. Developers take advantage of the lower construction costs in these less affluent markets and find it more profitable to provide additional density. Simultaneously, the disparity between market and affordable rents is less striking in these locations, so developers lose relatively less revenue per affordable unit than in more affluent markets. Given the relatively low land values in these locations, our simulations indicate that construction costs are the main driver for the higher IRRs for projects with inclusionary housing.

Developers find it more attractive to build 100-percent market-rate projects in moderate-strong markets, as seen by the higher dotted line in locations 11 to 15. This pattern flips in very affluent neighborhoods since developers attain the highest IRRs when building affordable units, reaching a return as high as 30 percent. In these expensive neighborhoods, the cost savings from using less land per unit exceed the income losses from the affordable units required. Land values are disproportionately high in these locations, so developers benefit from any opportunity to lower land costs per unit. For example, the land value in location 19 is 123-percent higher than in location 14 and 213-percent higher than in location 11.

In exhibit 8, we match six selected locations to specific neighborhoods in the city of Los Angeles: Boyle Heights, Koreatown, Silver Lake, Hollywood, Downtown Los Angeles (DTLA), and Westwood. As already noted, we match locations to neighborhoods using monthly rents from census data. With an average monthly rent of $1,505, Boyle Heights roughly corresponds to location number 6, a moderate-to-weak market. We notice in the figure that IRRs under both scenarios are virtually indistinguishable. Koreatown, a less affordable neighborhood with an average monthly rent of $1,887, relates to location number 11 and lies between a moderate-low and moderate-strong market. Developers prefer building a market-rate project in this neighborhood. The same development decision holds in Silver Lake (location number 14), a neighborhood with a higher rent at $2,188.

The other three neighborhoods are in strong markets with high rents: Hollywood (location number 16) has an average monthly rent of $2,383, DTLA (location number 18) has an even higher monthly rent at $2,609, and Westwood (location number 20) has the highest monthly rent at $2,915. While in Hollywood, developers are almost indifferent between both scenarios; in DTLA and Westwood, they prefer building affordable units.

In sum, our financial simulations match the observed construction patterns of TOC projects observed in the data. Developers find it more attractive to build in moderate-low markets instead of building in moderate-strong markets. However, our simulations also indicate that we should observe more TOC projects in very affluent neighborhoods and fewer projects in weak markets. We acknowledge that our financial simulations may be somewhat limited since we do not explicitly let building quality vary by location.[15] In reality, developers may lower the quality to make projects financially feasible in weaker markets. Another reason that may push developers to build in weak or moderate-to-low markets is the expedited approval process that TOC projects enjoy relative to market-rate projects. We have underscored the substantial time reduction in TOC project approval in the previous section. If we were to model this faster approval process or lower TOC risk rate in our proformas, IRRs with affordable units would increase across the board, making the small differences in locations 4 to 10 more salient.

So far, we have performed our IRR calculations using an affordability share of 22 percent of the total units in a project. However, that share could vary accordingly to make projects more or less attractive to developers, depending on the locations in which they invest. For instance, a lower affordability share could make projects in moderate-to-low markets even more financially attractive, as they would lose relatively less revenue per affordable unit. Moreover, since developers obtain very high IRRs in strong markets, it might be feasible to raise the share of affordable units to the point where they become indifferent between a full market-rate project and one with affordable housing units.

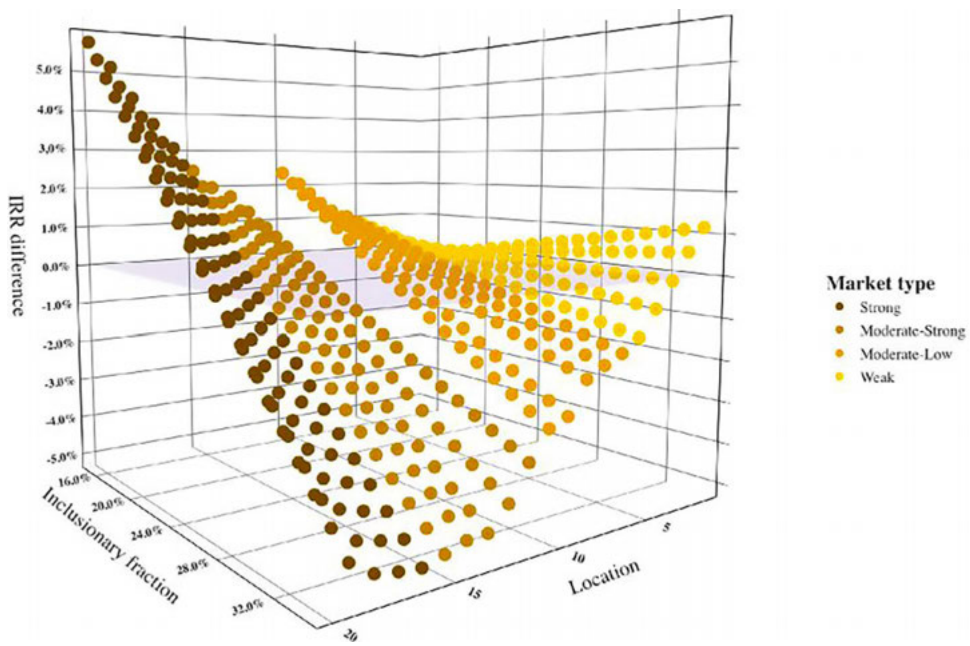
Exhibit 9 presents a 3-D graph where the vertical axis shows the differential IRR between projects with affordable units and market-rate projects. Values above zero indicate that providing affordable units is a financially more attractive alternative. The horizontal-right axis displays the 20 locations, and the horizontal-left axis the inclusionary fraction. This inclusionary fraction is our policy variable: the share of the total units that should be affordable to low-income residents (65 percent of AMI). We consider 20 possible values for the share of affordable housing (the inclusionary fraction in exhibit 4), from a minimum of 15 percent to a maximum of 34 percent. To explore our IRR findings'

[15] Our 20 percent drop in construction costs across locations 1 through 10 is a sharp discontinuity that may ignore gradual declines in quality that developers may incur as they build in lower-income neighborhoods. Further, the reverse pattern may hold as developers gradually increase quality standards in strong markets.

sensitivity, we consider inclusionary fractions below the lowest share permitted by the TOC program. Also, to facilitate the visual analysis, the graph shows a plane at a differential IRR of 0 percent.

Exhibit 9

IRR Sensitivity to Affordability Shares by Location



IRR = internal rate of return.
Source: Authors' calculations

A first finding is that in strong markets, TOC projects can accommodate more affordable units and remain financially more attractive than market-rate projects. For instance, in Westwood, the most expensive area (location 20), projects can give a higher IRR (compared to all market rate) at an affordability share of 26 percent, a higher share than our baseline simulation of 22 percent. The maximum affordability share, which makes developers indifferent between providing affordable units or not, drops to 21 percent in location 16). Thus, in a neighborhood like Hollywood, an inclusionary fraction of 21 percent is about right.

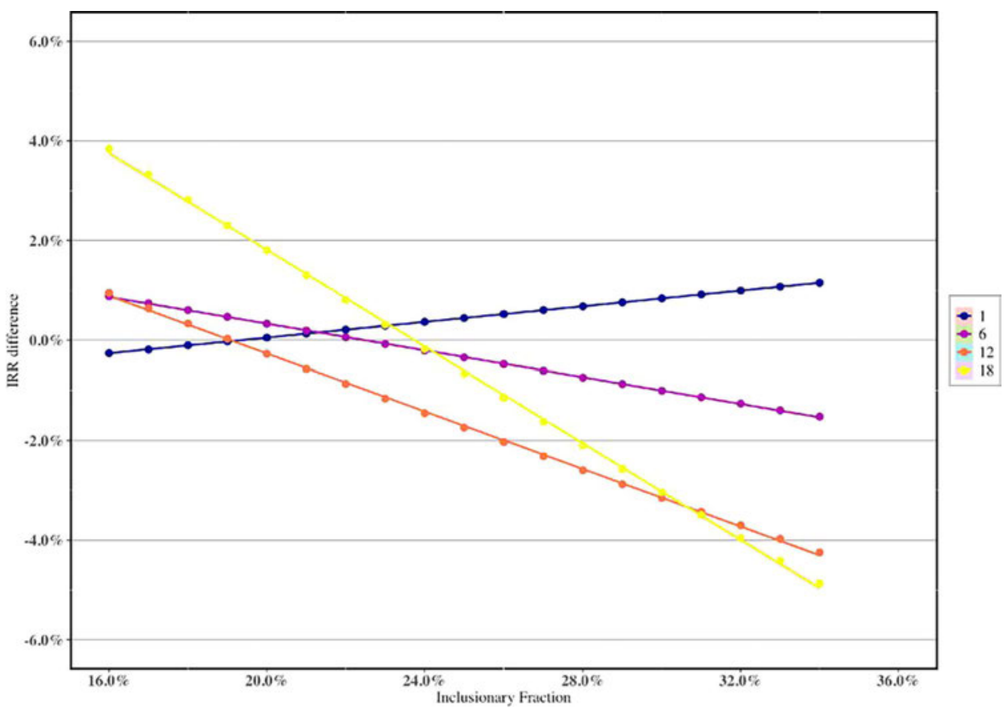
A second finding is that TOC projects in moderate-strong markets can tolerate lower inclusionary fractions ranging from 18 to 20 percent. These are modest reductions in the affordability share compared to our baseline scenario of 22 percent. They suggest that TOC guidelines could be eased in high-opportunity neighborhoods like Silver Lake and Koreatown if policymakers want to induce developers to build more affordable housing.

A third finding is that the difference in IRRs between projects with and without affordable units is less sensitive to the inclusionary fraction in moderate-low markets and even inverts in weak markets. As seen in exhibit 9, projects with affordable units are more profitable under an inclusionary fraction of 22 percent in all moderate-low markets. We find that the inclusionary fraction could increase slightly to 23 percent in location 10. Overall, it seems that the minimum affordability share of 20 percent for low-income households determined in the TOC guidelines aligns well with developer incentives. Furthermore, we note that IRRs increase with the affordability share in very weak markets (locations 1 and 2). Given the low land values and relatively lower construction costs, developers benefit from increased density, given that the rent loss per revenue unit is relatively modest in these very accessible locations.

Exhibit 10 provides a 2-D version of exhibit 9, where we have selected one location from each of the four groups. We plot the IRR difference between projects with affordable units and market-rate projects in the vertical axis. In the horizontal axis, we plot the inclusionary fractions that range from 16 to 34 percent, as in exhibit 9. These four locations summarize the main findings from exhibit 9: the rate at which the IRR difference varies with the inclusionary fraction decreases as we move from strong to weaker markets. The rate reverses in some weak markets and becomes positive in the most accessible locations; hence, developers find it more attractive to increase the affordability share.

Exhibit 10

IRR Sensitivity to Affordability Shares in Selected Locations



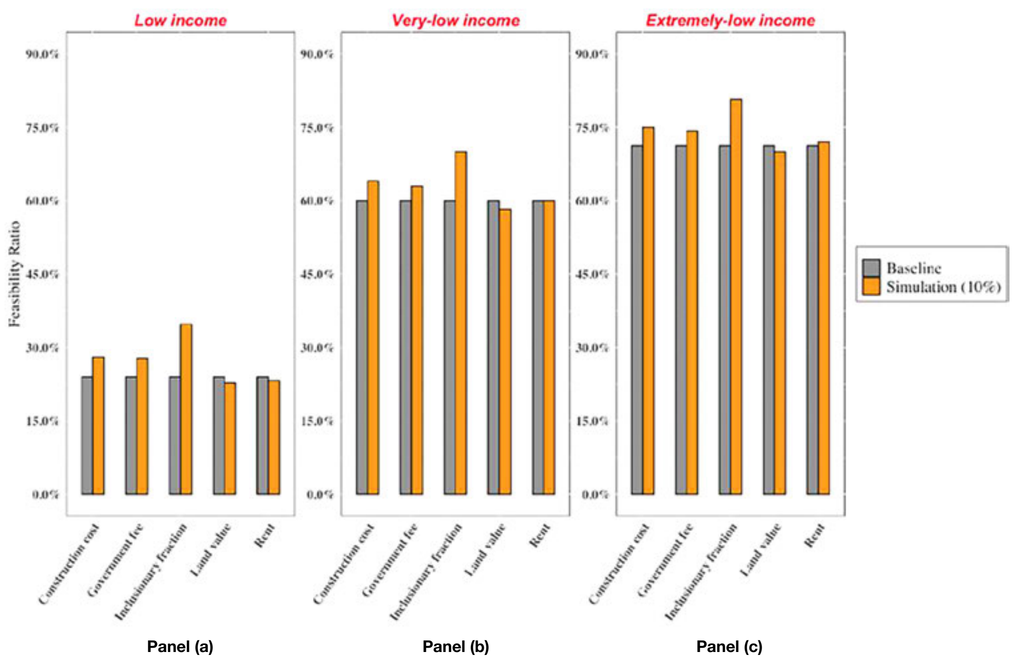
IRR = internal rate of return.
Source: Authors' calculations

In our simulation analysis, multiple factors such as market rents or government fees influence a project's financial feasibility. We examine how financial feasibility varies with five factors: market rents, land values, construction costs, government fees, and an inclusionary fraction (or affordability share). The first three are market factors, whereas the last two are policy factors. While market factors are often not the purview of regulation, our goal is to compare the influence of market conditions and elements of projects such as government fees and the inclusionary fraction that are direct regulatory outcomes. Our thought experiment evaluates the extent to which projects become financially feasible in response to a favorable change in one factor, holding the other factors constant.

We determine the feasibility ratio as the number of dots in exhibit 9 that lie above the differential IRR of 0 percent over the total number of dots (400 in our simulations).[16] In exhibit 9, 176 out of 400 projects (44 percent) exceed the differential rate of 0 percent. We then let each factor vary by 10 percent, increasing all projects' feasibility regardless of location. For example, we consider a decline of 10 percent in government fees across the board or a 10-percent citywide increase in rents. A larger change in the feasibility ratio indicates a greater relevance for a particular factor.

Exhibit 11

Financial Feasibility of Affordable Housing Projects by Market and Policy Factors



Source: Authors' calculations

In panel (a) of exhibit 11, we present the feasibility ratio's response to each of the five factors for projects that include affordable units for low-income residents. The baseline bars denote that 24

[16] We adjust the range of the inclusionary fraction from 16 to 34 percent to 20 to 39 percent. The latter range aligns better with the TOC guidelines, which set a minimum inclusionary fraction of 20 percent for low-income households.

percent of all projects are financially feasible in our baseline scenario. We find that the feasibility ratio increases the most after a 10-percent reduction in the inclusionary fraction (from 24 to 34.75 percent). A 10-percent reduction in construction costs or government fees results in moderate increments in the feasibility ratio to 28 percent and 27.75 percent, respectively. A 10-percent increase in rents or land values leads to a decrease in the feasibility ratio to 22.75 percent and 23.25 percent, respectively. Therefore, it appears that policy factors are quantitatively more relevant than market factors in determining the financial feasibility of projects that include affordable units for low-income households. While a 10-percent drop in the affordability share induces developers to build TOC projects across the board (and start providing affordable units in moderate-strong markets), a decline in land values or rents increases their incentives to build market-rate projects in more affluent locations.

The TOC guidelines allow developers to build a lower share of affordable units if they allocate them to very low-income or extremely low-income households. We examine our results' sensitivity to lower affordability shares for both groups in panels (b) and (c) of exhibit 11. The baseline bars in panel (b) indicate a feasibility ratio of 60 percent when we let the affordability shares vary from 11 to 30 percent for very low-income households instead of 20 to 39 percent for low-income households in panel (a). Similarly, the baseline bars in panel (c) denote a feasibility ratio of 71 percent when we let the affordability shares vary from 8 to 27 percent for extremely-low-income households. Consequently, we find that, under reasonable ranges of inclusionary fractions, TOC projects become financially more attractive than market-rate projects when the developer allocates affordable units to extremely low-income households. Again, our financial simulations match the observed patterns in the data. As we show in exhibit 5, most TOC projects allocate affordable units to extremely low-income households.

In addition, our simulations in panels (b) and (c) reinforce the predominant role that the inclusionary fraction has as a driver of the feasibility ratio. Construction costs and government fees, though relevant, provide modest increases in the feasibility ratio, and the effects are relatively constant across affordability tiers. The role of land values and market rents remain quantitatively less relevant, yet an increase in rents raises the feasibility ratio marginally when providing affordable units to extremely low-income households.[17]

[17] We also examine the financial feasibility of high-rise buildings compared to mid-rise buildings. The additional stories for high-rise buildings come at a steep construction cost for developers ($280 per square foot), who have to compensate for these additional costs with a rent premium. We calculate IRRs for mid and high-rise projects with a 22-percent affordability share across all locations. We find that the rent premium developers need to charge in high-rise buildings is large, in the range of 15 to 20 percent, or $380 to $470. While these incremental rents are reasonable in an affluent metropolitan area like Los Angeles, it might be the case that developers building high-rise projects target a more affluent segment of the market. Therefore, our simulations suggest that developers interested in opting for the subsidy to build a project with affordable housing will usually consider a mid-rise rather than a high-rise project. These results are available upon request.

Conclusion and Implications

Conclusions

Our financial simulations match the observed construction patterns of TOC projects observed in the data. Developers find it more attractive to build in moderate-low markets instead of moderate-strong markets because they take advantage of the lower construction costs in less affluent markets. Developers find it more attractive to build 100-percent market-rate projects in moderate-strong markets. This pattern flips in very affluent neighborhoods. In these expensive neighborhoods, the cost savings from using less land per unit exceed the income losses from the affordable units required.

When we explore the sensitivity of IRRs to affordability shares across locations, we find that (1) in strong markets, TOC projects can accommodate more affordable units and remain financially more attractive than market-rate projects (especially in the wealthiest locations); (2) TOC projects in moderate-strong markets can tolerate lower inclusionary fractions ranging from 17 to 20 percent (these are modest declines relative to our baseline scenario of 22 percent); and (3) the difference in IRRs between projects with and without affordable units is less sensitive to the inclusionary fraction in moderate-low markets and even inverts in weak markets.

The main factor that affects the feasibility of inclusionary housing programs is the affordability share. Land values and market rents show quantitatively small effects. Regarding affordability tiers, projects that provide affordable units to extremely low-income households exhibit a much higher feasibility ratio than projects that target low-income households.

Implications of Inadequate Housing Supply and Effect of Density Bonus and Transit-Oriented Communities

One implication of the shortage of housing in Los Angeles County has been a population outflow. Census estimates that the number of people in the county in 2019 was about 60,000 people lower than in 2015. Nevertheless, this outflow has not helped relieve the housing burden because the county still has in-migration of high-income people. While there is debate on whether the inflow of high-income people displaces low-income residents in specific neighborhoods, such inflows continue to ratchet up demand pressures even as net population growth eases.

In all of this context, the DB and TOC programs are still relatively small. In 2019, they produced 500 units of affordable housing (or less than 0.1 percent of what is necessary under a baseline deficit of 566,000 units) and 4,100 units of all housing (or less than 10 percent of what is necessary to prevent market rents from rising.) These low numbers imply that as admirable in concept as the DB and (especially) the TOC programs are, they are not sufficiently scaled yet to move the needle on housing affordability.

For Los Angeles to actually impact the cost of housing in the region, it will need to roughly double housing production. The TOC program can help with this. First, and most obviously, it allows for a reduction in land costs per unit. A 65-percent increase in zoned units is, holding land prices constant, equivalent to a 40-percent reduction in land cost per unit. Second, it has successfully sped up the process of getting projects permitted by 6 months. Speed reduces costs because it lowers the total amount of money that must be returned to equity investors and lenders. Suppose the required return for a project is 7 percent per year. Shortening the time to build by six months reduces the cost by 3.5 percent. Further, by bringing more certainty to the permitting process, TOC reduces risk, and therefore, in principle, required return on equity.

As currently designed, the TOC program can be a tool to ramp up the production of units. However, it encourages developers to build a small number of extremely low-income units instead of a larger number of low-income units. Consider the tradeoff: extremely low-income units, with rents of at most 30 percent of AMI, collect less than one-half the rents of low-income units, based on at most 80 percent of AMI. However, to get the full density benefit, developers can choose between 8 percent extremely low-income and 20 percent very low-income units. As 20 percent is more than double 8 percent, the rent foregone by focusing on extremely low-income units is less than the rent foregone by focusing on low-income units. In a market that is hundreds of thousands of units short of affordable units, the TOC program, in its current calibration, will make a small dent, even if it leads to substantial increases in total units.

That said, the TOC program is overall well-calibrated—it encourages developers to build while not providing them a windfall. Greg Morrow's (2013) dissertation showed how under-zoned Los Angeles is, and the only way for the city to overcome its housing shortage is to upzone. Until TOC came along, upzoning tended to happen in a bespoke manner; thus, developers that upzoned would receive windfalls that many found inequitable. This practice has led to a general objection to upzoning—that it is unfair to give developers something of great value (i.e., larger FARs) that they did nothing to earn.

Measure JJJ contemplated automatic upzoning in exchange for concessions by developers. The idea was to have transparent rules about the condition of upzoning, thus bringing greater certainty to the development process while ensuring that developers paid a community benefit that would not be so burdensome as to stifle development but would be sufficiently large to prevent windfalls. The TOC program has so far proved to do just that.

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Inclusionary Zoning and Housing Market Outcomes

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Abstract

As regions across the United States experience high and rising house prices, inclusionary zoning has become more popular as a tool to increase the availability of affordable housing for households making less than their region's median income. When inclusionary zoning requires private developers to subsidize below-market-rate units, however, it may act as a tax on housing, leading to reduced supply and higher prices than cities would experience without the policy. Few empirical studies have attempted to measure how inclusionary zoning affects housing supply and prices. In this article, the author uses a new dataset on inclusionary zoning in the Baltimore-Washington region to estimate its effects on market-rate house prices and building permits in a difference-in-difference study. The author finds some evidence that inclusionary zoning increases market-rate house prices but none that it reduces new housing supply. Additionally, the author finds that most optional programs that offer developers increased development rights if they choose to provide below-market-rate housing units have been unsuccessful in producing affordable units. Alexandria and Falls Church, Virginia, are exceptions, where density bonuses are valuable, owing to traditional zoning's restrictions on new housing construction.

Introduction

Inclusionary zoning (IZ) is a policy under which local governments require or incentivize real estate developers to provide some below-market-rate housing units in new housing developments. IZ proponents promote it as a tool to address the important public policy concern of access to affordable housing for households of diverse income levels. Its name indicates that its creators view IZ as an antidote to exclusionary zoning policies. Exclusionary zoning rules include minimum lot-size requirements, multifamily housing bans, and other rules that limit the housing supply in a jurisdiction, thereby driving up housing prices (Ikeda and Washington, 2015).

Although IZ may be intended to address the serious consequences of other land use regulations that limit housing supply and drive up prices, economic theory predicts that IZ could actually exacerbate regulatory constraints on housing supply. As legal scholar Robert Ellickson explains, IZ is a tax on the construction of new housing units and a price ceiling on the units that must be set aside at below-market rates (Ellickson, 1981). Both of these factors can be expected to reduce the quantity of housing supplied, resulting in higher prices for units that are available at market rates.

IZ programs vary widely in design. Many jurisdictions offer developers density bonuses in exchange for providing set-aside units. This practice allows more market-rate units to be built than would otherwise be permitted, offsetting some or all the cost of providing below-market-rate units. These density bonuses will be more valuable where market-rate prices are higher and where other land use regulations are more binding. If the value of these density bonuses outweighs the cost of providing below-market-rate units, the real-world effects of IZ could be the opposite of Ellickson's predictions.

As a further complication, in some cases, IZ units are required to serve households making up to 120 percent of their region or locality's median income, and little rent reduction may be required relative to market rents. In these cases, IZ may have little effect on development outcomes. In other cases when IZ units are required to serve very-low-income households, IZ programs may be a large tax on development.

While Ellickson describes mandatory IZ programs that require developers to set aside affordable units as a condition of building new housing, some jurisdictions have optional IZ programs under which developers may provide affordable units in exchange for a density bonus. Some past empirical work on the effect of IZ on housing markets has not distinguished between the effects of mandatory and optional IZ programs, but theory says they should have different effects. Mandatory IZ may be a tax on new housing if the cost of providing below-market-rate units exceeds the benefit of density bonuses or other offsets to developers. Optional IZ, however, allows developers to participate in the program if the value of the density bonuses exceeds the cost of providing subsidized units. The introduction of optional IZ should either lead to increased housing supply and lower prices relative to a jurisdiction's status quo or have no effect if developers elect not to participate in the program.

In this article, the author reviews the empirical and theoretical evidence of the effects of IZ on housing market outcomes and contributes a new analysis of the effects of IZ on house prices and new housing supply in the Baltimore-Washington region. The following section will review the literature on the effects that IZ has on house prices and new housing supply. The section after the literature review describes the history and growth of IZ in the Baltimore-Washington region. The fourth section of the article explores how economic theory predicts IZ programs of various designs can be expected to affect house prices and new housing supply. The fifth section explains her dataset and data-gathering process. Lastly, in the sixth the author explains the results of her empirical model, in which she uses a difference-in-difference study design to estimate the effects of IZ in the Baltimore-Washington region on house prices and new housing supply. Building on past empirical work on IZ, the author distinguishes between mandatory and optional programs, which have different expected effects on market outcomes, and the author uses a spatial model to account for IZ's potential cross-border effects. The author finds some evidence that IZ raises prices but none that it decreases housing supply.

Literature Review

IZ programs are but one piece of a complex set of regulations that localities use to restrict housing development. These regulations include exclusionary zoning rules, widely recognized to contribute to housing supply constraints and high housing costs.[1] Across the country, some of the most highly regulated regions also have high concentrations of IZ programs, including California regions, Boston, and New York City. In a study of the factors that lead localities to adopt IZ programs, economists Rachel Meltzer and Jenny Schuetz identified a positive correlation between jurisdictions adopting both IZ and growth controls.

One possible interpretation of this correlation is that jurisdictions with growth controls (and possibly other restrictive land use regulations) have higher housing costs, leading them to adopt IZ in reaction to those costs. Even without inferring this causal relationship, however, it appears that IZ is more likely to be adopted by places favoring a higher level of land use regulation in general (Meltzer and Schuetz, 2010: 593).

Meltzer and Schuetz identified evidence that localities with larger housing affordability problems are more likely to adopt IZ programs but more robust evidence that political factors—including the percentage of votes cast for Democratic candidates and the number of active affordable housing nonprofits—predict IZ adoption (Meltzer and Schuetz, 2010: 586-7).

Although IZ programs continue to proliferate,[2] their effect on housing market outcomes remains in debate. IZ advocates often promote two key goals for these programs: (1) promoting mixed-income housing development as a tool to reduce socioeconomic segregation and (2) serving a population that may struggle to afford market-rate rents in their neighborhood or jurisdiction of choice (particularly new-construction housing) but who are not recipients of other public assistance for housing that is typically targeted toward a lower income population. In her testimony on New York City's IZ program, legal scholar and Commissioner of the Department of Housing Preservation and Development City Planning Commission Vicki Been explains the program will "stretch our public dollars so that we can devote more public funds to the most critical needs, will enhance neighborhood economic diversity, and [will] allow mobility among our neighborhoods, thereby reducing inequality" (Been, 2015).

On the other hand, critics of IZ suggest that Ellickson's analysis of its effects on the housing market are correct; IZ comes with the cost of taxing new development, reducing supply, and increasing market-rate house prices. IZ undoubtedly benefits the households that receive below-market-rate units, but if these benefits to a small percentage of generally middle-income households come at the cost of increased housing scarcity and higher prices for everyone not receiving IZ units, the programs likely exacerbate the problems they are trying to help.

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[1] For a review of the economic literature on the relationship between land use regulations and housing supply, see Gyourko and Molloy, 2014.

[2] One study identifies 507 programs in the United States, most of which were adopted in the first decade of the 21st century. See Stromberg and Sturtevant, 2016.

Only four studies have used causal inference methods to measure the effect of IZ on broader housing market outcomes. This literature is likely small because of the difficulty of gathering data on IZ policy across permitting jurisdictions. Three of the four studies examine the effects of IZ across California localities, and one uses data from the Bay Area and the Boston region.

Antonio Bento and his coauthors used a two-way fixed effects model to measure the effects of IZ on housing starts, the percentage of housing starts that are single-family versus multifamily, the prices of new homes, and the size of new homes from 1988 to 2005 (Bento et al., 2009: 7). They found that IZ caused prices to increase 2 to 3 percent faster relative to jurisdictions without the policy but that IZ did not decrease housing starts. They also found that IZ reduced the size of new single-family homes and led to a larger portion of new construction being multifamily rather than single family. The authors characterized their findings: "The results are fully consistent with economic theory and demonstrate that inclusionary zoning policies do not come without costs" (Bento et al., 2009: 7).

Ann Hollingshead also studies IZ in California, looking at the effect of a state court ruling that IZ programs without density bonuses or other offsets violated a state prohibition on local rent control. This ruling reduced the tax effect of IZ by leading some jurisdictions to increase their density bonuses and to transition from mandatory to optional programs (Hollingshead, 2015). Hollingshead found that reducing the burden of IZ programs actually led to about a 2 percent increase in median rents.

Jenny Schuetz, Rachel Meltzer, and Vicki Been studied the effects of IZ in the Boston area and the Bay Area on the single-family home market from the 1980s through the first decade of the 21st century (Schuetz, Meltzer, and Been, 2011: 297). They used a model with jurisdiction fixed effects, time trends, and a control for whether house prices appreciated during a given year. In the Boston area, they found that the implementation of IZ rules has corresponded with higher housing prices and reduced construction rates during times of regional house-price appreciation but not during soft markets. In the Bay Area, Schuetz, Meltzer, and Been found that, as in Boston, IZ corresponds with more rapidly rising house prices during periods of market appreciation but that it decreases prices during soft markets (Schuetz, Meltzer, and Been, 2011: 297). They found no evidence of a relationship between IZ and housing supply in the Bay Area (Schuetz, Meltzer, and Been, 2011: 297).

Tom Means and Edward Stringham used a first difference model to estimate the effect of IZ on California housing markets from 1980 to 2000, controlling for the number of years that each jurisdiction has had an IZ program in place (Means and Stringham, 2012). They found significant and large effects of IZ increasing house prices and reducing new housing supply, and they found that IZ's effect on house prices has increased over time. Their work builds on Benjamin Powell and Stringham's case study work on IZ in California (Powell and Stringham, 2004).

History of Inclusionary Zoning in the Baltimore-Washington Region

In 1971, Fairfax County, Virginia, adopted the country's first ordinance that required developers to build below-market-rate housing as a condition of building market-rate housing. The program did not offer a density bonus or other regulatory reduction to offset the cost of providing subsidized units (Housing Virginia, 2017). Following the rule's implementation, the development company DeGroff Enterprises, Inc. sued the county for takings without just compensation. Their case reached the Virginia Supreme Court in 1973. The court overturned the county's IZ ordinance, finding that IZ was not a power granted to local governments under the state's zoning enabling act and that the requirement was a regulatory taking without compensation (Housing Virginia, 2017).

Following this decision, the Virginia General Assembly passed two new sections to the Code of Virginia that allowed localities to implement IZ programs (1989). The first, Va. Code Ann. §15.2-2304, applies specifically to Albermarle, Arlington, Fairfax, and Loudoun counties and Alexandria and Fairfax cities.[3] These jurisdictions are permitted to implement IZ programs that include density bonuses in exchange for below-market-rate units or other incentives to compensate developers for at least some of the cost of the affordable units (Housing Virginia, 2017). The second, Va. Code Ann. §15.2-2305, allows all the state's municipalities to implement IZ programs for projects that receive a rezoning or otherwise do not comply with their jurisdiction's by-right development.[4] Programs allowed by §15.2-2305 must have affordability set-asides that are not more than 57 percent of the density bonus they offer (in other words, if a project requires 57 income-restricted units, the density bonus would have to allow the developer to build at least 100 more units than it would be allowed under the baseline zoning). Additionally, the number of IZ units required may not exceed 17 percent of the total units in a new development.

In addition to the IZ programs that Va. Code Ann. § 15.2-2304 and § 15.2-2305 specifically allow, any Virginia municipality may enact optional IZ programs. Under these programs, developers are not required to build below-market-rate housing as a condition of building market-rate housing even under a rezoning; however, jurisdictions may offer incentives such as density bonuses to developers that choose to provide below-market-rate housing.

Shortly after Fairfax County's original IZ program was found to violate the Virginia constitution, Montgomery County, Maryland, implemented its Moderately Priced Dwelling Unit (MPDU) program in 1974.[5] It is now the longest running IZ program in the region and the country. Montgomery County's program has been held up frequently as an example of successful IZ (The Urban Institute, 2012).

In 2004, Montgomery County policymakers made a few changes to the MPDU program (Montgomery County, 2004). They increased the affordability period for IZ units from 20 to 99 years for rental units and from 10 to 30 years for owner-occupied units. At the same time, the county reduced the project size that triggers MPDU requirements from 35 to 20 units and adopted a 20-percent density bonus for projects that include MPDUs. The reform also began allowing the affordable units to be provided off site in some cases.

[3] Va. Code Ann § 15.2-2304, https://law.lis.virginia.gov/vacode/title15.2/chapter22/section15.2-2304/.

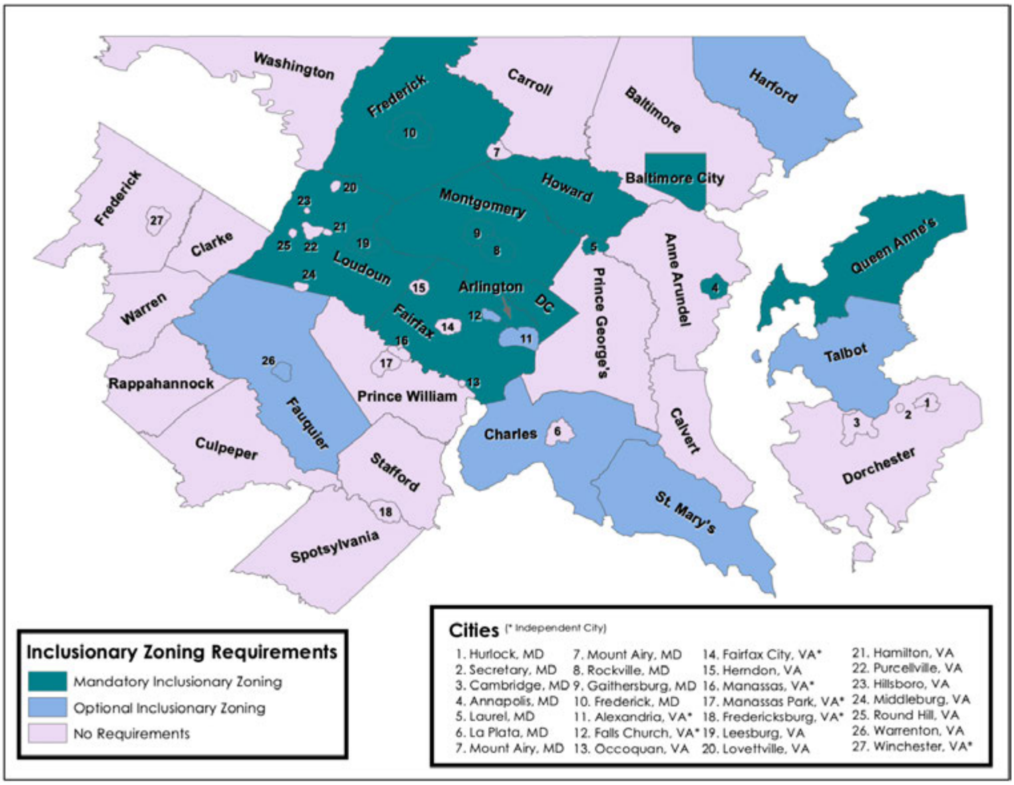
[4] Va. Code Ann § 15.2-2305, https://law.lis.virginia.gov/vacode/title15.2/chapter22/section15.2-2305/.

[5] Jurisdictions use various terms to refer to requirements or incentives for developers to provide below-market-rate housing. Aside from MPDU programs, other terms include bonuses for Affordable Dwelling Units or Workforce Dwelling Units. The author refers to all these programs as IZ throughout.

Most of the permitting in the Baltimore-Washington region is done at the county level, but some cities and towns are also permitting jurisdictions. Today, among the 26 permitting jurisdictions in Maryland within the Baltimore-Washington region, 14 have IZ programs, 5 of which are optional programs. Of the 28 Virginia permitting jurisdictions that are part of the Baltimore-Washington region, 8 have adopted IZ programs, 4 of which are optional. The District of Columbia adopted a mandatory IZ policy in 2009. The map in exhibit 1 shows mandatory and optional IZ programs across the region as of 2017.

Exhibit 1

Jurisdictions with Mandatory and Optional Inclusionary Zoning Programs, 2017

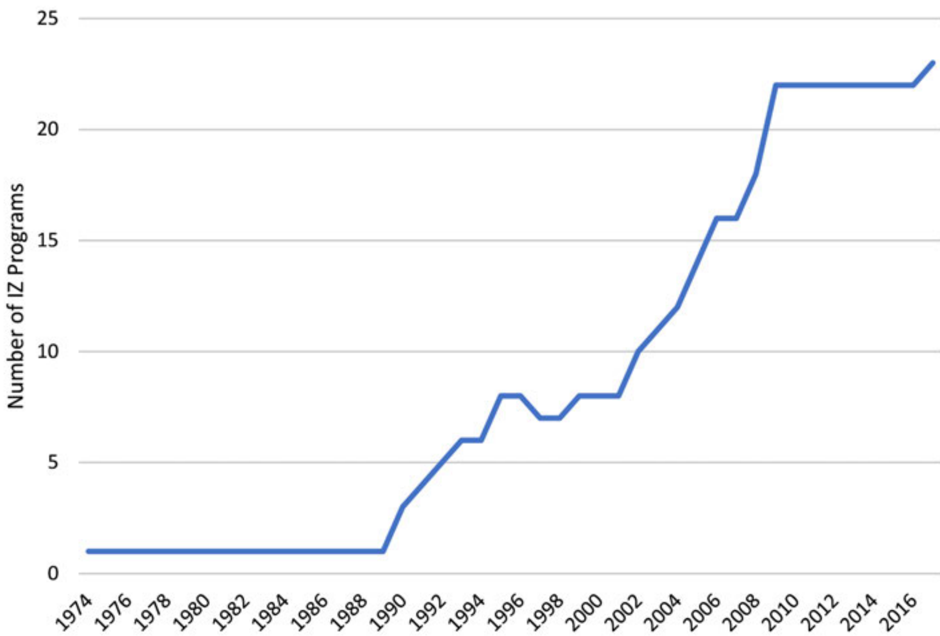


Sources: Illustration by Nolan Gray; data gathered from the zoning ordinances of the permitting jurisdictions in the Baltimore-Washington region

Aside from Fairfax County, whose first IZ program ended because of the Virginia Supreme Court ruling, Prince George's County, Maryland, is the only locality in the region to implement and then abolish an IZ program. In 1991, the county adopted an IZ program that applied to portions of the jurisdiction. County policymakers repealed the program in 1996 because, as a Brookings Institution report describes, county officials "believed that Prince George's County had more than its fair share of the region's affordable housing (Brown, 2001)." With this exception, the prevalence of regional IZ programs has increased steadily over time. Exhibit 2 shows the number of IZ policies in the region over time.

Exhibit 2

Number of Jurisdictions with Inclusionary Zoning in the Baltimore-Washington Region, 1974–2017



IZ = inclusionary zoning.
Source: Data gathered from the zoning ordinances of the permitting jurisdictions in the Baltimore-Washington region

Policymakers in the region have indicated awareness and concern about how their inclusionary zoning programs affect market outcomes. In 2015, 5 years after Washington, D.C., adopted a mandatory IZ program, two local organizations—the Coalition for Smarter Growth and the DC Fiscal Policy Institute—proposed amendments to the program that would require a larger percentage of IZ units and would target rental IZ units to households earning 60 percent of area median income (AMI) rather than 80 percent (Zippel and Cort, 2016). The organizations pointed out that housing affordable to residents earning 80 percent of AMI is available on the private market, whereas households earning 60 percent of AMI may struggle to find housing they can afford. These organizations also demonstrated that following the adoption of IZ in DC, the new housing supply continued its recovery following the 2008 financial crisis, providing evidence that the original program was not a tax on development—or at least not such a tax that it choked off new construction drastically. In response to their proposal, the Office of Planning revised its IZ program to require rental IZ units to be affordable to households earning 60 percent of AMI but kept the number of units required at 8 to 10 percent of the total number of new units in projects covered by IZ requirements.

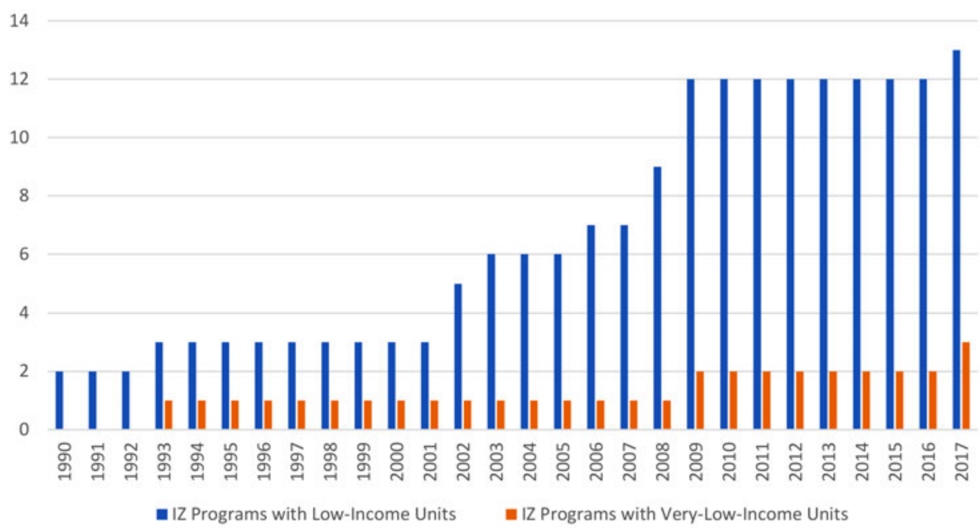
The recommendation to reduce the income limits for IZ units in D.C. was based on a model showing that the expected value of bonus density more than offset the cost of providing set-aside units under the original IZ program (Zippel and Cort, 2016). In adopting changes to increase the cost of subsidized units relative to bonus density, DC policymakers seemed to be seeking an IZ policy that produced as much income-restricted housing as possible while maintaining roughly the same amount of total new development permitted under its zoning regime before the adoption of IZ.

Aside from the distinction between mandatory and optional IZ programs, IZ policy varies widely across regional jurisdictions. Most of the regional jurisdictions with IZ programs offer density bonuses for affordable units, with the exceptions of Howard County and Gaithersburg, Maryland. The density bonuses that developers receive as a condition of providing affordable housing range from 10 to 100 percent of density that would be permitted without IZ. In some suburban jurisdictions, these density bonuses generally mean a reduction in minimum lot-size rules.

Following others in the IZ literature, the author defines IZ units that must be affordable to households making 50 percent or less of the AMI as applying to "low-income households" and those that must be affordable to households making less than 30 percent of the AMI as applying to "very low-income households." Until 1990, no IZ programs in the region included requirements to serve low- or very low-income households, but the number of IZ programs requiring set asides for lower income households has increased steadily since then. Exhibit 3 shows this trend over time.

Exhibit 3

Number of Inclusionary Zoning Programs that Require Units Affordable to Low- and Very Low-Income Households, 1990–2017



IZ = inclusionary zoning.

Note: Low-Income Units are affordable to households earning 50 percent of AMI, and Very-Low-Income Units are affordable to households earning 30 percent of AMI.

Source: Data gathered from the zoning ordinances of the permitting jurisdictions in the Baltimore-Washington region

Exhibit 4 provides additional information on some of the key details of the IZ programs in place in the region as of 2017. The author gathered all the data on IZ mandates and the details of programs from local land-use ordinances and special reports on IZ. In some cases in which these sources were ambiguous or incomplete, the author contacted planning offices for clarification via phone or email. An appendix provides citations to the IZ ordinances and reports from which the author's data come.

Exhibit 4

Inclusionary Zoning Policies in the Baltimore-Washington Region in 2017

Jurisdiction	Years IZ in Place as of 2017	Mandatory IZ	Number of Units that Triggers IZ Program	IZ Units Required (percentage)	Applies to Households Earning 50 Percent or Less of AMI	Applies to Households Earning 30 Percent or Less of AMI	Payment to Jurisdiction Allowed in Lieu of IZ Units	IZ units May Be Provided Off Site	Maximum Density Bonus (percentage)
Alexandria County, VA	23	No	5	9.0	No	No	Yes	Yes	30
Annapolis, MD	14	Yes	10	6.0	No	No	Yes	No	15
Arlington County, VA	13	Yes	50	5.0	No	No	Yes	Yes	25
Baltimore, MD	9	Yes	30	10.0	Yes	Yes	Yes	Yes	20
Charles County, MD	26	No	50	12.0	No	No	No	No	100
Fairfax County, VA	28	Yes	50	12.0	Yes	No	Yes	Yes	20
Falls Church, VA	16	No	0	6.0	Yes	No	Yes	No	20
Fauquier County, VA	23	No	2	20.0	No	No	No	No	100
Frederick County, MD	15	Yes	25	12.0	Yes	No	Yes	Yes	22
Frederick, MD	9	Yes	25	12.5	No	No	No	No	22
Gaithersburg, MD	12	Yes	20	15.0	Yes	No	Yes	No	0
Harford County, MD	9	No	0	10.0	Yes	No	No	No	20
Howard County, MD	19	Yes	0	10.0	No	No	Yes	Yes	0
Laurel, MD	10	Yes	50	6.0	Yes	No	No	No	6
Leesburg, VA	10	Yes	24	6.3	Yes	No	Yes	No	20
Loudoun County, VA	25	Yes	50	6.3	Yes	Yes	Yes	No	20
Montgomery County, MD	44	Yes	20	12.5	No	No	Yes	Yes	20
Queen Anne's County, MD	13	Yes	20	10.0	No	No	Yes	Yes	10
Rockville, MD	29	Yes	50	12.5	Yes	No	No	Yes	22
St. Mary's County, MD	16	No	0	12.0	Yes	No	No	No	10
Talbot County, MD	12	No	0	50.0	No	No	No	No	100
Warrenton, VA[6]	1	No	2	0.0	Yes	Yes	No	No	100
Washington, DC	9	Yes	10	8.0	Yes	No	No	No	20

AMI = area median income. IZ = inclusionary zoning.

Source: Data gathered from the zoning ordinances of the permitting jurisdictions in the Baltimore-Washington region; see the appendix for source information

[6] Warrenton does not require a set percentage of set-aside units for projects to participate in the density bonus program.

IZ programs in the region have varied widely in the number of income-restricted units they have produced. Among the jurisdictions with optional IZ programs, only Alexandria and Falls Church, Virginia, have produced any units. In addition to offering density bonuses in exchange for subsidized units, the Alexandria rule gives planners discretion to reduce parking requirements.[7] In jurisdictions where land is expensive, complying with parking requirements presents a large cost to developers, so this offset may be particularly valuable (Shoup, 1997). Falls Church offers reduction development fees in addition to density bonuses in exchange for affordable units.

Relative to other jurisdictions with optional IZ programs, Alexandria and Falls Church have high house prices. Among the author's full sample, the median per-square-foot house price in 2017 is $206. Among those with IZ, it is $239. Among the jurisdictions with mandatory versus optional programs, the medians are $247 and $210, respectively. The median price in Alexandria is $361 per square foot, and in Falls Church, it is $417, both well above the typical jurisdiction with an optional IZ program. These high prices are owing in large part to the jurisdictions' otherwise exclusionary zoning. Large parts of both municipalities permit only single-family, detached housing development.

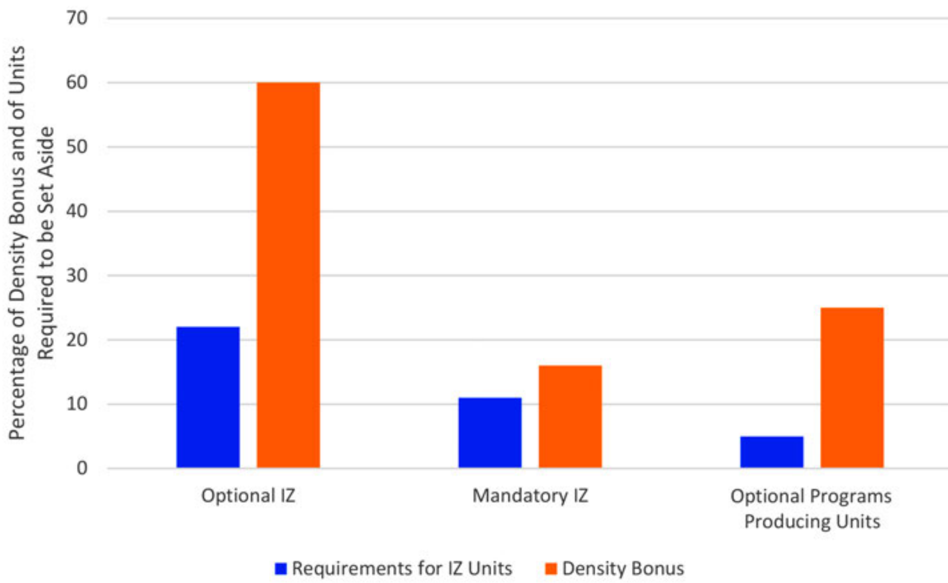
Alexandria's and Falls Church's limitations on the rights to build housing give their density bonuses value. Because they permit much less housing than what developers would provide absent land-use regulations, developers are willing to provide affordable housing in exchange for the right to build valuable market-rate housing. In other jurisdictions with optional programs, typical land-use regulations are likely less binding, so density bonuses are less of an incentive for providing subsidized units. In these jurisdictions, the value of the density bonuses may not outweigh the cost of providing below-market-rate units.

On the whole, the ratio of density bonuses relative to below-market-rate units that optional IZ programs would require is much larger than under mandatory programs. Alexandria and Falls Church have larger density bonuses and require fewer IZ units than the typical mandatory IZ program. This finding provides some evidence that density bonuses under the region's mandatory programs are not large enough to offset the cost of providing IZ units; consider that Alexandria's program, with high density bonuses relative to the typical mandatory program, has delivered only 17 IZ units per year on average (with a population of about 160,000 in 2017), and Falls Church has delivered fewer than 5 units per year on average (with a population of about 14,500 in 2017). It may also be the case, however, that density bonuses in other jurisdictions offer little value because their traditional zoning regulations are not a major constraint on new housing supply. Exhibit 5 shows average IZ unit requirements and density bonuses for all optional programs, mandatory programs, and optional programs that have produced IZ units.

[7] City of Alexandria, VA, Municipal Code. 1995. Article VII: Supplemental Zone Regulations, Sec. 7-700. https://library.municode.com/va/alexandria/codes/zoning?nodeId=ARTVIISUZORE_S7-700ALINFLARRADEHEREREOREPAINPRLODCOHO.

Exhibit 5

Mean IZ Requirements and Density Bonuses Across Program Types



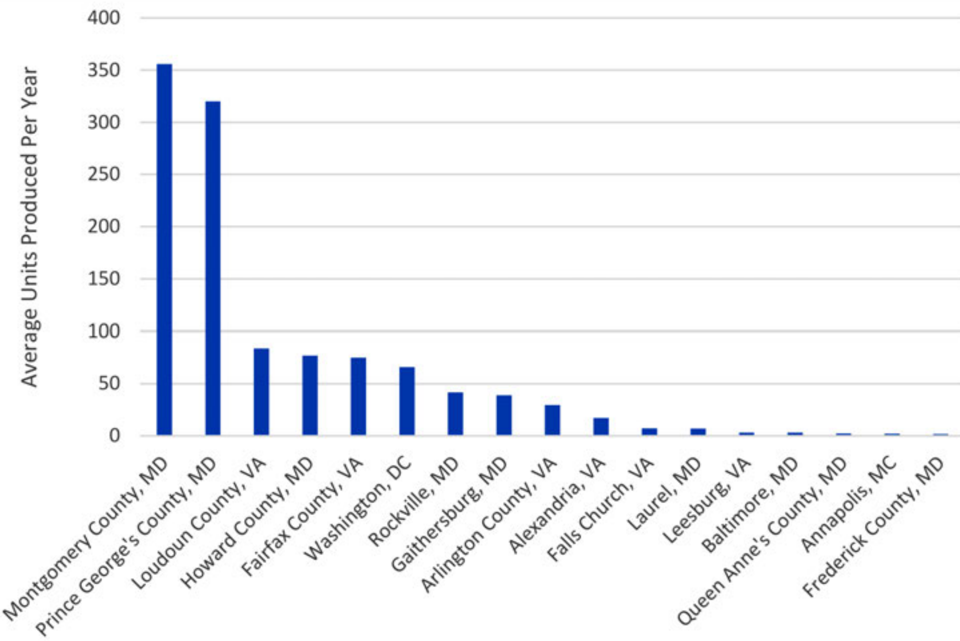
IZ = inclusionary zoning.

Sources: Author's calculations; data gathered from the zoning ordinances of the permitting jurisdictions in the Baltimore-Washington region

More than one-half of the IZ units in the entire region have been built in Montgomery County (15,660 of 26,733 units). This result is partly because of the program's long history, but Montgomery County's program is also the most productive on an annual basis. Exhibit 6 shows the production of IZ units by jurisdiction, per year the IZ program has been in place.

Exhibit 6

IZ Units Produced Under the Baltimore-Washington Region's IZ Programs per Year of Program, 1974–2017



IZ = inclusionary zoning.
Source: Data gathered from permitting jurisdictions' reports on their IZ programs, supplemented with conversations with planning staff when necessary

One complicating factor in studying the effect of IZ on overall housing supply and prices is that many jurisdictions' IZ programs give city planners broad discretion to determine requirements on a site-by-site basis. For example, many of the large multifamily buildings permitted since Washington, D.C., adopted IZ have received approval through the city's planned unit development (PUD) process that allows projects that deviate from the city's by-right zoning to be built. When developers receive approvals through the PUD process, they are required to provide a benefits and amenities package to the project's neighborhood. Often these packages include more affordable housing units and units that are affordable to lower income households than would otherwise be required under the city's inclusionary zoning ordinance. The requirement to provide additional affordable units as a result of negotiations between the developer, the city's Zoning Board of Adjustments, and other vested interests is not reflected in the de jure ordinances.

Additionally, local policymakers have often granted themselves discretion to waive IZ requirements on a project-by-project basis. Baltimore city's IZ program has produced only 27 units since it went into effect in 2009. The city's IZ ordinance provides for a 20-percent density bonus, but if developers are able to show that this bonus does not compensate them for the cost of providing the IZ units, they can receive waivers from complying with the requirement (Baltimore City Department of Legislative Reference, 2016). As a result of these waivers, the IZ units produced have fallen far short of what the ordinance would seem to require, and the program is having less of an effect on the city's housing market as a whole (Sherman, 2014).

Thirteen jurisdictions allow developers to pay fees rather than provide affordable units in a mixed-income building. In some cases, the revenue these programs raise has become unmoored from the narrow goals that are typically associated with IZ. Arlington County, Virginia, has collected more fees in lieu of IZ units than any other jurisdiction in the region. The fees collected from developers go into the county's Affordable Housing Trust Fund. These funds are used to build homeless shelters and projects that consist of entirely subsidized housing. In these cases, fees collected do not meet typical IZ objectives of supporting mixed-income housing, but they are in line with the county's stated goal of directing subsidies for its least well-off individuals (Arlington County, 2015).

Finally, in some cases, the complex array of an IZ program's taxes and subsidies has little effect on ultimate rent prices for IZ units relative to market-rate units. For example, one Washington, D.C., project built in 2016 includes units affordable to households earning 30 percent, 60 percent, 100 percent, and 120 percent of area median income. In many cases, the units affordable to households earning 100 to 120 percent of AMI receive only a slight subsidy of less than $100 per month relative to market rents (Chaffin, 2018). The discrepancy between real-world IZ implementation and stated policies presents a challenge to measuring their effects empirically.

The Economic Theory of IZ

Given that IZ programs vary widely in their implementation, economic reasoning will predict different effects on housing market outcomes from different specific programs. Exhibit 7 describes how common aspects of IZ programs can be expected to affect new housing supply and, in turn, prices, all else equal. An explanation of how each aspect of IZ programs can be expected to affect housing markets follows.

Exhibit 7

Inclusionary Zoning Components' Expected Effects on New Housing Supply and Prices

Policy	Expected Effect on New Building Permits	Expected Effect on Market-Rate House Prices
Density bonus	↑	↓
Percentage of new units required to be income restricted	↓	↑
Income-restricted units for lower income residents	↓	↑
Years IZ units are income restricted	↓	↑
Developer allowed to make a payment to the jurisdiction in lieu of building IZ units	↑	↓
IZ units allowed to be built off site	↑	↓
Applies to both multifamily and single-family development	↓	↑
IZ program applies to entire jurisdiction	↓	↑
Minimum project size to which IZ program applies	↓	↑
Participation in IZ program is optional	↑ or no effect	↓ or no effect
Participation in IZ program is mandatory	↑, ↓, or no effect	↑, ↓, or no effect

IZ = inclusionary zoning.

Components of typical IZ programs contribute to the "IZ tax," whereas others are an "IZ subsidy." Exhibit 7 considers how the variables of an inclusionary zoning program, relative to a hypothetical inclusionary program with different requirements, could be expected to affect housing market outcomes as either a tax or subsidy to market-rate construction. For example, the primary IZ subsidy to development is the density bonus that developers usually receive when they are required to provide IZ units under mandatory IZ programs or are incentivized to provide them under optional programs. An inclusionary zoning program with a larger density bonus is a subsidy to market-rate housing construction relative to a smaller density bonus. Allowing for more potential units under current zoning is the key way IZ programs may increase new housing supply and, in turn, potentially lower market-rate prices and produce new subsidized units.

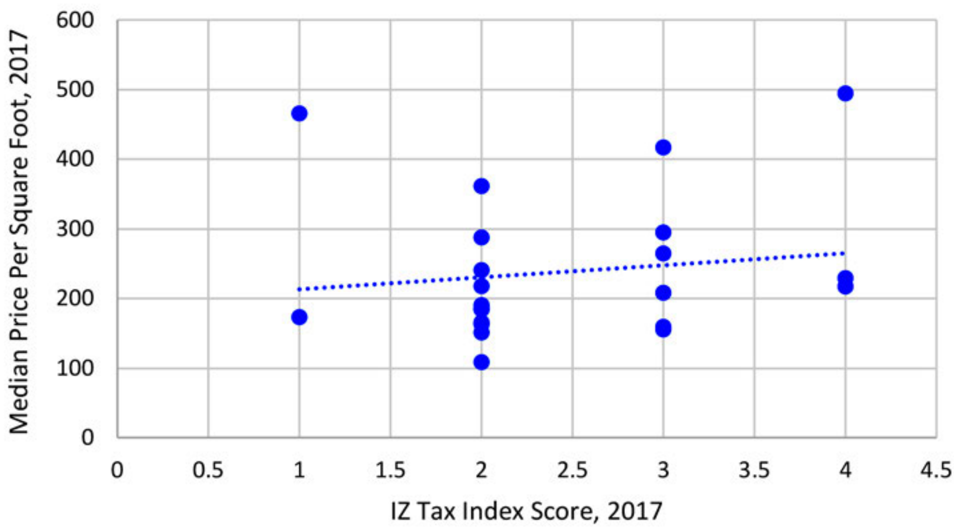
The IZ tax consists of the cost of providing IZ units, which includes several components. The percentage of total new units required to be subsidized, the requirement of IZ units to be affordable to lower income residents, and the length of time that the IZ units must remain subsidized all contribute to the cost of complying with the program relative to an inclusionary zoning program with which these requirements are less costly to comply.

Finally, some programs include flexibility for developers to comply in ways that reduce their cost. In the case of mandatory IZ programs that, as a whole, tax new housing construction, introducing flexibility will reduce the IZ tax, holding other aspects of the program constant. In some jurisdictions, developers are permitted to contribute to an affordable housing fund in lieu of providing units. If the required contribution is less than the cost of providing subsidized units over the required affordability period, this option will reduce the program's tax. Similarly, some programs allow developers to provide affordable units at a site other than where the new market-rate units are built. This option may reduce the cost of the IZ units if, for example, they are built in a mid-rise building with lower per-unit construction costs than new market-rate units in a high-rise building. In some cases, IZ programs apply only to multifamily developments or single-family developments. If the IZ program as a whole is a tax on development, but it only applies to new multifamily construction, new supply can move to single family rather than multifamily; this move would cause a smaller decline in new construction and a smaller increase in market-rate prices than the program would have caused otherwise. Similarly, when IZ requirements apply to only a portion of the jurisdiction, developers may move construction to the exempted portions rather than reduce it overall. IZ programs vary in the size of new development to which they apply. Projects that apply only to large new developments may allow new construction to continue apace if developers are able to avoid the IZ tax by building more smaller new housing projects.

To explore the relationship between the characteristics of IZ programs and housing market outcomes, the author creates two indices of characteristics of these programs. The first, the IZ tax index, measures the five key factors that add to project costs under IZ programs. These five components are the minimum project size IZ requirements apply to, equal to 1 if IZ applies to projects of 20 units or fewer (the median project size that triggers IZ); the second component is the percent of set-aside units required, equal to 1 if the program requires at least 11 percent of units to be below market rate (the median requirement); the third component is the minimum affordability period, equal to 1 if units are required to be set aside for 30 years or more (the median requirement); the fourth component is equal to 1 if IZ units are required to be affordable to low- or very low-income households; and the fifth component is equal to 1 if the program is mandatory. Exhibit 8 shows the positive relationship between the IZ tax and median per square foot house prices in 2017 among jurisdictions with mandatory or optional IZ programs.

Exhibit 8

House Prices and the Inclusionary Zoning Tax Index in 2017

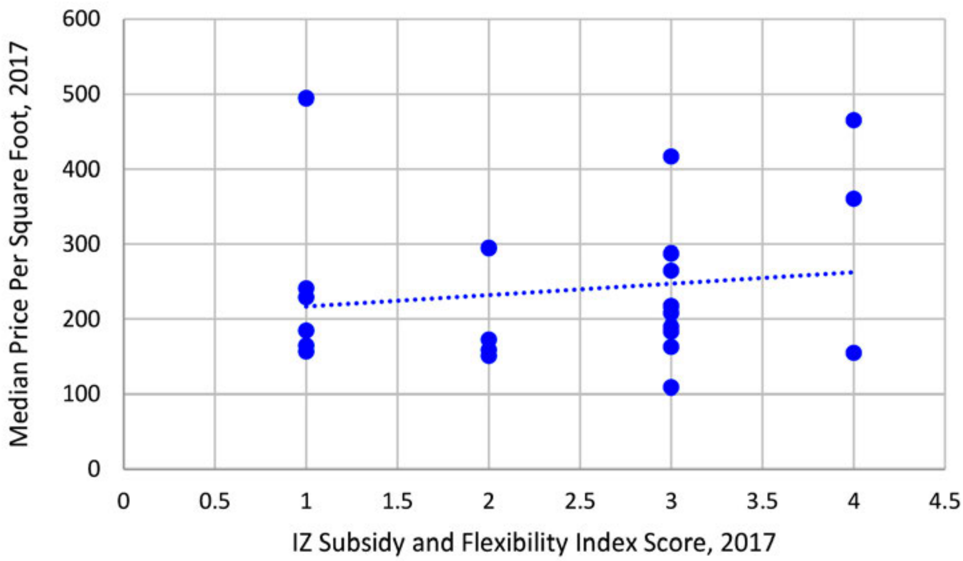


IZ = inclusionary zoning.
Sources: Zillow Research and author's calculations based on the IZ ordinances in the Baltimore-Washington region (ordinances available in the appendix)

A second index, the IZ subsidy and flexibility index, measures five factors that either subsidize housing construction under IZ or reduce the cost to developers of complying with program requirements. The first component is equal to 1 if the maximum density bonus is greater than or equal to 20 percent (the median highest potential bonus across programs); the second component is equal to 1 if developers have the option to make a payment to the locality in lieu of providing IZ units; the third component is equal to 1 if IZ units may be provided off site; the fourth component is equal to 1 if the IZ requirement applies to only part of the locality; and the fifth component is equal to 1 if the IZ program is optional. Exhibit 9 shows the relationship between this index and median per-square-foot house prices in 2017 among jurisdictions with mandatory IZ programs. Again, the correlation is positive. IZ programs in more expensive jurisdictions tend to have more costly requirements to comply with and more factors that potentially offset these costs.

Exhibit 9

House Prices and the Inclusionary Zoning Subsidy and Flexibility Index in 2017



IZ = inclusionary zoning.
Sources: Zillow Research and author's calculations based on the IZ ordinances in the Baltimore-Washington region (ordinances available in the appendix)

Ideally, studies of the effects of IZ on housing market outcomes would consider the nuances of each IZ program. Bento and his coauthors come closest by controlling for IZ programs that apply to projects with 10 or fewer housing units and programs that apply to low-income households (Bento et al., 2009). In the author's study, the sample size is, unfortunately, too small to include IZ program characteristics beyond distinguishing between optional and mandatory programs in the regression analysis that follows.

In addition to the disparate effects from each aspect of an IZ program, the programs will have different effects over time. On the supply side, IZ programs that are a tax on development can be expected to reduce new housing supply as soon as the program goes into effect. They may lead to a spike in permits before their implementation if developers know that an IZ tax will affect development in the future and advanced notice of the coming IZ requirement gives them an opportunity to secure building permits before the program takes effect. On the price side, the effects of IZ can be expected to increase the longer the program is in place. Whether an IZ program as a whole is a tax or a subsidy, its effects on price will increase the longer the program affects a city's new housing supply and, in turn, its total housing stock.

Because housing in one jurisdiction is a substitute for housing in nearby jurisdictions, IZ programs may affect market outcomes not only in the jurisdiction that implements them but in neighboring jurisdictions as well. If an IZ program is a tax on development, it can be expected to reduce new housing supply in the jurisdiction that implements it while increasing supply in nearby localities, where development can be expected to become relatively more profitable. On the price side, an IZ program that taxes development can be expected to raise prices in the jurisdiction that implements the program and to also cause a smaller price increase in nearby jurisdictions.

De jure and de facto IZ programs often differ significantly, creating challenges for estimating the effects of an IZ program on market outcomes. In many jurisdictions, the permitting process for each major project is a negotiation between a developer and city officials. This process may result in actual IZ requirements being greater or less than the policy would seem to require. In the author's empirical work, she uses the number of IZ units produced relative to a jurisdiction's population as a proxy for the program's expected effect on house prices and new housing supply. The following section explains the data on IZ in the Baltimore-Washington region that the author uses to test the effects of IZ on house prices and new building permits.

Data

The sample the author uses in her analysis includes the 56 permitting jurisdictions in the Baltimore-Washington Combined Statistical Region that are in Maryland, Virginia, and the District of Columbia. These are 28 counties, 5 independent cities, 22 cities and towns that are within counties, and the District of Columbia. The author excludes the region's jurisdictions in West Virginia, Pennsylvania, and Delaware. None of these jurisdictions have IZ programs. Twenty-four jurisdictions in her sample have or have had IZ programs, 16 mandatory and 8 optional. Within the time period for which the author has data on new housing supply, 20 jurisdictions adopted IZ, and Prince George's County repealed it. Within the time period for which the author has data on house prices, 16 jurisdictions adopted IZ.

In coding each jurisdiction's IZ ordinance, the author uses some discretion in determining how to categorize specific features of each program. The program in Arlington County, Virginia, is ambiguous in whether it is mandatory or optional. The county does not require developers to provide affordable units in any projects that are permitted by right. The county does require IZ units for any projects that require a site plan review, however. The median project size that triggers IZ requirements in the region is 20 units. Any project of 20 units or more in Arlington will very likely go through the site plan review process, so the author classifies this program as mandatory.

The most difficult data to gather, and potentially the least accurate data in the author's dataset, are the number of units that have been built in each jurisdiction and the fees they have collected in lieu of affordable units. These data are in dispersed places if jurisdictions report it at all. Montgomery County, Maryland; Washington, D.C.; and Arlington and Alexandria, Virginia, provide excellent reports on their IZ programs, including detailed information on the number of units produced and fees collected, where applicable. For other jurisdictions, the author pieced together information from their websites, conversations with planning staff, news reports, and reports from other researchers to develop the most accurate dataset possible. In some cases, the author obtained data on the total number of IZ units produced, but not the year in which each unit was delivered. In those cases, the author used the average number of units produced for each year of the program's existence. If the author's data on the number of units produced and fees collected are not accurate, they are likely biased toward 0 because planning staff in jurisdictions with IZ programs that produce few units may not know about a small number of units produced in the past. The author's data reflect the total number of IZ units produced under each program, to the best of the author's knowledge, but not all these units are still income restricted.

To isolate the effect of IZ on housing supply and house prices, ideally, a model would control for the effect of a jurisdiction's other land use regulations on these outcome variables. Simply controlling for the existing land use regulations across jurisdictions will not be an effective control, however, because the effect of the same regulations on house prices and new housing supply will vary across jurisdictions. The effect of, say, a minimum lot-size regulation on housing supply and prices will be heterogeneous. For example, a 10,000-square-foot minimum lot-size requirement in a jurisdiction where the market would otherwise provide multifamily housing will have a much larger effect on housing supply and prices than the same regulation would have in a jurisdiction where the market would provide single-family homes on 5,000-square-foot lots.

Rather than attempt to control for the effects of land use regulations on the author's dependent variables of interest, she restricts her analysis to those jurisdictions where IZ was introduced at a distinct time from other land use regulations. Most of the jurisdictions in the author's sample introduced IZ with a stand-alone IZ ordinance rather than including IZ as a component of a larger zoning rewrite. The exceptions are Loudoun County, Virginia, which adopted IZ and a new zoning ordinance in 1993; Annapolis, Maryland, in 2004; and Harford County, Maryland, in 2008. The author excludes these three jurisdictions from her regressions because she is unable to isolate the effect of IZ relative to other land use policies introduced at the same time. After this, the author is left with a sample of 53 jurisdictions, 7 with optional IZ programs and 13 with mandatory IZ programs.

To measure the effect of IZ on house prices, the author uses Zillow data on median per-square-foot house prices.[8] Zillow researchers provide an index that mimics the price of a constant set of homes in each jurisdiction over time, using both actual sale data and data on the hedonic factors that affect house value, even among houses that are not sold during the period. Zillow uses its Zestimate value for each home in a jurisdiction to identify an estimate of the median home in that jurisdiction (Zillow Research, 2014). Zillow has found its Zestimates to be unbiased (Zillow Research, 2014). Relative to repeat sales indices, Zillow's methodology better reflects the effect of new-construction homes on median prices and any type of housing that is relatively unlikely to be sold during the period of interest because repeat sales indices can provide information about only housing that has been sold twice in the time period they include.

Permitting jurisdictions in the Baltimore-Washington region include counties, independent cities, and incorporated cities and towns that do their own permitting. Zillow provides price data at the county level, which include any towns and cities within those counties, and at the city level. Counties with incorporated towns or cities that issue building permits require an adjustment to isolate the prices for homes in the county outside other permitting jurisdictions because the county-level median price data reflect the permitting jurisdiction(s) within the county and the areas of the county under county-level land use regulations. The author uses the number of households in each jurisdiction from decennial censuses and the American Community Survey (ACS) to take a weighted average of the prices of incorporated jurisdictions relative to county prices to isolate the median price at the county level.

[8] Because Zillow has made its estimates available, economists have been using them in real estate research. See, for example, Goodman and Mayer, 2018.

For measuring the effect of inclusionary zoning on new housing supply, the author uses jurisdictions' total permitted housing units from the U.S. Census Bureau's Building Permits Survey (BPS). This data source is not perfect for new housing supply because it reflects gross new housing permits rather than permits net of demolitions. Additionally, not all permitted housing ends up being built, and the rate of building to permits may vary across jurisdictions. In spite of those problems, the BPS is used widely as a supply variable in the housing literature, including in some work on the effects of IZ on housing supply.[9]

The author uses demographic control variables from the ACS and from the decennial census at the county level and place level in the years in which they are available. The author uses linear interpolation to fill in these control variables in the years in which they are not available, including non-Census years before the start of the ACS in 2005 and the years in which not all demographic controls are available for places in the ACS. Margaret M. Weden and her coauthors provide support for using linear interpolation for Census demographic controls in longitudinal studies at the county level (Weden et al., 2015). Exhibit 10 provides summary statistics for the author's data on house prices, housing permits, demographic data, and mandatory and optional IZ.

Exhibit 10

Summary Statistics for All Available Observations

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Price per square foot	864	163.70	75.46	43	495
Residential unit building permits	1,320	756.40	1,172.21	0	7,898
Inclusionary zoning	2,645	0.12	0.33	0	1
Mandatory IZ	2,645	0.09	0.28	0	1
Optional IZ	2,645	0.04	0.19	0	1
Inclusionary units built	2,645	9.16	60.43	0	1224
Population	1,483	148,397	252,472	54	1,142,234
Population density	1,445	1,909.71	2,142.59	24.8	10,154.7
Median household income	1,367	63,632.28	21,767.46	20,185	148,750
Mean commute time	1,378	31.49	5.62	16.6	63
Percentage over age 25 with bachelor's degree or higher	1,371	28.48	14.93	2.5	80.9
Percentage of White non-Hispanic householders	1,366	75.14	16.79	16.1	100

IZ = inclusionary zoning. Max. = maximum. Min.= minimum. Std Dev = standard deviation.

Note: These observations include the years 1994–2017 for house prices, 1990–2017 for building permits and demographic controls, and 1970–2017 for IZ policy.
Sources: Zillow Research, Building Permits Survey, IZ ordinances in the Baltimore-Washington region (available in the appendix), and the U.S. Census Bureau

[9] For example, Schuetz, Meltzer, and Been (2011) use it in their research on the effects of IZ on housing supply.

The observations the author is able to use in her regression analysis range from 561 to 1,082, depending on the specification. Her spatial regressions require strongly balanced panels, causing them to have fewer observations than the standard panel regressions.

Model

The author uses a difference-in-difference study design and a two-way fixed-effects model to estimate the effect of IZ on new housing supply and prices by comparing the change in these outcome variables after jurisdictions adopt IZ to outcomes in jurisdictions that have not adopted it.

Endogeneity is a potential identification problem in this research—if IZ correlates with higher market-rate housing prices, this correlation could be either because of an IZ tax that reduces new housing supply and drives up house prices or because localities adopt IZ programs in response to high and rising prices. To test whether localities adopt IZ in response to price spikes, the author uses a two-way fixed-effects model to estimate whether the years before a jurisdiction adopts an IZ program correspond with price increases. Equation 1 shows this model:

$$P_{jt} = \beta_0 + \beta_1 I_{jt-1} + \beta_2 I_{jt-2} + \beta_3 I_{jt-3} + u_j + v_t + \varepsilon_{jt} \quad (1)$$

Here P_{jt} is the log of median per-square-foot house price at the level of permitting jurisdiction j at time t. I_{jt-1} is a dummy variable indicating whether a permitting jurisdiction adopted a mandatory or optional IZ program in the following year; I_{jt-2} indicates whether the jurisdiction adopted IZ 2 years later; and I_{jt-3} indicates adoption 3 years later. The coefficients on the IZ leads are positive and insignificant, with the exception of the indicator on the 2-year lag, which is significant at only the 10-percent level. Exhibit 11 shows the full results of this model.

Exhibit 11

House Prices in the Years Preceding Inclusionary Zoning Implementation, 1994–2017

Variables	Ln (price per sq. ft.)
One year before IZ	0.013 (0.018)
2 years before IZ	0.016* (0.016)
3 years before IZ	0.021 (0.020)
Constant	4.390*** (0.000)
Jurisdiction fixed effects	Yes
Year fixed effects	Yes
Observations	608
R-squared	0.954
Number of Jurisdictions	38

IZ = inclusionary zoning. Ln = natural log.

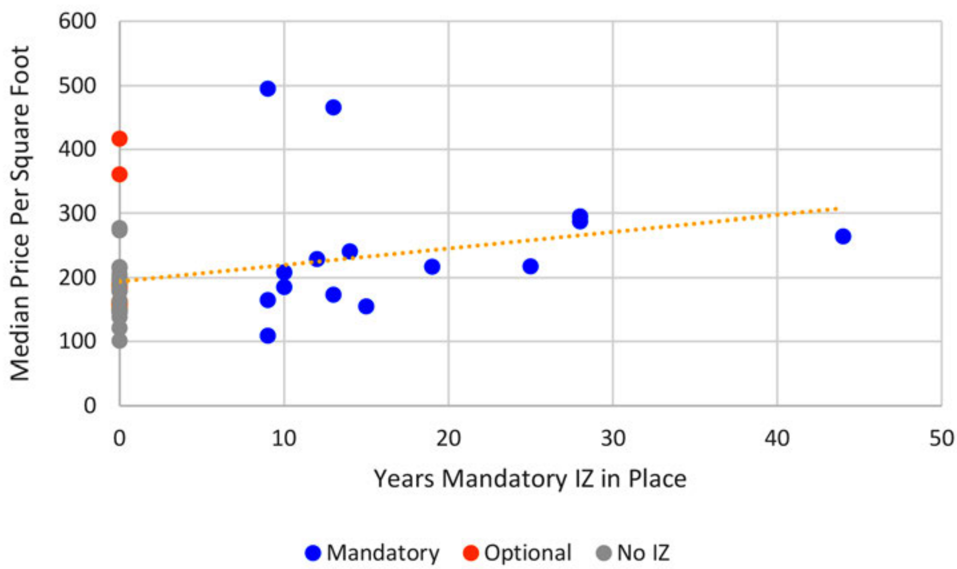
*Notes: Robust standard errors clustered by jurisdiction in parentheses. *** represents p < 0.01, ** represents p < 0.05, * represents p < 0.1.*

These findings are somewhat mixed but generally indicate that IZ does not seem to be implemented in response to large price spikes. This pre-trends test does not account for potentially omitted variables that could explain both the adoption of IZ and house price increases following the adoption of IZ, however.

Next, the author examines the effect of IZ programs on median per-square-foot prices at the permitting jurisdiction level. Because IZ can be expected to affect prices over time, with little or no effect on prices before its effect on new housing supply has had cumulative effects on the jurisdiction's total housing stock, the author examines the relationship between the number of years a mandatory IZ program has been in effect and per-square-foot house prices. The following figures illustrate this relationship. Exhibit 12 includes all jurisdictions, and exhibit 13 includes only jurisdictions that have mandatory IZ programs in place as of 2017.

Exhibit 12

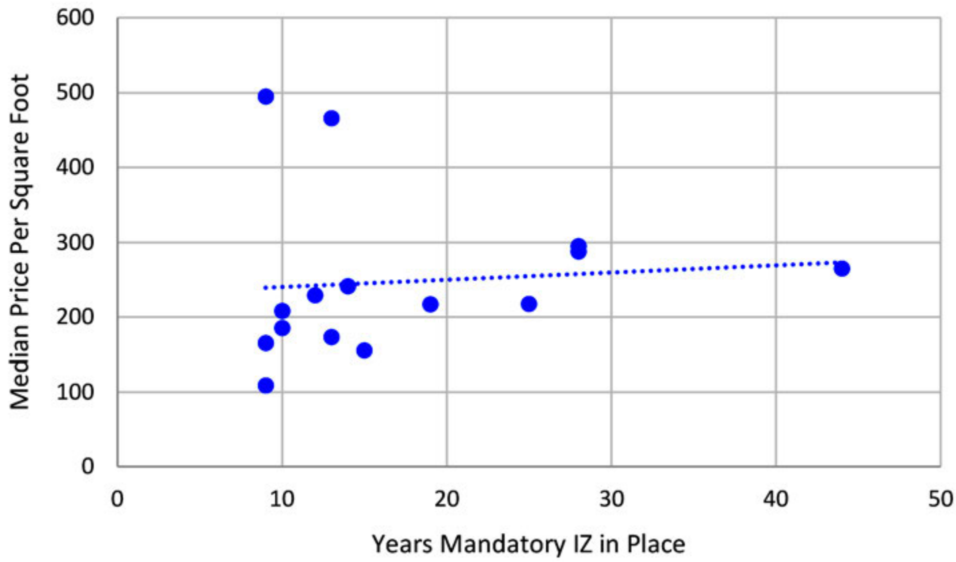
Years Mandatory Inclusionary Zoning Enforced and 2017 Per-Square-Foot House Prices Among Full Sample of Jurisdictions



IZ = inclusionary zoning.
Sources: Zillow Research and IZ ordinances in the Baltimore-Washington region (ordinances available in the appendix)

Exhibit 13

Years Mandatory Inclusionary Zoning Enforced and 2017 Per-Square-Foot House Prices Among Jurisdictions with Mandatory Inclusionary Zoning



IZ = inclusionary zoning.
Sources: Zillow Research and author's calculations based on the IZ ordinances in the Baltimore-Washington region (ordinances available in the appendix)

The author takes advantage of the difference between mandatory and optional programs in her sample to distinguish between programs that are likely to affect housing markets versus those that are not. Because jurisdictions with optional programs have adopted these affordability policies, it can be surmised that they share some characteristics with the jurisdictions that have mandatory programs, including policymakers who express concern for affordability and a willingness to provide density bonuses in exchange for below-market-rate units. Because the optional programs, except for those in Alexandria and Falls Church, have not produced IZ units, however, the adoption of these programs should not have an effect on house prices and housing supply within the jurisdiction.

The author first tests the effect of mandatory IZ programs on house prices and supply, using jurisdictions with no IZ program as the control group. Then the author separately tests the effect of optional IZ programs, dropping Alexandria and Falls Church, with jurisdictions with no IZ program as the control group. The author's dependent variable is P_{jt}, again the log of median per-square-foot house prices in jurisdiction j at time t. As explained previously, the author's independent variable of interest is the number of years an IZ program has been in place, Y_{jt}, as shown in equation 2:

$$P_{jt} = \beta_0 + \beta_1 Y_{jt} + u_j + v_t + \varepsilon_{jt}$$

Exhibit 14

Effect of Length of Mandatory Inclusionary Zoning Programs on House Prices

Variables	1 Ln (price per sq. ft.)	2 Ln (price per sq. ft.)	3 Ln (price per sq. ft.)
Number of years of mandatory IZ	0.011*** (0.0026)	0.0081*** (0.0018)	0.011* (.0061)
Ln (median household income)		0.0026 (0.13)	1.6*** (.087)
Population density		0.00012 (0.000029)	0.000031 (0.000039)
Mean commute time		–0.0057044 (0.0038)	–0.0019 (.0053)
Percentage over age 25 with bachelor's degree or higher		–0.0019 (0.00081)	–0.0026 (.0016)
Percentage of White non-Hispanic householders		0.0074 (0.0028)	–0.0031 (0.0028)
Constant	4.420*** (0.020)	3.830*** (1.332)	4.390*** (0.000)
Jurisdiction fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	
Spatial autoregression			Yes
Number of years of mandatory IZ x year			Yes
Spatial autocorrelation λ			3.50 (2.21)
Observations	734	690	561
R-squared	0.947	0.955	
Pseudo R-squared			0.113
Number of jurisdictions	35	35	33

IZ = inclusionary zoning. Ln = natural log.

*Notes: Robust standard errors clustered by jurisdiction in parentheses. *** represents $p < 0.01$, ** represents $p < 0.05$, * represents $p < 0.1$. In the maximum likelihood estimation, the pseudo R^2 is {corr(y.ŷ}2.*

Sources: Zillow Research, IZ ordinances in the Baltimore-Washington region (available in the appendix), and the U.S. Census Bureau

Column 1 in exhibit 14 shows the results of this basic specification. The author finds that each year of a mandatory IZ program can be expected to increase per-square-foot house prices by 1.1 percent, significant at the 1-percent level. In column 2, the author adds demographic controls, which reduces the coefficient of interest to 0.81 percent. The demographic controls are all small and insignificant.

In column 3, the author moves to a spatial model. The "IZ tax" that increases prices in the jurisdiction that adopts it can also be expected to increase prices in nearby jurisdictions because real estate markets are competitive across borders. To account for this, the author uses a model with spatial lags. The author creates a weighting matrix, *W*, of the inverse distance between the centroid of each jurisdiction relative to the other jurisdictions in the region, weighted by the jurisdiction's share of the region's total population. The author uses the maximum likelihood estimation method Lung-fei Lee and Jihai Yu developed to estimate the effect of Y_{jt} on P_{jt} with a spatial lag on price (Lee and Yu, 2010). Because this model does not allow for year fixed effects with the author's sample size, the author instead uses an interaction term of year and the number of years the jurisdiction's IZ program has been in place, as shown in equation 3:

$$P_{jt} = \lambda W_j P_{jt} + \beta_0 Y_{jt} + \beta_1 \left(Y_{jt} \times T_j \right) + u_j + \varepsilon_{jt}$$
$$\varepsilon_{jt} = \rho W \varepsilon_{jt} + v_{jt},$$

where ε_{jt} is a spatially autoregressive error term. In this specification, the author finds that 1 additional year of a mandatory IZ program can be expected to increase per-square-foot home prices by 1.1 percent, indicating that the model represented in equation 2 may understate the effect of mandatory IZ on price. The spatial autocorrelation coefficient λ is not quite significant at the 10-percent level. In this specification, all the demographic controls are small and insignificant except for the natural log of median income, which is large, positive, and significant at the 5-percent level.

The author turns next to testing the effects of optional IZ requirements on price after dropping Alexandria and Falls Church. Because those programs have not produced IZ units, the author expects them to have no effect on price. The results from these models are reported in exhibit 15.

As expected, the coefficient on the number of years an optional program has been in place is small and insignificant in column 1. After including the demographic controls in column 2, the coefficient of interest remains insignificant. Population density is the only significant demographic control, and it is positive and small.

Exhibit 15

Effect of Length of Optional Inclusionary Zoning Programs on House Prices (1 of 2)

Variables	1 Ln (price per sq. ft.)	2 Ln (price per sq. ft.)
Number of years of optional IZ	0.00086 (0.0022)	0.0018 (0.0016)
Ln (median household income)		–0.028 (0.11)
Population density		0.000073*** (0.000023)
Mean commute time		–0.0026 (0.0030)
Percentage over age 25 with bachelor's degree or higher		–0.0017 (0.0012)
Percentage of White non-Hispanic householders		0.0019 (0.0014)
Constant	4.37*** (0.0234)	4.57*** (1.21)

Exhibit 15

Effect of Length of Optional Inclusionary Zoning Programs on House Prices (2 of 2)

Variables	1 Ln (price per sq. ft.)	2 Ln (price per sq. ft.)
Jurisdiction fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
Observations	560	524
R-squared	0.957	0.955
Number of jurisdictions	27	27

IZ = inclusionary zoning. Ln = natural log.

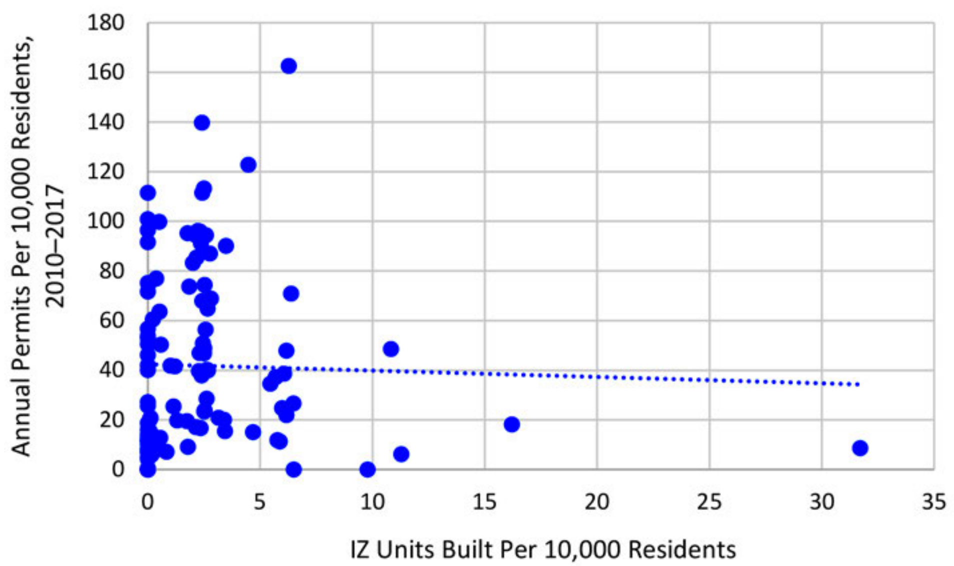
*Notes: Robust standard errors clustered by jurisdiction in parentheses. *** represents p < 0.01, ** represents p < 0.05, * represents p < 0.1.*

Sources: Zillow Research, IZ ordinances in the Baltimore-Washington region (available in the appendix), and the U.S. Census Bureau

The author turns now to the effects of IZ on new housing supply. Exhibit 16 shows the relationship between the number of units produced under mandatory IZ programs per 10,000 residents and the average number of housing units permitted per 10,000 residents from 2010 to 2017, the period for which all mandatory IZ programs in the author's sample have been in place for 1 year or more. The author uses this variable as a proxy for the size of the IZ program's effect on its jurisdiction's housing market. Mandatory IZ requirements that are commonly waived, such as in Baltimore, will produce few units and, in turn, will have little effect on housing market outcomes. Similarly, IZ programs that are enforced will have little effect on the jurisdiction's housing market if they apply only to large projects and if developers can avoid them if they are a tax on development.

Exhibit 16

Per Capita Housing Units Permits Per Capita and Mandatory Inclusionary Zoning Units Produced Per 100 Permits for All Programs, 2010–2017



IZ = inclusionary zoning.

Sources: Building Permits Survey and data on local IZ units built (available in the appendix)

The author uses the same two-way fixed-effects approach to estimate the effect of mandatory inclusionary zoning programs on total new residential units permitted, as shown in equation 4:

$$T_{jt} = \beta_0 + \beta_1 U_{jt} + u_j + v_t + \varepsilon_{jt}$$

On the supply side, the author's dependent variable is the log of total residential units permitted, T_{jt}, following Schuetz, Meltzer, and Been's (2011) research on the effects of IZ on housing supply. The author's independent variable of interest, U_{jt}, is the number of IZ units delivered under a mandatory IZ program in jurisdiction *j* in year *t* per 10,000 residents, as explained previously. The results from this regression model are reported in exhibit 17.

Exhibit 17

Effect of IZ Unit Production Under Mandatory Programs on New Building Permits

Variables	1 Log (total permits)	2 Log (total permits)	3 Log (total permits)
IZ units per 10,000 people	0.025 (0.025)	0.040 (0.029)	–0.12 (26)
Ln (median household income)		0.63 (1.2)	–1.05*** (0.31)
Population density		–0.000 (0.00040)	–0.00020 (0.00011)
Mean commute time		–0.0067 (0.045)	0.0017 (0.027)
Percentage over age 25 with bachelor's degree or higher		–0.0076 (0.010)	0.0017 (0.0058)
Percentage of White non-Hispanic householders		0.030 (0.035)	0.075*** (0.010)
Jurisdiction fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	
Spatial autoregression			Yes
IZ units per 10,000 people x year			Yes
Constant	5.48*** (0.14)	–3.00 (12.62)	
Spatial autocorrelation λ			–3.63 (3.77)
Observations	1082	1033	936
R-squared	0.81	0.88	
Pseudo R-squared			0.0011
Number of jurisdictions	46	45	36

IZ = inclusionary zoning. Ln = natural log.

*Notes: Robust standard errors clustered by jurisdiction in parentheses. *** represents p < 0.01, ** represents p < 0.05, * represents p < 0.1. In the maximum likelihood estimation, the pseudo R^2 is {corr(y.ŷ}2.*

Sources: Zillow Research, IZ ordinances in the Baltimore-Washington region (available in the appendix), and the U.S. Census Bureau

Here, the author finds no evidence of mandatory IZ programs having an effect on new housing supply in the results of the cross-sectional models reported in columns 1 and 2. Column 3 uses the same spatial autoregression approach described in equation 3 for new housing supply rather than price. As in the cross-sectional models, the author finds no evidence that mandatory IZ reduces new building permits. Finally, the author tests the effect of IZ units delivered per 10,000 residents in jurisdiction *j* in year *t* on house price. The regression results are reported in exhibit 18.

Exhibit 18

Effect of Inclusionary Zoning Unit Production Under Mandatory Programs on House Prices

Variables	1 Ln (price per sq. ft.)	2 Ln (price per sq. ft.)	3 Ln (price per sq. ft.)
IZ units per 10,000 people	0.0040 (0.0030)	0.00074 (0.0018)	-0.00036 (0.012)
Ln (median household income)		0.0068 (0.15)	1.7*** 0.087
Population density		0.00015 (0.000031)	0.000052 (0.000037)
Mean commute time		–0.0059 (0.0043)	–0.0014 (0.0053)
Percentage over age 25 with bachelor's degree or higher		–0.0027 (0.00093)	–0.0029 (0.0016)
Percentage of White non-Hispanic householders		0.0067 (0.0027)	-0.0029 (0.0029)
Jurisdiction fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	
Spatial autoregression			Yes
IZ units per 10,000 people x year			Yes
Constant	4.43*** (0.02)	3.82** (1.54)	
Spatial autocorrelation λ			1.17 (1.92)
Observations	732	690	561
R-squared	0.941	0.957	
Pseudo R-squared			0.275
Number of jurisdictions	35	35	33

IZ = inclusionary zoning. Ln = natural log.

*Notes: Robust standard errors clustered by jurisdiction in parentheses. *** represents p < 0.01, ** represents p < 0.05, * represents p < 0.1. In the maximum likelihood estimation, the pseudo R^2 is {corr(y.ŷ}2.*

Sources: Zillow Research, IZ ordinances in the Baltimore-Washington region (available in the appendix), and the U.S. Census Bureau

The results of the cross-sectional models in columns 1 and 2 and the spatial model in column 3 indicate that, using this dependent variable as a proxy for a mandatory IZ program's effect on market-rate prices, mandatory IZ does not affect price.

The specification in equation 2, with the number of years a mandatory IZ program has been in place as the dependent variable of interest (results in exhibit 14), provides some support for Ellickson's description of mandatory IZ as a tax on development. If mandatory IZ programs tax construction and result in reduced new-housing construction, their effect will increase over time as reduced housing construction year after year reduces a jurisdiction's total housing supply relative to what it would have had without the IZ program. The results in exhibit 11 provide evidence that IZ is not adopted in response to rising prices, indicating that its effect on price is exogenous. Further, optional IZ programs (results in exhibit 15) that do not produce units have no effect on prices, indicating that these jurisdictions do not experience the same price increase as jurisdictions where IZ may tax new construction. The author's empirical finding that, on average, mandatory IZ programs in the Baltimore-Washington region tax market-rate housing is supported by the lack of uptake of optional IZ programs with higher density bonuses than those offered under the region's mandatory programs.

The supply model in exhibit 17 provides evidence that IZ programs, proxied by the number of units they produce relative to their jurisdiction's size, have no effect on new housing permits. A potential explanation for mandatory IZ increasing price—although not decreasing supply—is that IZ increases the cost of building new housing without reducing the quantity of construction. For example, IZ may lead developers to pursue more smaller projects. Smaller projects may allow them to avoid IZ requirements by staying below a unit threshold for each project. It may be less efficient to build smaller numbers of units in each project, resulting in higher prices without a reduction in total new supply. Alternatively, IZ may lead developers to shift to higher end housing that has the profit margins to cross-subsidize IZ units where lower end new construction may be infeasible under IZ requirements (Hamilton and Smith, 2012).

As reported in exhibit 18, the author finds that using a jurisdiction's number of IZ units produced relative to its population as the independent variable of interest indicates that IZ programs do not affect market prices. Although the author thinks that the number of years an IZ program has been in place is the more theoretically sound model for how IZ programs can be expected to affect prices, this finding shows that the results reported in exhibit 14 are sensitive to specification.

Conclusion

IZ's prevalence is rapidly increasing, but relatively little work has been done to study its effects on housing markets. The author's results contribute to the small amount of literature on this issue and provide new data on the characteristics of IZ programs in the Baltimore-Washington region. Much of the scholarship on IZ so far has used data from California, and this study increases the geographical diversity of IZ research. The effects of IZ programs across the country are likely highly dependent on local housing market conditions and program design.

Measuring the effects of IZ on housing market outcomes is difficult because each program is unique and the sample size of jurisdictions in a housing market is relatively small. Actual requirements for income-subsidized units may deviate from a locality's stated policy, so data on IZ policies are noisy. These measurement challenges provide reasons to be cautious about making strong claims about IZ's effect on housing markets based on empirical studies, but the body of research attempting to measure the causal effect of IZ on house prices and new housing construction provides some evidence that IZ increases house prices and reduces housing supply.

In her analysis of IZ's effects in the Baltimore-Washington region, the author finds evidence that mandatory IZ programs increase house prices but not that they reduce new housing construction. Measuring the effect of optional programs separately from that of mandatory programs allows the author to distinguish between programs that Ellickson's theory would predict act as a tax on development versus those that it would not. As expected, the author finds that optional programs that are not producing IZ units are not associated with higher house prices.

As IZ continues to gain prevalence as a tool for attempting to increase access to affordable housing, more empirical work on its effects on housing markets is needed to evaluate whether it is possible for IZ to achieve affordable housing goals without exacerbating affordability problems for those who do not receive IZ units. In particular, researchers should seek out changes to IZ policy that are exogenous to local policymakers' control for the strongest identification strategies—such as court decisions or state legislation that changes local IZ programs—that present opportunities to study these programs' causal effects on housing markets. Additionally, case study work on specific IZ programs can provide important insights. For example, the general lack of IZ production under optional programs indicates that even large density bonuses may not offset the cost of providing below-market-rate units. Fieldwork that includes learning from homebuilders and other real estate industry professionals may present opportunities to learn about how IZ affects how much and what type of housing gets built.

Optional IZ programs with density bonuses large enough to result in production present a way for policymakers to incentivize affordable housing construction without the risk of introducing a new tax on market-rate development. Optional programs rely on exclusionary zoning to work, however, as the cases of Alexandria and Falls Church show. They do not solve an underlying problem of exclusionary zoning.

Appendix

Exhibit 19

Ordinances for Mandatory Inclusionary Zoning Programs and Reports that Provide Additional Data on Inclusionary Zoning Requirements (1 of 2)

Alexandria, VA	Alexandria. 2020. *The Zoning Ordinance of the City of Alexandria, Virginia*. "Allowance for increases in floor area ratio, density and height and reductions in required off-street parking as incentive for provision of low- and moderate-income housing." https://library.municode.com/va/alexandria/codes/zoning?nodeId=ARTVIISUZORE_S7-700ALINFLARRADEHEREOREPAINPRLODCOHO; Alexandria. 2019. "City of Alexandria Procedures Regarding Affordable Housing Contributions." https://www.alexandriava.gov/uploadedFiles/housing/info/2019_ProceduresRegardingAffordableHousingContributions_04.10.19.pdf; Alexandria. 2020. "Affordable Housing Projects and Partners." https://www.alexandriava.gov/housing/info/default.aspx?id=74589; Alexandria. 2016. "The City of Alexandria's Affordable Set-Aside Program from the 1990s to Today." https://www.alexandriava.gov/uploadedFiles/housing/info/SetAsideReportFINALFORWEB2016.pdf.
Annapolis, MD	Annapolis. 2020. *Code of Ordinances*. "Moderately Priced Dwelling Units." https://library.municode.com/md/annapolis/codes/code_of_ordinances?nodeId=TIT20SU_CH20.30MOPRDWUN.
Arlington County, VA	Arlington. 2020. *Arlington County Zoning Ordinance*. "Affordable Housing Zoning Ordinance." https://housing.arlingtonva.us/development/land-use-zoning-tools/; Arlington County Department of Community Planning, Housing, and Development, *Annual Affordable Housing Targets Report for 2015*, February 2016.
Baltimore, MD	Baltimore. 2016. *Housing and Urban Renewal*. "§ 2B-22. Project benefitting from significant land use authorization or rezoning." http://legislativereference.baltimorecity.gov/sites/default/files/Art%2013%20-%20Housing.pdf.
Charles County, MD	Charles County. 2019. *Code of Ordinances and Resolutions*. "Article XV. Moderately Priced Dwellings." https://ecode360.com/27247973.
Fairfax County, VA	Fairfax County. 1991. "Ratio of Bonus Density to Required Percentage of ADUs." https://www.fairfaxcounty.gov/housing/sites/housing/files/Assets/documents/ADU%20Resources%20for%20Developers/ADU%20Advisory%20Board/Ratio_of_Bonus_Density.pdf. Fairfax County. 2020. *The Fairfax County Zoning Ordinance*. "Residential District Regulations." https://www.fairfaxcounty.gov/planning-development/sites/planning-development/files/assets/documents/zoning/zoning%20ordinance/art03.pdf; Fairfax County. "Privately-Owned Affordable Rental Housing Options. https://www.fairfaxcounty.gov/housing/rentalhousing/adu-and-wdu.
Falls Church, VA	Falls Church. 2020. *Code of the City of Falls Church, Virginia*. "Sec. 48-1335. – Affordable dwelling unit residential density bonuses, fee deferrals, and related requirements." https://library.municode.com/va/falls_church/codes/code_of_ordinances?nodeId=PTIICOOR_CH48ZO_ARTVIIAFDWUNPR_S48-1335AFDWUNREDEBOFEDERERE; Falls Church. "Affordable Dwelling Unit (ADU) Program Fact Sheet." https://www.fallschurchva.gov/DocumentCenter/View/10685/ADU-Program-Fact-Sheet.
Fauquier County, VA	Fauquier County. 1995. "Fauquier County Board of Supervisors' Policy on Housing Low and Moderate Income Families." https://www.fauquiercounty.gov/home/showdocument?id=594.
Frederick, MD	Frederick. 2009. *The Code of the City of Frederick, Maryland 1966*. "Chapter 19 Affordable Housing." https://library.municode.com/md/frederick/codes/code_of_ordinances?nodeId=PTIITHCO_CH19AFHO_S19-7DEBO.
Frederick County, MD	Frederick County. 2002. MPDU Legislation. "Chapter 6A Moderately Priced Dwelling Units." https://www.frederickcountymd.gov/7707/MPDU-Legislation.

Exhibit 19

Ordinances for Mandatory Inclusionary Zoning Programs and Reports that Provide Additional Data on Inclusionary Zoning Requirements (2 of 2)

Gaithersburg, MD	Gaithersburg. 2020. *The Code of the City of Gaithersburg, Maryland*. "Article XVI. Affordable Housing Requirements." https://library.municode.com/md/gaithersburg/codes/code_of_ordinances?nodeId=PTIITHCO_CH24ZO_ARTXVIAFHORE.
Harford County, MD	Harford County. 2020. *Zoning Code*. "§ 267-32. Starter Home Housing Bonus." http://www.harfordcountymd.gov/DocumentCenter/View/2257/Zoning-Code-PDF?bidId=.
Howard County, MD	Howard County. 2007. *Code*. "Subtitle 4. Moderate Income Housing Units." https://www.howardcountymd.gov/LinkClick.aspx?fileticket=oBZ_A7GFw2Q%3d&portalid=0.
Laurel, MD	Laurel. 2008. *Code of Ordinances*. "Ordinance No. 1830. Affordable Housing Program." https://library.municode.com/md/laurel/ordinances/code_of_ordinances?nodeId=756355.
Leesburg, VA	Leesburg. 2003. "Section 3.17.3 Affordable Dwelling Unit Density Adjustments." *Town of Leesburg Zoning Ordinance*. https://www.leesburgva.gov/departments/planning-zoning/zoning-information/zoning-ordinance.
Loudoun County, VA	Loudoun County. 2020. *Revised 1993 Zoning Ordinance*. "Article 7. Administration and Regulations of Affordable Dwelling Unit Developments." https://www.loudoun.gov/DocumentCenter/View/99645/Revised-1993-Zoning-Ordinance?bidId=.
Montgomery County, MD	Montgomery County. 2018. "Requirements and Procedures for the Moderately Priced Dwelling Unit Program Department of Housing and Community Affairs." https://www.montgomerycountymd.gov/DHCA/Resources/Files/housing/singlefamily/mpdu/ER%2011-18AM%20Final%20Signed_pd.pdf; "Montgomery County. Number of MPDUs Produced Since 1976." https://www.montgomerycountymd.gov/DHCA/housing/singlefamily/mpdu/produced.html; Aaron Trombka et al. "Strengthening the Moderately Priced Dwelling Unit Program: A 30 Year Review." https://www.montgomerycountymd.gov/DHCA/Resources/Files/housing/singlefamily/mpdu/report_mpdu30yearreview.pdf.
Prince George's County, MD	Brown, Karen Destorel. 2001. "Expanding Affordable Housing Through Inclusionary Zoning: Lessons from the Washington Metropolitan Area." *A Discussion Paper Prepared by The Brookings Institution Center on Urban and Metropolitan Policy*. https://www.brookings.edu/research/expanding-affordable-housing-through-inclusionary-zoning-lessons-from-the-washington-metropolitan-area/.
Queen Anne's County, MD	Queen Anne's County. 1996. "Section 18:1-108 Moderately Priced Dwelling Units." *Public Local Laws of Queen Anne's County*. https://ecode360.com/7141068?highlight=affordability,afford#7141068.
Rockville, MD	Rockville. 2020. "Chapter 13.5 Moderately Priced Housing." *Code of Ordinances*. https://library.municode.com/md/rockville/codes/code_of_ordinances?nodeId=CICO_CH13.5MOPRHO.
St. Mary's County, MD	St. Mary's County. 2016. "Chapter 32.3 Supplemental Development Standards." *The St. Mary's County Comprehensive Zoning Ordinance*. https://www.stmarysmd.com/docs/CZO.pdf.
Talbot County, MD	Talbot County. 2020. "Section 190-14 Affordable Workforce Housing Floating District (AWH)." *The Code*. https://www.ecode360.com/10158967?highlight=affordability,affordable#10158967.
Warrenton, VA	Warrenton. 2016. "Article 9-3 Affordable Dwelling Unit Provisions." *Town of Warrenton Zoning Ordinance*." http://cms.revize.com/revize/warrenton/document_center/Planning/Article%209%20%20Supplemental%20Regulations%20Amended2018.pdf, 9-4.
Washington, DC	Washington, D.C. 2017. "1002 Bonuses and Adjustments to Incentivize Inclusionary Units." *District of Columbia Municipal Regulations*. http://dcrules.elaws.us/dcmr/11-c1002 ; Washington. 2019. "Inclusionary Zoning Fiscal Year 2018 Annual Report." https://dhcd.dc.gov/page/fy2018-inclusionary-zoning-annual-report.

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Absorption Disruptions and Serial Billing: Managing Portability Practices in the Housing Choice Voucher Program

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Abstract

The U.S. Department of Housing and Urban Development (HUD) grants discretionary authority to public housing authorities (PHAs) to set program rules for the Housing Choice Voucher (HCV) program. In this paper, we ask how housing authorities use their authority to navigate portability decisions. Drawing on interviews with officials at 51 housing authorities, we show that discretionary choices around portability often center on agency utilization rates. As housing authorities seek to quickly increase their budget utilization, they often switch from billing sending agencies for portability vouchers to absorbing them into their portfolio. That decision eases the administrative burdens associated with portability, but it limits the ability of housing authorities to serve households on their waitlists. In addition, the decision to absorb portability vouchers when agencies need to quickly increase their utilization has broad ripple effects throughout the ecosystem of housing authorities. We propose reforms to incentivize regional collaboration and simplify billing practices in ways that would both improve organizational efficiency and ease administrative burdens in the HCV program.

Introduction

The U.S. Department of Housing and Urban Development (HUD) grants discretionary authority to public housing authorities (PHAs) to set program rules for administering the Housing Choice Voucher (HCV) program (Buron et al., 2010; Devine et al., 2000; Dunton et al., 2014; Finkel et al., 2003; Moore, 2016). Housing authorities are responsible for maintaining waitlists, selecting tenants, and organizing briefing sessions for selected households. They set payment standards within a restricted range and design their own outreach programs to landlords. Those decisions shape many aspects of the HCV experience, including who receives priority for the program, how long applicants wait for a voucher, and the types of neighborhoods (and units) that voucher households are able to access. In this paper, we extend research on those discretionary choices to understand how housing authorities navigate portability. Specifically, we investigate the way housing authorities approach portability as a tool to increase utilization and identify competing agency priorities involved in their decisions. Although this terrain may be familiar to agency officials tasked with the everyday responsibility of managing the program, our analysis offers policy researchers, program advocates, and other agency officials a window into the inherent tradeoffs associated with portability.

To understand how housing authorities navigate portability decisions and the way those decisions are directly tied to utilization goals, we draw on interviews with officials at local housing authorities. After an introduction to discretionary decisionmaking in public housing authorities, we focus our attention on the federal regulations guiding local practices around portability. Although our research centers on the voices of officials at local housing authorities, we augment those qualitative data with administrative records from the Voucher Management System (VMS). Our analysis shows how agencies intentionally pursue portability decisions—notably, the decision to absorb portability vouchers—when they need to quickly increase utilization. Although the decision to absorb portability vouchers eases the administrative burden on housing authorities, especially those with limited staff resources, it also limits their ability to select applicants from their waitlists. Absorption decisions ripple through the ecosystem of housing authorities and create challenges for other agencies seeking to achieve their own utilization goals. To improve policy, we consider how housing authorities collaborate with nearby agencies to ease the administrative burdens of portability and enhance neighborhood choice for voucher households. We conclude with several proposals for reforming the portability procedures of the HCV program to increase efficiencies, ease administrative burdens, and better assist low-income households.

Discretionary Authority in the Housing Choice Voucher Program

The HCV program is the largest rental assistance program in the United States. It assists more than 2.3 million low-income households to afford rent in private-market housing units (HUD, 2018b). For households at or below 50 percent of area median income (AMI), HCV provides a partial subsidy that covers the difference between 30 percent of household income and the rent. The program is funded and overseen by HUD, but it is implemented by 2,200 local PHAs.[1] HUD rules dictate many aspects of the program, including eligibility by citizenship status and broad income-targeting criteria. Local PHAs retain discretionary authority over many other aspects of the program, however, including prioritization of assistance, search duration, and occupancy standards. The local discretion yields extensive variation across PHAs as they implement this federal program. Previous research on those discretionary choices considers portability practices (Climaco et al., 2008; Greenlee, 2011), cost utilization strategies (Finkel et al., 2003),

[1] In the 2018 *Picture of Subsidized Housing*, HUD identifies 3,803 unique housing agencies that administer HUD programs. Of those, 2,197 report participation in the HCV program.

administrative costs (Turnham et al., 2015), interagency collaboration (Basolo, 2003; Katz and Turner, 2001), and waitlist practices (Moore, 2016).

Understanding those discretionary decisions is critical because those choices shape who gets what, when they get it, what type of wait they have to endure, and the activities they must do to keep their benefit. Although discretionary choices matter for all safety net programs, they are particularly salient in the HCV program because it is not an entitlement (Moore, 2016). Because housing vouchers are rationed, many of the decisions PHAs make focus on the distribution of resources. For example, PHA choices around the opening and closing of the waitlist affect the ability of households to sign up for assistance. If a household gets on the waitlist, discretionary choices around the local preference structure affect how quickly the household will reach the top of the list. Those decisions affect the burdens encountered by agency officials and clients alike (Herd and Moynihan, 2019) and highlight key tradeoffs made by program administrators in their daily routines of work.

A substantial body of research explores the discretionary choices made by local housing agencies and their effect on program management. For example, Buron et al. (2010) report on housing authority practices related to rent flexibility, including decisions around setting minimum rents and payment standards for the HCV program. Dawkins and Jeon (2017) consider trends in the share of cost-burdened households and the association with PHA decisions on payment standards and rent caps. Turnham et al. (2015) examine administrative costs in high-performing HCV programs. Dunton et al. (2014) describe how PHAs target and work with households experiencing homelessness. A growing area of work describes how Moving to Work (MTW) agencies use their enhanced discretion to operate PHA programs (Abravanel et al., 2004; GAO, 2018; Khadduri et al., 2014; Levy, Edmonds, and Simington, 2018; Miller et al., 2007; Oppenheimer, Haberle, and Tegeler, 2013; Webb, Frescoln, and Rohe, 2016). Greenlee, Lee, and McNamara (2019) examine small PHAs' perceptions of HUD performance measurement and changes to the Moving to Work program. Increasingly, advocacy organizations concerned about equity and fairness in the program have examined trends in waitlist policies and practices (NLIHC, 2012, 2004; PAHRC 2016). By centering research on discretionary choices around portability, our analysis contributes to this important effort to understand administrative decisions in the program.

Portability in the Housing Choice Voucher Program

Portability in the HCV program permits voucher households to move from one jurisdiction to another without losing their subsidy (Climaco et al., 2008; Greenlee, 2011; Konkoly, 2008). In other words, portability enables mobility not only *within* jurisdictions but *across* jurisdictions, as well. This unique feature of the program is designed to expand housing choice for voucher households and overcome the legacy of structural disadvantage that resulted from households being stuck in public housing developments. In an analysis of data from 1998 to 2005, Climaco et al. (2008) report that 8.9 percent of households with a voucher made a portability move from one jurisdiction to another. Portability moves overwhelmingly occur after admission into the program, rather than immediately upon admission, and those movers were overwhelmingly very low-income families. Households with children were more likely to take advantage of portability than were other assisted households (Climaco et al., 2008).

For public housing authorities, portability decisions are closely linked to other administrative goals, including maximizing program utilization. Broadly, housing agencies approach utilization in two ways. On one hand, *unit utilization* refers to the number of units leased as a share of the total number of units under the Annual Contributions Contract (Finkel et al., 2003). Alternatively, *budget utilization* considers the annual program cost at a housing authority divided by the annual budget authority. Efforts to maximize the utilization rate are often the focus of advocacy organizations (CBPP, 2013), play a role in performance measures (HUD, 2015), and affect future funding levels (Hoffman, 2018). We use *utilization* to refer to both of those measures, although in practice, most housing authorities focus on maximizing their budget authority rather than reaching their unit utilization. Discretionary choices made by housing authorities influence both the share of Annual Contributions Contract units under lease and the budget utilization. External factors—including the tightness of the market and the quality of affordable units—and internal factors—including the methods used to issue vouchers and the frequency with which waitlists are purged and updated—both affect the voucher utilization rate across housing authorities (Finkel et al., 2003). As we show below, when public housing authorities seek to quickly increase their utilization rates, they often exercise their discretionary authority around portability.

The portability process begins when a household notifies its PHA (the "sending PHA") of its intent to move with its voucher to a location within another PHA's jurisdiction (the "receiving PHA"). Under most conditions, voucher households are permitted to move across jurisdictions without losing their voucher. Under certain conditions, however, the sending PHA can deny the portability move (HUD-PIH, 2016). For example, if the household was a nonresident applicant and has yet to lease for a year within the PHA's jurisdiction;[2] if the sending PHA cannot afford the move because the payment standards in the receiving jurisdiction are too high;[3] or if a PHA has discretionary authority, approved through the MTW demonstration, to restrict portability (Khadduri et al., 2014).

Once the sending PHA approves the move, the receiving PHA has two options. It can either absorb the voucher directly into its portfolio or bill the sending agency for the monthly cost of the voucher. If the receiving PHA absorbs the voucher, it takes over the voucher as one of its own. An important consideration is that the receiving PHA then counts the voucher towards its utilization, and the sending PHA is no longer involved in the cost or administration of the voucher. If the receiving PHA elects to bill the sending PHA, then it takes over the local administration of the voucher, but the monthly housing assistance payment (HAP) is billed to the sending PHA. The receiving PHA receives a portion of the administrative fees paid by HUD to the sending PHA (HUD, 2018a). Whether to absorb households that port into its jurisdiction or to bill the sending housing authority is entirely within the discretionary authority of the receiving PHA. Although those decisions may reflect a principled stance of housing authorities, they also reflect practical and pragmatic choices about program utilization, as we describe below.

[2] See 24 CFR 982.353(c)(3).

[3] See 24 CFR 982.353(e)(1).

Despite the frequency of portability moves among voucher households, only a handful of studies evaluate that process in the HCV program (Climaco et al., 2008). Greenlee (2011) reports on administrative practices and interagency collaborations among Illinois housing authorities as they deal with portability concerns. Specifically, Greenlee considers the administrative practices designed to regulate portability and how they influence the experiences of households porting across jurisdictions. In their report on discretionary authority in the HCV program, Devine et al. (2000) report substantial variation in PHA practices around portability by housing authority size and geographic location. Nearly two-thirds of PHAs report that they always absorb families that port into their jurisdiction from another housing authority (Devine et al., 2000). This research has grown increasingly important as HUD seeks to streamline portability policies and ease the regulatory burdens of interjurisdictional mobility. To that end, HUD finalized a set of rules in 2015 around portability. The agency received more than 50 comments on the proposed rule changes, many of which ease the burdens for clients and agencies alike.[4]

The regulatory challenges of portability for public housing authorities are particularly acute, given the regional fragmentation in the HCV program. Typically, dozens—if not scores—of housing authorities operate within a single metropolitan area, and they often do so with very little formal interaction or coordination. In fact, according to testimony prepared by the Center for Budget and Policy Priorities, in 35 of the 100 largest metropolitan regions in the country, at least 10 agencies are currently responsible for administering vouchers through the program (CBPP, 2018). Often, although not always, those agencies have nonoverlapping jurisdictions. Although PHAs have the opportunity to form consortia to consolidate some operations to generate administrative efficiencies and broaden the search area for voucher households,[5] very few PHAs have opted into consortia agreements. A 2012 report from the Government Accountability Office (GAO) acknowledged that agency consolidation could improve both oversight and efficiency for the program, ultimately yielding cost savings for HUD (GAO, 2012).

Data and Methods

To understand the way housing authorities exercise their discretionary authority, we draw on semi-structured interviews with officials at 51 housing authorities across the United States. Our interviewees occupied a range of roles at the housing authorities, including the executive director, HCV program coordinator, housing manager, and intake coordinator, but all interviewees shared the distinction of being directly involved in program administration. Although those actors directly oversee the implementation of portability provisions in the HCV program, their voices are rarely recorded in the research process. The majority of interviews occurred at PHA offices, but interviews with smaller housing authorities were occasionally conducted over the phone. Interviews ranged from 21 minutes to 2 hours, and they averaged 65 minutes. All interviews followed a protocol, although interviewees were encouraged to guide the discussion. Although the focus of the analysis in this paper centers on portability and its relationship to program utilization,

[4] This 2015 rule removed a proposed mandatory absorption requirement; codified the requirement that PHAs notify local HUD offices when denying a portability voucher on the grounds of insufficient funding; mandated briefings on the mechanisms of portability; and empowered families to select their receiving PHA when moving to a jurisdiction with multiple PHAs administering vouchers.

[5] See 24 CFR 943.115-130.

our interviews covered a broader range of discretionary choices, including waitlist practices, local preferences, landlord collaboration, and other administrative challenges. Interviews were recorded and transcribed, and themes were coded in NVivo.

We sampled housing authorities for range to ensure that our sample includes agencies that vary in size, geography, and housing markets (Small, 2009).[6] When possible, we sampled multiple housing authorities in a single metropolitan area to gather information from different types of agencies working under similar market conditions. Our sampling approach enables us to qualitatively identify organizational and market characteristics that influence discretionary choices around portability (e.g., program size, MTW status, etc.) and ensure that the sample captures agencies with a range of those characteristics.

Exhibit 1 compares the descriptive characteristics of housing authorities in our sample to the characteristics of all agencies administering a voucher program. Nearly two-thirds of in-sample agencies administer at least 1,250 vouchers through the program, whereas only 18 percent of agencies administer 500 vouchers or fewer. Although housing authorities with at least 1,250 vouchers constitute only 17 percent of agencies in the HCV program, those housing authorities administer the lion's share of vouchers. In fact, those large or very large agencies are responsible for administering nearly 75 percent of vouchers in the program—an important acknowledgment given their overrepresentation in our sample.[7] Twenty-seven percent of housing authorities in our sample are from the South, and 18 percent are from the North. Midwestern agencies are underrepresented in our sample, whereas those from the West are overrepresented. Our sample includes eight housing authorities that currently participate in the MTW demonstration.

Exhibit 1

Sample Characteristics of Public Housing Authorities

	Sample PHAs (%)	All PHAs with HCV Programs (%)
Size: Small or Very Small (<250 vouchers)	13.73	46.63
Size: Low–Medium (250–500 vouchers)	3.92	17.06
Size: High–Medium (500–1,250 vouchers)	17.65	19.07
Size: Large (1,250–10,000 vouchers)	49.02	15.64
Size: Very Large (> 10,000 vouchers)	15.69	1.60
Location: Midwest	13.73	26.30
Location: Northeast	17.65	25.68
Location: South	27.45	35.79
Location: West	41.18	12.23

HCV = housing choice voucher. PHA = public housing agency.

[6] Given the terms of our institutional review board (IRB) approval (Georgetown University #2018-0050), we anonymize the names of participating housing authorities and the officials interviewed throughout the paper. Where the characteristics of the agencies are important for explaining their discretionary decisions, we identify the agency size, geographic region, or associated housing costs.

[7] Those public housing authority characteristics are drawn from the 2018 Picture of Subsidized Households (HUD 2018b).

To provide more nuanced comparisons, we stratify the sample by agency size and compare in-sample agencies to similarly sized agencies. Those comparisons are reported in exhibit 2. Generally, the agencies in our sample administered more vouchers than similarly-sized agencies. Among large agencies, which comprised the largest share of our sample, the mean number of vouchers administered by our sample agencies was one-third larger than the mean number administered by all large public housing authorities. Likewise, on average, large and very large agencies in our sample billed nearly twice as many portability vouchers than similarly-sized agencies. For agencies of all sizes, the average household contribution toward rent is slightly higher for in-sample agencies compared to the full set of PHAs.

Exhibit 2

Sample Characteristics by Size of the Voucher Program

	Mean Number of Billed Portability Vouchers		Mean Number of Total Vouchers Administered		Mean Household Contribution Toward Rent	
	Sample PHAs	All PHAs with HCV Programs	Sample PHAs	All PHAs with HCV Programs	Sample PHAs	All PHAs with HCV Programs
Very Small/Small (< 250 vouchers)	0.43	2.79	133.29	109.53	316.57	316.11
Low–Medium (250–500 vouchers)	4.00	7.21	387.00	354.26	415.00	348.04
High–Medium (500–1,250 vouchers)	27.22	17.40	836.33	760.92	449.78	357.90
Large (1,250–10,000 vouchers)	120.76	65.92	3,964.32	2,874.57	422.28	368.64
Very Large (> 10,000 vouchers)	825.25	449.66	22,075.50	19,606.03	428.63	407.91

HCV = housing choice voucher. PHA = public housing agency.

Despite the differences between in-sample agencies and the complete universe of PHAs, our sampling methodology enables us to capture a range of approaches to portability associated with agency and market characteristics. Notably, as a qualitative study drawing primarily on interviews with agency officials, our goal is not to make generalizable claims based on a representative sample of housing authorities. Instead, we aim to understand how agencies exercise their discretionary authority to manage portability practices and maximize program utilization, and how agency characteristics (e.g., size, program administration) affect those practices.

We augment those qualitative data with administrative records from the VMS. Housing authorities report key measures of their voucher program each month through the VMS. Those data enable us to identify the average HAPs for both within-jurisdiction vouchers and portability vouchers.[8] We use those data to identify the average HAPs and compare them across housing markets. Notably, we cannot identify the total number of portability vouchers with data from the VMS because agencies report only the number of billed portable vouchers (not the number of vouchers absorbed). On average, agencies administered nearly 50,000 billed portability vouchers each month between 2008

[8] Data from the VMS used in this analysis are publicly available from HUD (www.huduser.gov).

and 2018.[9] Although those data offer a window into the process, they represent an incomplete estimate of the scale of portability in the HCV program.

Findings

We begin this section by briefly acknowledging the importance of program utilization to the discretionary choices made by housing authorities. Every housing authority in our sample shared the goal of maximizing program utilization. Utilization metrics factor into Section Eight Management Assessment Program (SEMAP) scores, but they are also important in determining annual renewal funding for public housing authorities. In principle, each agency could maximize utilization by spending their full budget allocation or leasing the total number of units in the Annual Contributions Contract. In practice, nearly all housing authorities sought to fulfill their utilization goals through their budget authority.

Many discretionary decisions made to fulfill other agency priorities affected utilization rates. For example, decisions about payment standards determine how much a housing voucher is worth and, therefore, the choice set of neighborhoods available to voucher holders. In most cases, HUD allows housing authorities to set their payment standards between 90 and 110 percent of the fair market rent (FMR). When housing authorities set the payment standard near the top end of this distribution—in other words, closer to 110 percent of the FMR—the value of the voucher increases and clients can access a broader set of units available in the jurisdiction. Although that creates residential choice, as households can select units in a wider array of neighborhoods, housing authorities are typically able to issue fewer vouchers when the per-unit cost is higher.

Like other discretionary choices, agency decisions about whether (and when) to absorb portability vouchers were based on multiple aims and priorities. Agency officials regularly decried the challenges of managing portability in the HCV program because it was universally viewed as an administratively cumbersome feature of the program that consumed disproportionate resources of local agencies. Incompatible rules on payment and occupancy standards (e.g., bedroom allocations) across jurisdictions increased the burdens of navigating portability. Agency officials considered competing goals and priorities in those decisions, including their efforts to lessen administrative burdens, generate equitable waitlist selection procedures, and acknowledge other agencies' needs in their absorption decisions. Even so, when agencies exercised their discretionary authority to absorb portability vouchers, they often did so as a way to maximize program utilization. Absorbing portability vouchers enabled agencies to quickly increase utilization. When programs were underutilized, they absorbed portability vouchers that they had previously been billing. This strategy of tailoring portability policies to achieve utilization goals was common practice, but it hinged on the availability of funding. For example, the director of a large housing authority noted that her agency regularly assessed utilization rates to decide whether or not to absorb their ports.

[9] Although approximately 50,000 billed portability vouchers are reported monthly through the VMS, we identify substantial variation over time. That fluctuation may reflect decisions made by both assisted households and agency administrators. During periods when families elect to move less frequently, those household-level choices lead to less portability overall. When agencies decide to absorb portability vouchers rather than bill the sending agencies, the number of billed portability vouchers declines.

> *When we're not at 100 percent lease-up, we absorb. Once we hit our 100 percent, of course, we cannot absorb, so we do the billables. Again, it's evaluated every 3 months. Where are we? Where are we? Where are we? All housing authorities do the same thing.*

When funding was available, most agencies reported that they would prefer to absorb their portability vouchers rather than engage in billing relationships with other agencies. Absorbing portability vouchers enabled them to use their full budget authority and save on administrative costs. As the director of a medium-sized suburban agency told us:

> *You know, [the decision to absorb] changes by the month because it has to do with federal funding. … When funds are really, really tight, or you get a reduction in funds and you're overspending, you really can't afford to absorb them, so you're going to bill back and forth. This past year, we got a little bump in funding, which was unexpected, and it was pleasant so we could absorb some [vouchers]. The rule of thumb is that you want to absorb them if you can because the whole billing back and forth takes time, takes energy, takes money.*

Officials at most agencies, including a medium-sized housing authority in a west coast county, tied those discretionary decisions directly to their funding situation.

> *In the past, when we've been like, "Hey, we got money to spend," we just absorb people right when they get here. And we're like, "Hey, come on in. Yep. Okay, we're done. You're ours."*

Another agency director similarly emphasized budget utilization as she explained the agency's approach to portability. When the agency was nearing 100-percent utilization, it billed sending agencies for portability vouchers; however, when it needed to quickly lease up to utilize their entire budget authority, the agency switched to absorbing them.

> *We treat our ports depending on our funding in the market. Right now, we're billing, and that's because we knew that our funding was getting low and we didn't want to absorb anybody else's tenants. We wanted to continue to lease ours as much as possible, so we started billing. However, when we were at a point where I wanted to lease up as fast as possible so that we could hang onto as much money as possible, we were absorbing, definitely absorbing.*

Although agencies can always pull from their waitlists to increase their utilization rates, most observed that the process of doing so—and with it, verifying eligibility, scheduling briefings, and issuing vouchers—was cumbersome and slow. Issuing new vouchers required the dedication of staff resources, and only a fraction of households that were issued vouchers successfully leased up. Instead, they often elected to absorb portability vouchers that were already leased-up in the jurisdiction—a practice that consumed substantially fewer agency resources than issuing the same number of vouchers to new households. The director of one large county agency noted:

> *If we're underutilized, and we need to issue vouchers, and we say, all right, we need to issue 200 vouchers right now, as soon as possible, well, we'll look—first thing we'll look at—we'll say, do we have any families to absorb? We have 10 families to absorb? Oh my God. Do you know how [much time that saves us]? How much work it will take to pull the family off the waiting list, issue their voucher, and then the success rate? We're just going to absorb those families.*

Similarly, reflecting on the slow pace of issuance and lease-up, the director of another agency pointed to the benefits of absorbing portability vouchers as a utilization strategy:

> *The difficulty is that the voucher program is not a race car, it's a cruise ship. It takes a really long time for us to pull people off the list, screen them, get them leased up.… One way that we can immediately increase our spending is, if we have a hundred vouchers that we've been billing other agencies for, if we absorb those into our own account. Hey, woo-hoo! We've just increased our account by a hundred. In the past, when we needed to get our numbers up really quickly, that's what we've done.… That's our little bank if we need to spend money, that's how we're going to do it.*

Although agency officials emphasized the financial benefits of absorbing vouchers, they also acknowledged that the strategy was often administratively easier. Absorption eased the burden of constantly sending bills back and forth and trying to collect payments from other agencies. As the director of one agency noted:

> *[Absorbing ports is] easier to do because you don't have to worry about people looking, taking forever to lease, they're already leased up and we'll just absorb them and let the other PHA know … they're now going to be a part of a budget. And it is easier to do that way because it can be tricky sending [a] bill every month or every year, you know, keeping up with it.*

For many agencies, the process of billing other agencies consumed substantial staff resources that could be spent on other parts of the HCV program. Agency officials often noted that they had many billing relationships with housing authorities across the country, and that those relationships often involved only a single voucher being billed. As the director of a medium-sized agency noted:

> *We have a staff person who spends hours and hours on this—all, like, the back and forth because we have Decatur, Georgia; Winston-Salem, North Carolina; all these places, Small Town, Kentucky; we're billing them, they are billing us.*

The tangled web of billing relationships was particularly elaborate for large agencies. For them, the decision to bill often meant sending bills to scores of agencies every month. In fact, the director of one large housing authority reported maintaining billing relationships with almost 200 separate housing authorities because the agency does not have the budget capacity to absorb portability vouchers into its own portfolio. In another large midwestern housing authority, the director noted the challenges of two large bureaucracies working together on the portability process:

> *Now you have these two bureaucracies trading paperwork back and forth. Let me tell you how that is going to go—it's awful. It's just a recipe for disaster.*

Even smaller agencies, such as a small housing authority on the east coast, noted that absorbing vouchers minimized administrative hassles:

> *You've got to keep track of the billing and then you've got to keep track to make sure that the bill … is paid. If everybody just absorbed, you probably wouldn't get to your waiting list. That's a problem, but it would be a whole lot less complicated.*

Although absorbing portability vouchers is often administratively easier, substantial tradeoffs are associated with the decision to do so. Specifically, the decision to absorb vouchers, rather than pull from the waitlist, means that agencies would have fewer resources to serve households currently waiting. Often, applicants spend years on agency waitlists before being selected for the program (PAHRC, 2016). When a housing authority uses its budget authority to absorb a portability voucher, rather than pull a client from the waitlist, it limits its ability to provide assistance to existing residents within its jurisdiction.

This limitation was the primary rationale provided by agencies that chose never to absorb portability vouchers into their portfolio. Although they were a minority of our sample, several agencies reported always billing the sending housing authority. We refer to those agencies as serial billers. Serial billers offered two common explanations for that practice. First, as noted previously, housing authorities that serially billed expressed concern that absorbing portability vouchers would limit their ability to serve clients on their own waitlists—it was often described as a matter of fairness. Although the HCV program is federally funded, many agencies expressed a preference to serve clients in their own communities, often through local preferences in their waitlist selection practices. If they absorbed portability vouchers, housing authorities would be left with fewer resources to devote to households on the waitlist.

Typical of that view was the idea of a portability voucher jumping ahead of a household who had been waiting for years. One agency official identified the injustice of prioritizing portability vouchers through absorption decisions:

> *Yeah, the portability families, they're cutting in line. They are absolutely cutting in line. … They're taking the spots of our applicants who are waiting on our waiting list, and they've got—if there's an absolute preference, they've got the absolute, absolute preference, because at any time, that local housing authority can just simply absorb their voucher, and they cut in front of everybody.*

Similarly, an official at a serial billing agency described the process of absorption as paying for a voucher that wasn't theirs:

> *When you absorb, that basically takes someone off of our list that we can help. You're taking someone else, like you're taking their voucher in, and we're absorbing the cost. So we don't want to absorb the cost of a voucher that's not ours. We want to administer from our waitlist.*

A voucher specialist at a large east coast agency was similarly direct:

> *We don't absorb. We don't do it because our executive director feels very strongly that those 20,000 names on the waitlist should be given an opportunity prior to someone else who just wants to come here from California. Right, they've been on the list waiting for however long. His goal is to serve the residents of this county.*

The second reason offered by serial billers concerned the administrative fees they earned. Receiving housing authorities earn a portion of the administrative fees paid by HUD to the sending agency when they administer vouchers through portability. In an environment of funding scarcity, one agency official simply noted the financial benefits of earning those extra administrative fees:

We [bill our port-ins] because, I guess, we kind of need the administrative fee. Billing creates extra work for us, but we need the [administrative] fee. And also, without absorbing them, we have extra vouchers available to help people on the waitlist.

Another agency official culled all of those pieces together to explain their billing decisions:

We bill because, well, not only was it a process that we already had in place, but it makes sense … for the [administrative] fees. Then, we wanted to use our vouchers for our residents instead of having someone come from out of state and using up the voucher that we had. So, back to that whole residency thing, allow the current residents in [our city] to be able to utilize the voucher. … Right now, we're billing about 120 residents, and it would significantly increase our utilization [to absorb them], but it also would keep us from being able to [select people from our city].

Since most agencies absorbed portability vouchers, conditional on their funding situation, many officials in our sample expressed skepticism about serial billers. Specifically, they expressed concern that the portion of their administrative fees remitted to the receiving housing authority was not commensurate with the amount of work required to assist a client that had already been issued a voucher.[10] Much of the administrative work for the program—for example, managing a waitlist, pulling a client from the list, and verifying eligibility and income—was done by the sending housing authority. Vouchers are substantially easier to administer after a client is already in the program. Referring to a specific agency in her metropolitan area known for their serial billing practices, one housing authority director lamented the disproportionate share of the administrative fee the billing agency was receiving:

They get that little bit of [administrative] fee. If you pool [administrative] fees, it's not even half. Like, a normal [administrative] fee is $80 per voucher, per month, all year long. So $80 for each one if they stay in my county. If I port them to [that county], I only pay them $40 because I get a little bit of my [administrative] fee because I still have to do administration on my end. I have to pay the bill every month, but they get that $40. There's $40 they weren't counting on. … I have 60 [portability vouchers] that I have not absorbed. They have thousands. So $40 times 1,000 times twelve months - that's [administrative] fees that they can use to pay their staff because we're all underfunded. I get it. It's a good strategy. I just don't like it.

The Ecosystem Disruption of Managing Portability Decisions

Expressed concerns about serial billers, and the effect of their discretionary decisions on other agencies, reflects a broader acknowledgment of the interconnectedness of housing authorities. Exercising discretionary authority to absorb portability vouchers has significant consequences for other agencies in the housing authority ecosystem. Because the decision to absorb a voucher results in the transfer of the voucher from the portfolio of one agency to another, it may negatively affect the utilization rate at the sending agency. We call this process an *absorption disruption*. As

[10] In 2015, HUD issued a final rule changing the way administrative fees for billed ports are assessed. Receiving PHAs receive the lower amount of either (a) 80 percent of the sending PHA's fee or (b) 100 percent of the receiving PHA's administrative fee. The sending PHA keeps the remainder of their administrative fee: either 20 percent of their fee or the difference between their fee and the receiving PHA's fee.

the absorption decisions of a single housing authority ripple through housing authority networks, other agencies are called upon to reevaluate their own discretionary choices.

Occasionally, we spoke with housing authority officials who were eager for receiving agencies to absorb their vouchers. When agency officials were worried about being overutilized, or using more than their full funding allocation, they reported trying to persuade receiving housing authorities to absorb their portability vouchers and, in doing so, remove them from the portfolio of the sending agency. As one director noted, by encouraging other agencies to absorb their vouchers, they were able to lower their utilization without removing clients from the program:

> *Right now, we're trying to encourage absorption [at other agencies] because we're overutilized. So, if you want our voucher, except for a VASH [Veterans Affairs Supportive Housing] or FUP [Family Unification Program], take it. You want to absorb it? Okay, we're fine without it. Typically, we're fine either way. We're a pretty flexible housing authority. ... But right now, if you want to absorb, that's fine with us.*

Although those absorption decisions helped overutilized agencies manage their programs, a more common sentiment concerned the negative effect of absorption decisions on the utilization rates of sending agencies. An official at one housing authority likened those absorption disruptions to a game of dominoes. Especially for sending agencies with a large number of portability vouchers, the decision by receiving agencies to absorb portability vouchers could destabilize the program and trigger a new round of discretionary decisions. Describing her recent experience, an official at one large county housing authority pointed to the complicated challenges of navigating this game of dominoes:

> *We were doing billables [and] … one housing authority from another county here…noticed us right away. "We're going to absorb, start absorbing—we're absorbing 100 of your people."… I'm already down [on my utilization], and by the time I pull names from my waitlist or get the homeless referrals—knowing that it takes so long to find somewhere—I'm going to drop. For every 200 vouchers you lose, you drop 1 percent lease-up. … I didn't have any choice but to then notice somebody else. … He goes, "What are you doing? Why did you do this to me?" I said, "Call so and so who started it." That's exactly what happens. … It forced us to notice somebody else and then, in turn, they are noticing somebody else, and there's the domino effect.*

Critically, the result of this game of dominoes was experienced unequally by housing authorities through a process of unequal exchange. Often, large housing authorities, or those with higher payment standards, had more flexibility to react to the absorption decisions of agencies in their network. Larger housing authorities typically had a greater capacity to lose vouchers without experiencing a significant fluctuation in their utilization rates. They often had more resources to respond to those changes, as well. In addition, housing authorities with higher payment standards were less likely to be squeezed by their billing relationships with other housing authorities. Broadly speaking, this game of portability dominoes had a differential impact depending on the size of a housing authority and its payment standards.

In one city with a high payment standard, the housing authority director noted that other housing authorities in nearby counties (and other parts of the state) regularly asked her agency to absorb vouchers rather than sending bills. Rents in her high-cost jurisdiction were significantly higher than rents elsewhere in the state, especially in the more rural counties. Despite their limited budgets, those sending agencies were forced to foot the bill for large HAP payments in high-cost cities. Describing her relationships with other agencies throughout the state, she noted:

> *People are always bugging us to absorb because we are higher cost. … So, we will often get like, "Can you just absorb?" And we are like, "No, we can't. We don't have the vouchers right now." But it is significantly more expensive. …. What is really bad is the more rural housing authorities where there is a significant difference. They're like, "Really, can't you please, please, please, can't you absorb?" And we are like, "How do we make in exception that we absorb for you, but we don't absorb for everybody?"*

The director of another agency in a high-cost county noted that smaller agencies regularly ask that agency to absorb their portability vouchers. Although the agency occasionally makes exceptions, it has generally been unable to do so because of the high volume of portability vouchers in its jurisdiction. Queried about whether sending agencies asked them to absorb portability vouchers, the director noted:

> *This happens all the time because our cost of housing is so high. Somebody comes from a small jurisdiction; they may be eating up three subsidies from their families in the small jurisdiction. They can serve three people with what they're paying you for this one person. [We say,] "Too bad, so sad, so sorry. We can't afford to do it." Occasionally, if somebody's in a financial shortfall, we may try to work it out. Otherwise, they just have to make the adjustments.*

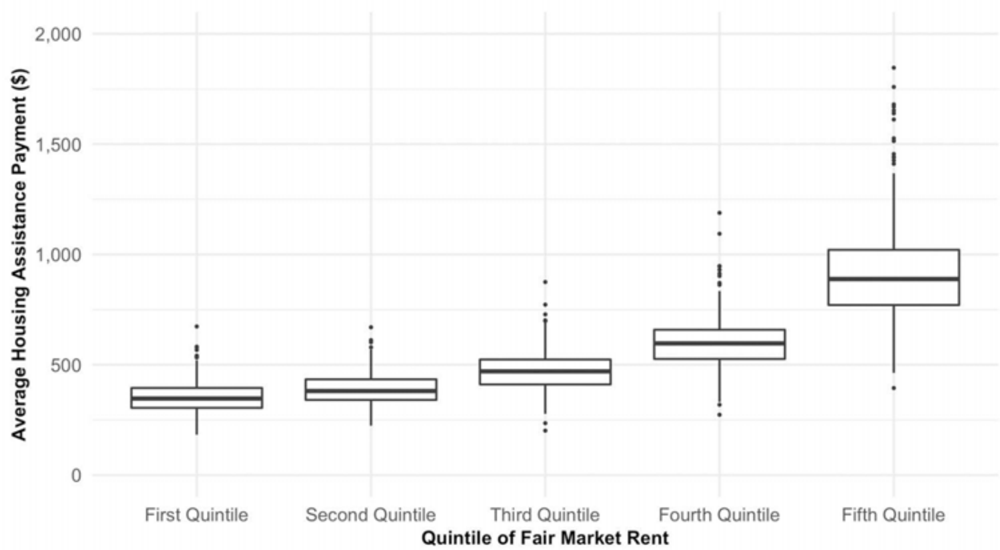
Similarly, the director of another medium-sized county agency described a recent conversation with his counterpart at a small, rural housing authority:

> *I was on the phone, [with] like this tiny housing authority… that had like 85 [vouchers]. It was tiny, right, and she's like, "Is there anything [you can do to help us]?" We had been billing them for a couple of years. The person moved a couple of years before and we were billing them and they ran into—might have been around sequestration or something. They had a significant financial issue, and she said, "Is there anything you could do? Is there any possible way you could absorb this person? It would save us like six months of HAP," or some crazy number because their FMRs were so low there. We actually went to the board and they approved it. We absorbed them. She was so happy. "Now, if I could just get Denver to do the same, and if I could just get Kansas City to do the same." She was going, like, literally jurisdiction by jurisdiction to where these people…had moved to over the years. It was more like six people, but it still is a huge number of their [vouchers]. It was 6 percent or 10 percent of their portfolio. It was brutal.*

This concern about differential HAP payments across jurisdictions—and the consequences for agencies in low-cost jurisdictions—is borne out by data from the VMS. In exhibit 3, we report the average HAP paid by public housing authorities.[11] We divide agencies according to the quintile of FMRs to distinguish PHAs operating in low-cost jurisdictions from those operating in high-cost markets. On average, agencies located in jurisdictions with the lowest quintile of FMRs report an average HAP payment of $362 per voucher. Agencies in the second quintile report an average HAP payment only slightly higher, at $379. By contrast, agencies in high-cost jurisdictions report significantly higher HAP payments. Agencies in the top quintile of FMRs report an average HAP payment of $905. In exhibit 3, we plot those differences in a boxplot to highlight the differential costs of the voucher program across jurisdictions.

Exhibit 3

Average Housing Assistance Payments for Public Housing Authorities by Fair Market Rent Quintile



Source: Data on Housing Assistance Payments are reported from the June 2018 Voucher Management System (VMS) data

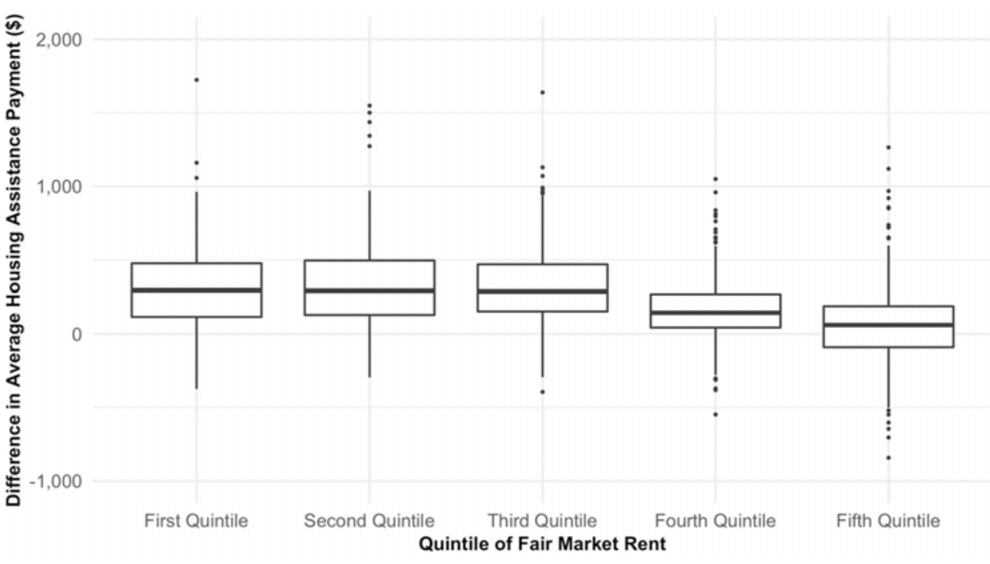
Because the cost of a voucher to a housing authority is lower for agencies in areas with low FMRs, those agencies experience a disproportionate burden when their clients port to high-cost jurisdictions. To highlight that burden, we next compare the average HAP for vouchers administered within an agency's jurisdiction (exhibit 3) to the average HAP for its billed portability vouchers. If HAP for portability vouchers is the same as HAP for within-jurisdiction vouchers, that difference is zero. When portability vouchers are more costly to an agency (because clients port to higher-cost locations), the difference is positive; when portability vouchers are less costly to an agency, the difference is negative. By way of example, if an agency reported that its average within-jurisdiction HAP is $550, but its average HAP for portability vouchers is $775, then the additional average monthly cost incurred from portability is $225 per voucher.

[11] All calculations reported in exhibits 3 and 4 rely on data reported by housing authorities in the June 2018 VMS data. We used 2018 FMRs for two-bedroom units to create the quartiles.

In exhibit 4, we plot the difference in average HAP for portability vouchers compared with other vouchers. Again, we plot those differences by FMR quintiles. Housing authorities in the top FMR quintile report that the average HAP for portability vouchers is only $71 more than the average HAP for vouchers administered within their jurisdiction. The boxplot reveals that, for many agencies in the top FMR quintile, HAP for portability vouchers is actually less expensive than HAP within their jurisdiction (because the average difference is negative). For those jurisdictions, voucher clients are using portability to relocate to lower-cost cities or counties. By contrast, housing authorities in areas with low FMRs report significantly higher HAP for portability vouchers relative to those within their jurisdiction. For agencies in the bottom quintile of FMR, exhibit 4 shows that, on average, HAP for portability vouchers is $308 more than HAP within a jurisdiction. That confirms the qualitative evidence suggesting that agencies located in low-cost housing markets are especially vulnerable to the financial consequences of portability. When the average HAP for portability vouchers exceeds the average HAP for vouchers administered within the jurisdiction, portability is financially burdensome for sending agencies (when their vouchers are not absorbed). Financially burdened by the higher costs of portability, those agencies are restricted to serving fewer clients within their own jurisdiction.

Exhibit 4

Difference in Average Housing Assistance Payments for Billed Portability Vouchers and In-Jurisdiction Vouchers by Fair Market Rent Quintile



Source: Data on Housing Assistance Payments are reported from the June 2018 Voucher Management System (VMS) data

This asymmetry in HAP payments between sending and receiving agencies often resulted in concerns that housing authorities quietly discourage portability. Simply put, when receiving agencies are unable to absorb portability vouchers because they are overutilized, or when they are simply unwilling to do so because they are trying to achieve other policy goals (e.g., serving households on the waitlist), the sending agencies may be more likely to discourage their clients from moving across jurisdictions. Especially in low-cost places, portability to high-cost cities can squeeze the budget of a housing authority. In a high-cost suburban jurisdiction with a medium-sized voucher program, agency officials painted a typical interaction scenario with a sending housing authority:

> *Mrs. Jones wants to move from [a small, rural town] to live near her granddaughter or whatever in [this county]. [The town] calls us, "Well, what are your rents?" After they've gotten themselves off the floor and picked the phone back up because our rents are literally three times theirs, they say, "Sorry, Mrs. Jones, you can't move to [our county]," because we can't absorb them. … They should not be denying her—it's in the regulations—but it happens every day. Selfishly, they would literally have to take three people of their 250 people off their voucher program to allow one person to move to [this county].*

Managing the Challenges of Portability

Reacting to the challenges of portability, including the administrative hassles of billing other housing authorities, we observed several interagency collaboration patterns. Those collaborations were designed to ease the administrative burden of portability, both for clients and for housing authorities. Often, those collaborations took the form of informal arrangements between housing authorities that regularly interacted with one another—for example, cities and their surrounding suburbs—but we also encountered formal interagency collaboration between housing authorities that regularly experience cross-jurisdiction moves. Even housing authorities that did not report formal arrangements with nearby agencies often noted that they were regularly in contact with their colleagues at those agencies, and those personal relationships generated opportunities for regular conversations about best practices.

Strong interpersonal relationships between agency staff helped to smooth the portability process between agencies. In fact, when agency staff had good working relationships, as well as similar payment standards and occupancy standards, the portability process happened fairly smoothly. As one official noted:

> *[T]he ports are more or less a wash between the jurisdictions, like the same number go to [a neighboring county] and come from [that county] here and [other nearby counties]. It's kind of a wash. We all get along well, and it's all good.*

When this interagency contact yielded something more regular, it often led to a simple agreement for cross-absorptions. Cross-absorption involved absorbing ports on a reciprocal, one-for-one basis. This practice limited the uncertainty from the absorption disruption, lessened the administrative burden, and created stability across programs that regularly traded clients.

> *We don't have anything, no formal agreements. We just work a lot with [one city] because most of their ports are with us. We do a lot of cross-absorbs. So basically that saves us administrative barriers. So when we process a port file that's from, say, [that city], we have to send out paperwork to them for billing and every time something happens in interim, any annuals. All the paperwork has to be sent to that housing authority for billing purposes and changes. And it's a lot of administrative work. So a lot of times, we cross-absorb, so they absorb the ones that are*

in their jurisdiction from us and we absorb the ones that are in their jurisdiction. Therefore, we have no more billing issues with those clients. … Cross-absorbs is just one-for-one, so we're not losing anything.

Although those pairwise agreements worked for housing authorities that regularly traded clients, they only took the form of bilateral agreements between agencies. Those agreements did little to assist clients looking for housing in the broader metropolitan region, and they could not accommodate multiple agencies involved in the regional movement of voucher households. Several housing authorities entered into mobility agreements with nearby agencies to resolve those issues. Under the terms of those agreements, clients could search for housing throughout the jurisdictions covered by the mobility agreement. The housing authority would agree to abide by payment standards set by the jurisdiction in which the households ended up renting. In one large county, four housing authorities entered into a mobility agreement that enabled regional mobility across jurisdictions without portability complications. Each housing authority does the inspections and sets payment standards for voucher households in its jurisdiction, regardless of the housing authority from which clients were issued their vouchers. An official at a participating housing authority in the mobility agreement noted:

We have an agreement that our client can move into any of [the cities] without going through the portability process. So all we do is ask that [the cities] do the inspection, but we still pay the rent directly to the landlords, so there's no billing. And we have quite a few clients on mobility. We use the host's payment standard. All we do is pay them a fee to inspect, and they use their payment standard to process utility, too.

Those types of agreements improve efficiency and expand residential choice for voucher households. In fact, there is a growing effort to incentivize those types of regional mobility agreements as a way to increase residential opportunity in the program. Our research suggests that those types of agreements would also lessen the administrative burdens imposed on staff at housing authorities and, in doing so, free up resources for them to devote to other aspects of program administration.[12] Those types of agreements continue to raise questions about the appropriate geographic scale at which housing authorities should operate (Katz and Turner, 2001).

Discussion

Our research on the administrative practices used by housing authorities to exercise their discretionary authority highlights key decision points, constraints, and tradeoffs faced by administering agencies. Central to our conversations were the tradeoffs made by housing authorities as they set payment standards and selected tenants for the program. Those decisions affect their budget and unit count allocations, which in turn influence their reported performance measures and future funding allocations. By and large, housing authorities were cognizant of those tradeoffs, and they carefully balanced multiple program goals, both at the local and national levels.

[12] An alternative model, currently used in Massachusetts, grants every agency in the state jurisdiction for the entire state. Agencies can tailor their programs to cover jurisdictions larger than their city, county, or municipality, although they are not required to provide jurisdiction across the entire state. This type of arrangement is achievable without any additional regulatory reform.

Similar tradeoffs shaped the way housing authorities approached portability. Although agency officials were overwhelmingly supportive of the goal of residential mobility achieved through portability, their practices were constrained by budgetary concerns and a preference to serve local households. Especially for smaller housing authorities with low payment standards, the prospect of households porting to a more expensive jurisdiction—and the receiving housing authority billing the sending housing authority—presented an enormous organizational constraint.

As policy officials consider reforms to the HCV program, we offer several innovative practices that both adhere to federal policies and facilitate mobility across jurisdictions while lessening the burden imposed on local housing authorities. Turnham et al. (2015) propose increasing the administrative fees given to both sending and receiving PHAs to cover the costs incurred by both agencies in portability billing. Another option is for HUD to offer supplementary funding on an ad hoc basis when sending housing authorities experience expensive ports. That funding would act as a deterrent to informal practices used by housing authorities to limit ports to places with high payment standards, which may coincide with strong economic opportunities. Finally, continued efforts to identify best practices to encourage regional collaborations would enable the federal government to better incentivize those types of partnerships to benefit both agencies and clients in the program (Basolo, 2003; Basolo and Hastings, 2003). In our sample, we encounter a single example of a partnership within a metropolitan region that allows voucher households to search for housing within an entire county, rather than limiting their search to the city in which the voucher was issued. In that type of partnership, payment standards continue to be set by individual housing authorities, and each agency conducts inspections within its jurisdiction and charges a small fee to the issuing authority. Regional arrangements are the least disruptive to the current constellation of housing authorities because they leave intact the current ecosystem of agencies. When mobility occurs within a metropolitan region, as much movement does, those types of arrangements lessen the administrative burden of billing and create flexibility for voucher households. The burden can be further eased by incentivizing shared payment standards and occupancy standards that would facilitate the seamless flow of households across jurisdictional boundaries. Such regional partnerships reinforce a metropolitan scale for the voucher program—a scale already used by HUD, which uses metropolitan FMRs to set payment standards. Promoting regional arrangements would cement this view of the program as operating regionally within metropolitan areas rather than operating solely within cities and counties.

An alternative to regional agreements would be a regular reconciliation of ports—either annually or every couple of years. This reconciliation would adjust the unit counts and budget authority of each housing authority to match its current voucher program. This type of reconciliation would ease the burden of housing authorities engaged in regular billing practices. Program ledgers would be adjusted to reflect the actual count of vouchers within a jurisdiction. By way of example, under this arrangement, if a household moves from Jefferson City to Missoula and lives in Missoula for a couple of years, the voucher would eventually come to belong to Missoula rather than Jefferson City—without affecting the ability of Missoula to pull from its waitlist. That, however, may result in a reduction in the size of the voucher program for small agencies that manage programs with a disproportionate share of ports out from their program. In the long term, it may create an equilibrium to better allocate housing assistance based on the demands and preferences of clients in the program.

Finally, we suggest considering the creation of a national housing authority designed exclusively to handle unabsorbed ports. Doing so would eliminate much of the administrative burden described throughout this paper while adding only modest costs to the program. This national housing authority would serve as a central billing agency for public housing authorities. Under the current system, agencies bill each other for unabsorbed ports—a process that has grown increasingly complicated, especially as the web of ports expands for larger housing authorities. By contrast, under this proposed system, all billing relationships would be centralized through a single, national housing authority.

Under this proposal, the receiving PHA would still have the option to absorb a portability voucher if it wishes to do so. The incentive to do so as a tool to increase program utilization would remain. Like now, the receiving PHA would take over all aspects of the administration of the porting voucher, and the sending PHA would be free to issue a new voucher to a family on its waitlist. When a voucher is absorbed, the process between the sending and receiving PHAs would not change from present practice.

If the receiving PHA does not initially absorb the portability voucher, however, the process would change from current practice. Although the receiving PHA would still take over the local administration of the voucher, billing would always go to the national housing authority rather than the sending PHA. The sending PHA would no longer be involved in the billing or administration of that porting voucher. From its perspective, the porting voucher has exited the local program, and they would pull from their waitlist in response to the exit of the porting voucher.

This new system would award the receiving PHA a set administrative fee for each unabsorbed portability voucher that would be set independent of the sending PHA. This fee structure departs from present practice, by which the administrative fee for a portability voucher depends on the relative value of the sending PHA's administrative fee. Under the proposed system, policymakers would need to determine whether the fee is equal to the full value of the receiving PHA's present administrative fee amount, or whether it is pegged to a portion of their current fee. Our intent is to standardize the administrative fee paid to receiving PHAs for each billed portability voucher commensurate with the work required to administer that voucher. The national housing agency will simplify those billing practices. Importantly, the national housing authority would expand and contract as needed to respond to the naturally occurring portability activity. Utilization rates would not be a metric of concern for this national agency because its utilization would always be 100 percent. It would merely be a service agency that interacts exclusively with billing PHAs.

Under this proposal, receiving PHAs could still absorb portability vouchers currently being billed to the national housing authority. Our interviews show that PHAs often decide not to immediately absorb a portability voucher, but the ability to do so in the future is an important strategy for managing their utilization rate. Unlike present practice, mass absorptions would no longer be disruptive to any associated sending PHAs. In fact, mass absorptions would only reduce the number of vouchers billed to the national housing authority.

We acknowledge that, as currently proposed, this plan for a national housing authority would slightly increase the number of overall vouchers in the HCV program. When a receiving PHA declines to absorb, it introduces another unit of voucher subsidy (and the related administrative fees) into the program that would not exist under current practices. Because sending PHAs are allowed to issue a voucher from their waitlist after the port has left their jurisdiction, regardless of whether receiving PHAs decide to absorb, those subsidies would emerge as "extra" vouchers in the system. With our proposal, the unabsorbed portability voucher would become part of the national housing authority's utilization (under current practice, an unabsorbed port is still part of the sending PHA's utilization). Based on past billed porting activity, we estimate that the national housing authority would manage approximately 50,000 port vouchers monthly—an increase of approximately 2 percent more than the present number of voucher units. Considering the administrative efficiencies generated and the reduction in uncertainty for local PHAs, we believe that this slight increase in overall units and the related spending would be worth the cost.

By restricting the turnover of unabsorbed portability vouchers, our proposal can keep the growth in overall units in the HCV program contained. Unlike regular vouchers, those now administered through a national agency would not turn over. If a tenant left the HCV program while on a voucher funded through the national housing authority, neither the administering housing authority nor the sending PHA would be authorized to reissue another voucher. If a voucher is eventually absorbed from the national housing authority, this "extra" subsidy that occurred with the sending port would be reconciled because the national housing authority would stop paying for the voucher, and the receiving PHA would then cover the cost of the voucher through its budget.

Conclusion

In this paper, we bring attention to the discretionary authority used by housing authorities to navigate portability in the HCV program. By highlighting the way agencies engage in portability decisions, we identify the inherent tradeoffs in the management of this program. Although our research emphasizes the importance of portability for achieving utilization goals, it also points to program features that are administratively cumbersome and time consuming for agency officials. We explain how absorption decisions made by individual housing authorities ripple through the larger ecosystem of housing agencies. Our analysis offers an opportunity to reconsider current policies to ease the burden on public housing authorities and improve access for assisted households.

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Departments

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Data Shop

Data Shop, a department of Cityscape, presents short articles or notes on the uses of data in housing and urban research. Through this department, the Office of Policy Development and Research introduces readers to new and overlooked data sources and to improved techniques in using well-known data. The emphasis is on sources and methods that analysts can use in their own work. Researchers often run into knotty data problems involving data interpretation or manipulation that must be solved before a project can proceed, but they seldom get to focus in detail on the solutions to such problems. If you have an idea for an applied, data-centric note of no more than 3,000 words, please send a one-paragraph abstract to david.a.vandenbroucke@hud.gov for consideration.

Musty Smells, Mold, and Moisture in the U.S. Housing Stock: Results from Two National Surveys

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. Government.

Abstract

A large body of public health research concludes that the presence of musty smells, mold, or moisture within the home is associated with the development and exacerbation of asthma and other respiratory ailments in children and adults. Despite this strong relationship, national data describing the scope and breadth of these home hazards in the U.S. occupied-housing stock are limited. Having this information publicly available is important for administrators and policymakers interested in remediating unhealthy housing and preventing asthma exacerbation attributable to poor housing conditions.

Abstract (continued)

In the proposed article, the authors introduce readers to two nationally representative housing surveys managed by the U.S. Department of Housing and Urban Development (HUD) that can be used to examine the national prevalence of significant home health hazards: the 2015 American Housing Survey (AHS) and the American Healthy Homes Survey II (AHHS II). Both surveys can be used to describe housing quality aspects within the U.S. housing stock. Additionally, the authors describe and compare the national prevalence of musty smells, mold, and moisture in both surveys. Prevalence rates are compared and discussed to help AHS and AHHS II data users better understand how self-reported housing quality metrics differ from more objective housing quality measures observed by a trained technician. Lastly, important data use implications are discussed.

Introduction

The purpose of this article is twofold. First, the article introduces readers to two national housing surveys HUD manages: the 2015 American Housing Survey (AHS) and the American Healthy Homes Survey II (AHHS II). Both AHS and AHHS II can be used to examine the national prevalence of significant home health hazards among occupied, U.S. housing units. Although AHS and AHHS II both seek to capture information about U.S. housing quality, the data collection efforts greatly differ. The AHS relies on respondents' self-reported questionnaires on aspects of housing quality. In comparison, the AHHS II uses self-reported questionnaires, field technician observations, and the collection and analysis of environmental samples to detect the presence of specific hazards.

Second, the article examines the relationship between (1) housing age and (2) musty smells, mold, and moisture in both surveys, using data analyses to form understudied associations. This relationship was selected for analysis because these home hazards have been associated with the development and exacerbation of respiratory ailments. Additionally, little is known about the relationship between housing age and musty smells, mold, and moisture in the U.S. housing stock. In this article, key survey differences and findings across the two data sources are examined. Results are highlighted and compared for both surveys. Critical implications regarding the interpretation of home hazard findings, given differing survey metrics and implementation procedures, are discussed.

Background

Prior public health research concludes that musty smells, mold, and moisture within the home environment are associated with the exacerbation of asthma and other respiratory conditions in children and adults, with more limited evidence of the association of asthma development among children (Fisk, Lei-Gomez, and Mendell, 2007). An update of a 2000 Institute of Medicine review concluded that there is sufficient evidence for a causal association between exposure to dampness and dampness-related agents and asthma exacerbation in children (Kanchongkittiphon et al., 2015). One study suggests that 21 percent of current asthma cases in the United States are attributable to mold and moisture in the home (Mudarri and Fisk, 2007). In a recent editorial on exposure assessment for dampness and mold in epidemiological studies, the authors concluded that nonbiological assessments of dampness and mold (that is, moldy odor, mold growth, water damage, or moisture) consistently resulted in stronger associations with health effects compared with the use of microbiological sampling (for example, mold in the air or dust) (Mendell and Adams, 2019).

Despite this important relationship, national data describing the scope and breadth of musty smells, mold, and moisture in the U.S. occupied-housing stock are limited. Although several international studies have found a strong relationship between housing age and these specific home hazards in their housing stock, this relationship remains relatively unknown in the U.S. housing stock. For example, one New Zealand study found that 35.1 percent of respondents reported mold, and mold was independently associated with older housing (Howden-Chapman et al., 2005). Having this information available for the U.S. housing stock is especially crucial for policymakers interested in remediating unhealthy housing and preventing asthma exacerbation attributable to poor housing conditions. State and local housing remediation program administrators can easily identify neighborhoods with large shares of older housing; therefore, understanding the relationship between housing age and home moisture has important policy and practice implications. Additionally, there is some evidence that physical remediation efforts that address the root causes of moisture sources significantly reduce symptom days and healthcare use for children with asthma who live in homes that have documented mold problems (Kercsmar et al., 2006).

Data Sources

The AHS and the AHHS II are two surveys on the U.S. housing stock. Although both surveys have similar purposes, data users should note several key differences. More information about each survey is provided below.

2015 American Housing Survey

The AHS is the nation's largest and most comprehensive housing survey. The AHS is jointly administered by HUD and the U.S. Census Bureau (Census); Census conducts the survey, which is sponsored by HUD ("About: American Housing Survey," n.d.). Since 1973, the AHS has provided timely information about the size, composition, cost, and quality of the U.S. housing stock. Conducted biennially in odd-numbered years, the AHS is a longitudinal survey with redrawn samples in 1985 and 2015. The primary unit of analysis in the AHS is occupied and vacant residential housing units. Census interviewers conduct in-person visits and call occupied households to collect information. When a unit is unoccupied, information is obtained from landlords, real estate agents, or knowledgeable neighbors ("Methodology: American Housing Survey," n.d.).

Geographically, the AHS covers all 50 states and the District of Columbia. Housing units are selected to be nationally representative; every AHS housing unit represents between 450 and 4,000 housing units. Every cycle, the AHS includes a national sample of approximately 85,000 housing units, including 50,000 nationally representative units, 30,000 units from 15 preselected metropolitan areas, and 5,000 HUD-assisted housing units.

Topical modules are sometimes included in the AHS to capture detailed information about important or emerging topics. Example analyses in this article use the Healthy Homes (HH) topical module from the 2015 AHS. The HH module was included in the 2011 and 2015 AHSs; the next iteration will occur in 2021. Developed in consultation with HUD's Office of Lead Hazard Control and Healthy Homes (OLHCHH), the National Center for Healthy Housing, and the Centers for Disease Control and Prevention, the HH module collects data on potential health and safety hazards in the home. It includes questions on second-hand smoke, important asthma triggers (for example, pests and mold), key injury hazards, radon exposure, and related topics.

American Healthy Homes Survey II

In cooperation with the Environmental Protection Agency (EPA), HUD implemented the AHHS II, a survey that estimates the national prevalence of lead-based paint hazards and other common contaminants (for example, formaldehyde, mold, and pesticide residues) in residential housing units in the U.S. occupied-housing stock. In addition to updating previous estimates of lead in paint, dust, soil, mold, and pesticide levels, AHHS II survey results will also be used to quantify the first national estimates of lead in water and formaldehyde in air. During AHHS II implementation, trained teams administered a survey questionnaire and collected environmental samples at each participating home. Collected samples were analyzed for lead, mold, formaldehyde, and pesticides using standardized laboratory and quality control procedures (Quan Tech, Sept. 2020).

The AHHS II study design employs a three-stage cluster sample of residential housing. QuanTech, a survey research firm under contract with HUD's OLHCHH, conducted sampling between May 2018 and May 2019 (QuanTech, Sept. 2020). Among a sample of approximately 2,200 random housing units drawn, approximately 700 residents of eligible units completed the survey. About one-half of recruited households were ineligible (10 percent), unreachable (10 percent), or refused to participate (23 percent). The AHHS II was conducted in 78 primary sampling units (PSUs) in 37 states. Each PSU is a county or group of counties selected randomly and range from heavily populated urban counties to very rural areas.

Once PSUs were identified, a two-person team of an interviewer and a certified lead inspector/risk assessor (technician) was dispatched to each locality. The interviewer arrived first and was responsible for recruitment. The resident of every selected unit was mailed an advance letter explaining the survey and announcing the interviewer's intended visit. Once homes were identified for participation, both the interviewer and the technician would conduct home visits. Upon arrival, the interviewer was responsible for administering the questionnaire, a household inventory of rooms, observations of housing conditions, and the receipt of a tap water sample collected by the resident. The technician was responsible for taking air samples, conducting wipe samples, testing painted surfaces for lead, and testing visible water service lines for lead. Participants could request final reports on any safety hazards found in the home.

The AHHS II is the third survey among a series of three HUD-sponsored national residential environmental health surveys. In 1998–2001, HUD sponsored the National Survey of Lead and Allergens in Housing in collaboration with the National Institute of Environmental Health Sciences (Clickner et al., 2001; NIEHS, n.d.). The survey was the first national survey to measure the prevalence of lead in dust, soil, and paint in the nation's housing stock. In 2005–2006, HUD oversaw the first iteration of the AHHS (AHHS I); field data and environmental samples were collected from 1,131 randomly selected homes (Dewalt et al., 2015). Findings from these surveys have proven useful for tracking national progress in reducing the number of U.S. housing units with lead-based paint and other home health hazards.

Example analyses displayed in this article use data from the AHHS II. Those data are expected to be publicly available by early 2021. In addition to data on lead hazards, this data source can be used to assess the prevalence of other home hazards, including the presence of musty smells, mold, and moisture.

Survey Differences

Although the AHS and the AHHS II are both nationally representative surveys that can quantify the prevalence of certain home hazards, there are several key differences across the two surveys that might contribute to differing findings. Data users should consider key survey differences when planning home hazard analyses (exhibit 1).

Exhibit 1

Survey Differences and Use Consideration for the American Housing Survey (AHS) and the American Healthy Homes Survey (AHHS II) (1 of 2)

Topic	2015 AHS	AHHS II	Use Considerations
Survey Content	Covers a broad range of housing topics, including some home hazards	Primary focus is housing-related hazards	AHS allows users to examine basic information about home hazards alongside other housing characteristics. AHS regularly sponsors a healthy homes topical module. AHHS II can provide very detailed information about specific home hazards and will be repeated less frequently.
Findings Audience	Wide range of stakeholders	Environmental health scientists	AHS covers a broad range of topics, which often does not allow for a deep dive into specific subtopics. Some AHHS II data collection methods are highly technical (for example, DNA-based analyses) and designed for interpretation by environmental health scientists.
Approximate Sample Size	85,000 housing units	700 housing units	Given the large sample size, prevalence estimates using AHS will have a relatively small standard error even when subsetting the data by select characteristics.
Unit of Analysis	Household (housing unit)-level and limited person-level information	Household (housing unit)-level information	Although both surveys allow for housing unit-level analyses, AHS allows users to identify key characteristics for the head of household. AHHS does not identify a head of household.

Exhibit 1

Survey Differences and Use Consideration for the American Housing Survey (AHS) and the American Healthy Homes Survey (AHHS II) (2 of 2)

Topic	2015 AHS	AHHS II	Use Considerations
Data Collection	Census interviewers conduct in-person visits or telephone calls; takes approximately 1 hour to complete	Two-person teams (interviewer and field technician); completion time ranges from 2.0 to 3.5 hours	Although lengthy, AHHS II data collection process is multidimensional and highly detailed, which allows users to gain a deep, unparalleled understanding of the prevalence of home hazards in the U.S housing stock. This information is not collected in any other national survey.
Survey Responses	All responses are self-reported	Includes self-reported questionnaire responses and observations from trained field technicians	For AHHS II, trained and certified inspectors and risk assessors record observations regarding several home health hazards. AHS relies fully on respondent self-reporting, introducing several types of potential bias, including self-report bias, selective recall bias, and social desirability bias.

Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Data Analysis Example

To highlight key differences across the 2015 AHS and the AHHS II, the prevalence of musty smells, mold, and moisture was examined in the occupied U.S. housing stock. Additionally, the relationship between (1) housing age and (2) musty smells, mold, and moisture was examined. This relationship was selected as a data analysis example because these home hazards have important implications for the public health community. Additionally, little is known about the prevalence of these conditions or the relationship between housing age and musty smells, mold, and moisture in the U.S. housing stock. In this section, the procedures used to analyze the AHS and the AHHS II are briefly explained. Then, key findings are highlighted.

Variable Availability and Metric Definitions

Before conducting analyses, the researchers examined available survey questions and corresponding variables pertaining to musty smells, mold, and moisture in both the AHS and the AHHS II. As mentioned previously, the AHS solely focuses on self-response, whereas the AHHS II collects information via self-response questionnaires and observations recorded by a trained field technician. Exhibit 2 highlights key survey questions pertinent to musty smells, mold, and moisture in both surveys.

Exhibit 2

Survey Question(s) Regarding Musty Smells, Mold, and Moisture in the 2015 American Housing Survey (AHS) and the American Healthy Homes Survey II (AHHS II)

Topic	Survey Name (Response Type)		
	2015 AHS (Respondent Self-Report)	**AHHS II (Respondent Self-Report)**	**AHHS II (Trained Technician Observation)**
Musty Smells	In the last 12 months, how often have you noticed any musty smells inside your home? *(Daily/Weekly/ Monthly/A few times/Never)*	Does your home frequently have a mildew odor or musty smell? *(Yes/No)*	Does this room have a musty smell? *(Yes/No)*
Mold	In the last 12 months, was there mold covering an area greater than or equal to the size of an 8-1/2" x 11" piece of paper in your unit? *(Yes/No)*	N/A	Does this room have any visible mold growth? *(Yes/No)*
Moisture and Leaks	(1) Did water leak in from the outside within the past 12 months? *(Yes/No)* and (2) Did any inside water leaks happen within the past 12 months? *(Yes/No)*	(1) Have there ever been water problems or dampness in your home from broken pipes, persistent leaks, heavy rain, or floods? *(Yes/No)* (2) How recently have there been water problems or dampness in your home? *(Right now/Not now but in the last 3 months/3 to 12 months ago/More than a year ago)*	N/A

NA = not applicable.
Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Based on question availability, topics were defined as follows:

- **Musty Smells.** In the AHS, musty smells were considered "frequent" if respondents reported noticing musty smells daily, weekly, or monthly during the prior 12 months. In the AHHS II, musty smells were coded based on "yes/no" questions regarding frequent or current musty smells noticed by household respondents and field technicians.

- **Mold.** In the AHS, housing units were considered to have mold if respondents reported noticing mold covering an area greater than or equal to 8-1/2" x 11"(dimensions of a standard sheet of paper) in any housing unit location during the prior 12 months. This "yes/no" question seeks to identify homes with large areas of mold growth. In the AHHS II, units were considered to have mold if the field technician noted "any visible mold growth" in kitchens, common living areas, bedrooms, or basements. The AHHS II questionnaire did not ask households to self-report the presence of mold.

- **Moisture and Leaks.** The presence of moisture or leaks was defined using two questions in the AHS and the AHHS II. AHS respondents were considered to have moisture in their home if they reported inside water leaks or leaks from the outside during the prior 12 months. In the AHHS II, respondents were considered to have moisture in their units if they reported water problems or dampness in their home from broken pipes, persistent leaks, heavy rain, or floods during the prior 12 months.

Analytic Procedures

All statistical analyses were performed using SAS software.[1] Survey analysis procedures were used to analyze complex survey design data. Such procedures account for multistage design, stratifications, variance estimation, and proper weighting (SAS Institute, n.d.). Standard error (SE) estimates were produced for all weighted prevalence estimates. For analyses using the AHS, the household-level public use file (PUF) was used (U.S. Census Bureau, 2015). Because the HH module questions were asked to only approximately one-half of respondents, proper weights were applied. The AHHS II file was received directly from HUD's contractor, QuanTech.

Select Findings

The following section provides uncontrolled, weighted tabulations regarding the prevalence of musty smells, mold, and moisture in the occupied U.S. housing stock. Tabulations include estimates from both the AHS and the AHHS II. It is important to note that, although many variables are based on similar concepts, survey questions are not consistent across data sources.

Musty Smells, Mold, and Moisture

When examining the prevalence of musty smells in the U.S. housing stock, rates differ by survey (exhibit 3). According to the 2015 AHS, an estimated 5.85 percent (SE: 0.17) of respondents reported frequent musty smells in their home. Prevalence rates were much higher among AHHS II respondents, with 13.4 percent (SE: 1.33) self-reporting frequent musty smells. Additionally, AHHS II technicians observed musty smells in 12.7 percent (SE: 1.94) of surveyed units.

Prevalence rates pertaining to visible mold in the U.S. housing stock were similar by survey. According to the 2015 AHS, an estimated 3.77 percent (SE: 0.14) of residents in occupied units reported a large area (8-1/2"x11" or larger) of mold inside the home. Similarly, AHHS II technicians observed visible mold (any size) in 2.76 percent (SE: 0.58) of housing units.

The prevalence of moisture and leaks was also similar in both surveys despite differences in survey questions. According to the 2015 AHS, 16.7 percent (SE: 0.26) of residents in occupied units reported indoor or outdoor leaks during the prior 12 months. Similarly, the AHHS II household questionnaire found that approximately 21.0 percent (SE: 1.93) of respondents self-reported dampness in their home from broken pipes, persistent leaks, heavy rain, or floods during the prior 12 months.

[1] SAS Institute Inc., Cary, North Carolina, USA: Version 9.4.

Exhibit 3

Prevalence of Musty Smells, Mold, and Moisture in the U.S. Occupied Housing Stock, 2015 American Housing Survey (AHS) and American Healthy Homes Survey II (AHHS II)

Outcome	2015 AHS		AHHS II			
	Respondent Self-Report		Respondent Self-Report		Technician Observation	
	%	SE	%	SE	%	SE
Musty Smells	5.85	0.17	13.4	1.33	12.7	1.94
Mold	3.77	0.14	N/A	N/A	2.76	0.58
Moisture and Leaks	16.7	0.26	21.0	1.93	N/A	N/A

N/A = not applicable. SE = standard error.

Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Housing Age and Musty Smells, Mold, and Moisture

To determine if housing age is associated with the prevalence of musty smells, mold, and moisture, cross-tabulations were conducted. Due to sample size issues in the AHHS II, housing age was collapsed into three categories (pre-1950, 1950–1979, and 1980+). Chi-square testing was conducted to determine if each hazard was significantly and independently associated with housing age. Despite collapsing housing age into three categories, standard error estimates were relatively high for the AHHS II due to limited sample size.

When examining the relationship between housing age and musty smells, both AHS and AHHS II estimates suggest that older housing units report higher rates of musty smells (exhibit 4). All three variables examining this topic yielded significant results.

Exhibit 4

Prevalence of Musty Smells in the U.S. Occupied Housing Stock, 2015 American Housing Survey (AHS) and American Healthy Homes Survey II (AHHS II)

Year Housing Unit Built	2015 AHS			AHHS II					
	Respondent Self-Report			Respondent Self-Report			Technician Observation		
	%	SE	p-value*	%	SE	p-value*	%	SE	p-value*
Pre-1950	6.26	0.39	0.0018	20.5	3.57	0.0021	21.3	4.05	<.0001
1950–1979	6.43	0.28		16.1	2.19		16.4	2.68	
1980+	5.18	0.24		8.60	1.83		6.48	1.90	

**Based on chi-square testing*

SE = standard error.

Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Analyses examining the relationship between mold and housing age yielded similar results in both the AHS and the AHHS II (exhibit 5). Prevalence rates of mold appear to be higher among pre-1950 housing units. Depending on which data source is examined, pre-1950 units have rates approximately two to five times higher than housing units built in 1980 or later.

Exhibit 5

Prevalence of Mold in the U.S. Occupied Housing Stock, 2015 American Housing Survey (AHS) and American Healthy Homes Survey II (AHHS II)

Year Housing Unit Built	2015 AHS			AHHS II					
	Respondent Self-Report			Respondent Self-Report			Technician Observation		
	%	SE	p-value*	%	SE	p-value*	%	SE	p-value*
Pre-1950	4.95	0.36	<.0001	N/A			5.95	2.32	0.0003
1950–1979	4.60	0.24					3.71	0.97	
1980+	2.57	0.17					0.77	0.27	

*Based on chi-square testing

N/A = not applicable. SE = standard error.

Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Lastly, the relationship between moisture and housing age was examined (exhibit 6). Although both surveys revealed a significant relationship, the directionality is less clear for the AHHS II data. In the AHS, there is a clear relationship between housing age and the reported presence of home moisture; however, in the AHHS II, the highest rate of moisture occurred in the middle category (units built between 1950 and 1979). This rate could be attributed, however, to the fact that confidence intervals overlap across categories. For both surveys, the newest housing (1980+) had the lowest prevalence of recent moisture problems.

Exhibit 6

Prevalence of Moisture in the U.S. Occupied Housing Stock, 2015 American Housing Survey (AHS) and American Healthy Homes Survey II (AHHS II)

Year Housing Unit Built	2015 AHS			AHHS II					
	Respondent Self-Report			Respondent Self-Report			Technician Observation		
	%	SE	p-value*	%	SE	p-value*	%	SE	p-value*
Pre-1950	22.4	0.69	<.0001	24.8	3.64	0.0003	N/A		
1950–1979	17.2	0.43		26.3	2.65				
1980+	13.9	0.37		15.4	2.17				

*Based on chi-square testing

N/A = not applicable. SE = standard error.

Sources: U.S. Census Bureau, 2015 American Housing Survey; HUD, American Healthy Homes Survey II

Data Implications

The data analysis example highlighted above shows that both the AHS and the AHHS II can be used to produce prevalence estimates regarding home health hazards in the occupied U.S. housing stock. Although estimates regarding musty smells differed across the surveys, prevalence estimates regarding the presence of mold and moisture were similar in both surveys despite survey differences.

Results suggest three critical implications regarding the interpretation of home hazard outcomes given differing survey metrics and implementation procedures used in the AHS and the AHHS II.

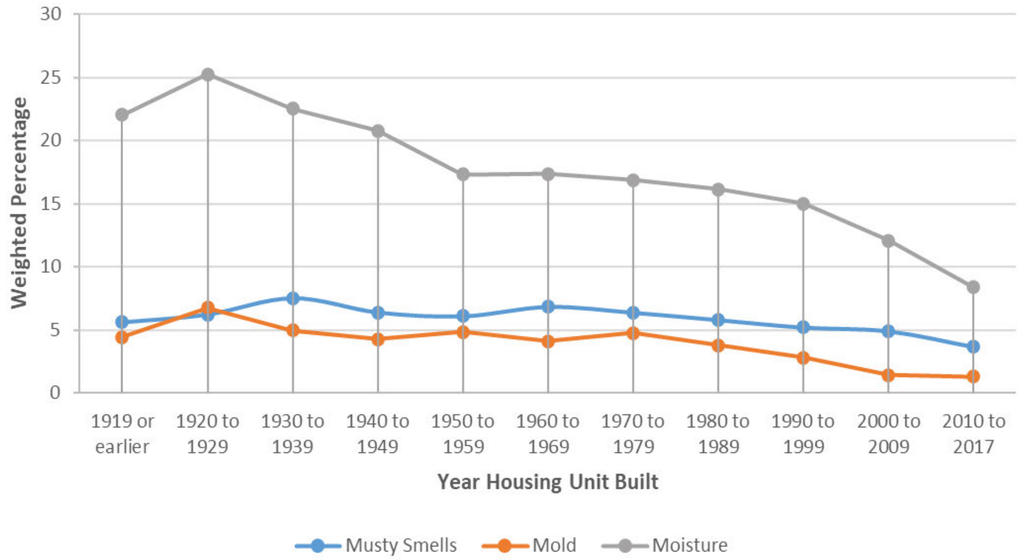
First, data users should consider their analytic purpose. Although the AHS can be used to broadly examine and estimate the prevalence of some home hazards, the AHHS II should be used for detailed analyses regarding specific hazards (for example, lead dust hazards). Most AHHS II data collection efforts for specific hazards represent the gold standard. If users plan to subset analyses by specific sociodemographic characteristics (for example, race and ethnicity), however, careful consideration should be given to potential sample size limitations.

Second, it is important for users to carefully review the survey questions and data collection efforts used to capture information about specific home hazards. For example, consider the "musty smells" topic. Researchers interested in this topic have several options. Although all questions capture the same construct, there are slight nuances that should be considered. The AHS asks respondents a Likert-scale question: *In the last 12 months, how often have you noticed any musty smells inside your home?* Response options include daily, weekly, monthly, a few times, and never. Conversely, the AHHS II asks respondents a "yes/no" question: *Does your home frequently have a mildew odor or musty smell?* Both self-report questions are similar, but different question wording may affect responses. The AHHS II also asks trained field technicians to complete the following question: *Does this room have a musty smell?* Again, options are yes/no. Because technicians are formally trained, users may want to bypass using self-reported metrics and use field observations. Data users should carefully consider question nuances when planning analyses.

Third, although AHHS II captures detailed information about specific hazards, including field technician observations, the low sample size makes multivariate analyses difficult. For example, in the analyses highlighted in this article, housing age had to be collapsed into three categories. Conversely, the large AHS sample size allows users to examine 11 categories of housing age (exhibit 7). From these analyses, the relationship between housing age and musty smells ($p=0.0255$), mold ($p<0.0001$), and moisture ($p<0.0001$) appears significant. This finding further underscores that research questions and output purpose should guide whether the AHS or the AHHS II is used for analyses.

Exhibit 7

Prevalence of Musty Smells, Mold, and Moisture by Housing Age, 2015 American Housing Survey



Source: U.S. Census Bureau, 2015 American Housing Survey

Conclusion

This article introduces readers to the use of the 2015 AHS and the AHHS II to determine the prevalence of certain home hazards in the U.S. housing stock. The presence of musty smells, mold, and moisture was examined in each survey as a data analysis example. Despite differing survey implementation strategies and survey questions, the results of both surveys were similar. Nonetheless, the results suggest several important considerations for data users interested in using these surveys for national population estimates regarding home hazards.

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Measuring Neighborhood Opportunity with Opportunity Atlas and Child Opportunity Index 2.0 Data

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Abstract

Researchers have recently introduced two datasets measuring neighborhood opportunity: the Harvard University Opportunity Atlas data (Chetty et al., 2018b) and the Brandeis University Child Opportunity Index (COI) 2.0 data (Noelke et al., 2020).

The Opportunity Atlas data measure neighborhood opportunity longitudinally on the basis of children's outcomes in adulthood for the years 1989 to 2015. The COI 2.0 data measure neighborhood opportunity contemporaneously for the years 2010 and 2015 on the basis of 29 child welfare indicators categorized into three domains: (1) education, (2) health and environment, and (3) social and economic.

In this article we describe the two datasets and present a data analysis example estimating what the Part I crime distribution in Dallas would be if neighborhood opportunity distributions (based on both neighborhood opportunity data sources) in Dallas were more similar to those of Chicago. We adjust for neighborhood opportunity differences between the two cities using the nonparametric propensity score matching technique (Barskey et al., 2002). We conclude that neighborhood opportunity differences explain little of the crime differences between the two cities.

Introduction

This article introduces readers to and illustrates a practical application of two measures of neighborhood opportunity: the Chetty et al. (2018b) Opportunity Atlas data[1] and the Child Opportunity Index (COI) 2.0 data.[2]

The main difference between the Opportunity Atlas and COI 2.0 approaches to measuring neighborhood opportunity is that the Opportunity Atlas measures opportunity longitudinally, whereas the COI 2.0 measures are contemporaneous. The Opportunity Atlas also has a narrower focus than the COI 2.0 data. For example, the COI 2.0 data contain health and education measures, whereas the Opportunity Atlas does not. In practice, some of the Opportunity Atlas opportunity measures are highly correlated with the COI 2.0 overall index because the COI 2.0 weighting method is partially based on two Opportunity Atlas child outcome measures.

For a data analysis example, we explore the relationship between the COI 2.0 index, an Opportunity Atlas measure of children's income in adulthood, and Part I crime (defined in the next section) rates in two cities: Chicago and Dallas. We chose to analyze crime because crime was shown to be a major motivation to escape low-opportunity neighborhoods in the Moving to Opportunity experiment (Sanbonmatsu et al., 2011). We analyze census tract data for the cities of Chicago and Dallas because crime incident data were publicly available with the necessary geographic and Uniform Crime Reporting classification information.[3,4] These cities also have fairly large differences in neighborhood opportunity distributions, which make the data analysis example more interesting and policy-relevant.

We estimate what the crime distribution in Dallas would be if Dallas' neighborhood opportunity distributions (based on both the Opportunity Atlas income measure and COI 2.0 index) were more similar to Chicago's, using Barskey et al.'s (2002) nonparametric propensity score matching technique. Our findings indicate that neighborhood opportunity differences explain little of the differences in crime between the two cities.

The remainder of this article is organized as follows: We discuss data sources in the next section. We then describe specific data used in our data analysis example, and next we report summary statistics and maps. We then present our data analysis example, and the final section includes concluding remarks.

Data Sources

Opportunity Atlas Data

The Opportunity Atlas data consist of 24 child outcome estimates, mainly for children in 1978–1983 birth cohorts, reported in exhibit 1. The outcomes were estimated by Chetty et al. (2018b) with panel microdata from 1989 to 2015; data from the 2000 and 2010 decennial censuses were linked to federal income tax return data and the 2005–2015 American Community Surveys to measure children's outcomes in adulthood, along with some parental characteristics.

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1 https://www.census.gov/programs-surveys/ces/data/public-use-data/opportunity-atlas-data-tables.html.

2 http://data.diversitydatakids.org/dataset/coi20-child-opportunity-index-2-0-database.

3 https://data.cityofchicago.org/.

4 https://www.dallasopendata.com/.

Exhibit 1

Opportunity Atlas Child Outcome Measures

Number	Outcome
1	Fraction of children who have a male claimer in the year they are linked to parents
2	Fraction of children who have a female claimer in the year they are linked to parents
3	Fraction incarcerated on April 1, 2010
4	Mean percentile rank (relative to other children born in the same year) in the national distribution of household income
5	Baseline income measure (2014–2015 income) as defined above but restricted to children who live in one of their childhood commuting zones in adulthood
6	Probability of reaching the top 1 percent of the national household income distribution (among children born in the same year) in 2014–2015
7	Probability of reaching the top quintile of the national household income
8	Mean percentile rank (relative to other children in the same year) in the national distribution of household income, measured at ages 24, 26, and 29
9	Mean percentile rank (relative to other children born in the same year) in the national distribution of individual income measured as mean earnings in 2014–2015 for the baseline sample
10	Baseline income measure (2014–2015 income) as defined above but restricted to children who live in one of their childhood commuting zones in adulthood
11	Probability of reaching the top 1 percent of the national individual income distribution (among children born in the same year) in 2014–2015
12	Probability of reaching the top quintile of the national individual income distribution (among children born in the same year) in 2014–2015
13	Mean percentile rank (relative to other children born in the same year) in the national distribution of individual income, measured at ages 24, 26, and 29
14	Fraction of children who grew up in a given tract and end up living in a tract with a poverty rate of less than 10 percent (according to tract-level Census 2000 data) in adulthood (tracts where children live as adults are defined as the tract of the last non-missing address observed on tax returns)
15	Fraction of children who file their federal income tax return as “married filing jointly” or “married filing separate” in 2015
16	Fraction of children who file their federal income tax return as “married filing jointly” or “married filing separate” at ages 26, 29, and 32
17	Mean individual income rank in 2014–2015 for the spouses of children who grew up in the given tract (child’s spouse refers to the person to whom they are married in 2015)
18	Fraction of children who live in one of their childhood commuting zones in adulthood
19	Fraction of children who live at the same address as their parents in 2015
20	Fraction of individuals who live in one of their childhood census tracts in adulthood
21	Fraction of women who grew up in the given tract who ever claimed as a dependent at any point a child who was born when they were between the ages of 13 and 19
22	Fraction of children claimed by two people in the year they are linked to parents
23	Fraction of children with positive W-2 earnings in 2015
24	Fraction of children with positive W-2 earnings at ages 24, 26, 29, and 32

Source: OpportunityInsights.org

Chetty et al. (2018b) generated tract-level estimates of children’s outcomes in adulthood by race, gender, and parents’ income level (the 1st, 25th, 50th, 75th, and 100th percentiles). They also produced pooled estimates for all races, pooled estimates for both genders, and pooled estimates for all races and both genders. The Opportunity Atlas data also contain mean predictions unconditioned on parental income.

Children were assigned to census tracts in proportion to the amount of their childhood they spent in each tract. In each tract-by-gender-by-race cell, Chetty et al. (2018b) predicted the conditional expectation of children's percentile outcomes in adulthood, given their parents' percentile in the household income distribution, using a univariate regression accounting for nonlinearity. Some outcomes are reported for different ages of children when they reach adulthood.

To protect privacy, Chetty et al. (2018b) added a small amount of random noise to each estimate; typically, the noise is less than one-tenth of the standard error of the estimate itself (Chetty et al., 2018b). The Opportunity Atlas data contain standard errors for each outcome, which account for both sampling error and the random noise added to the estimates for privacy protection.

The Opportunity Atlas data are available at the national, county, commuting zone, and census tract level.

Child Opportunity Index 2.0 Data

COI 2.0 data measure child neighborhood opportunity based on 29 indicators categorized into three domains: education, health and environment, and social and economic. We list the domains and factors in exhibit 2 (adopted from Noelke et al., 2020, table 2). More complete information, including data sources, is available in Noelke et al. (2020) and Acevedo-Garcia et al. (2020).

Exhibit 2

Child Opportunity Index (COI) 2.0 Indicators and Sources (1 of 2)

Indicator	Description (Source)
Education Domain	
Early Childhood Education (ECE)	
ECE centers	Number of ECE centers within a 5-mile radius (Noelke et al.'s own data collection from state and federal sources)
High-quality ECE centers	Number of NAEYC-accredited centers within a 5-mile radius (authors' data collection from state and federal sources)
ECE enrollment	Percentage of 3- and 4-year-olds enrolled in nursery school, preschool, or kindergarten (American Community Survey [ACS])
Elementary Education	
Third grade reading proficiency	Percentage of third graders scoring proficient on standardized reading tests (EDFacts, Great Schools [GS], and Stanford Education Archive [SEDA])
Third grade math proficiency	Percentage of third graders scoring proficient on standardized math tests (EDFacts, GS, and SEDA)
Secondary and Postsecondary Education	
High school graduation rate	Percentage of ninth graders graduating from high school on time (EDFacts and GS)
Advanced Placement (AP) course enrollment	Ratio of students enrolled in at least one AP course to the number of 11th and 12th graders (Civil Rights Data Collection [CRDC])
College enrollment in nearby institutions	Percentage of 18–24-year-olds enrolled in college within 25-mile radius (ACS)
Educational and Social Resources	
School poverty	Percentage of students in elementary schools eligible for free or reduced-price lunches, reversed[5] (National Center for Education Statistics, Common Core of Data)
Teacher experience	Percentage of teachers in their first and second year of teaching, reversed (CRDC)
Adult educational attainment	Percentage of adults aged 25 and older with a college degree or higher (ACS)

[5] If a metric is 99 percent, it would be 1 percent reversed. This is so that all indicators can be in the same direction (a higher level indicates more opportunity).

Exhibit 2

Child Opportunity Index (COI) 2.0 Indicators and Sources (2 of 2)

Indicator	Description (Source)
Health and Environment Domain	
Healthy Environments	
Access to healthy food	Percentage of households without a car located further than one-half mile from the nearest supermarket, reversed (USDA)
Access to green space	Percentage of impenetrable surface areas, such as rooftops, roads, or parking lots, reversed (CDC)
Walkability	EPA Walkability Index (EPA)
Housing vacancy rate	Percentage of housing units that are vacant, reversed (ACS)
Toxic Exposures	
Hazardous waste dump sites	Average number of Superfund sites within a 2-mile radius, reversed (EPA)
Industrial pollutants in air, water, or soil	Index of toxic chemicals released by industrial facilities, reversed (EPA)
Airborne microparticles	Mean estimated microparticle (PM2.5) concentration, reversed (CDC)
Ozone concentration	Mean estimated 8-hour average ozone concentration, reversed (EPA)
Extreme heat exposure	Summer days with maximum temperature above 90 degrees F, reversed (CDC)
Health Resources	
Health insurance coverage	Percentage of individuals aged 0–64 with health insurance coverage (ACS)
Social and Economic Domain	
Economic Opportunities	
Employment rate	Percentage of adults aged 25–54 who are employed (ACS)
Commute duration	Percentage of workers commuting more than 1 hour, one-way, reversed (ACS)
Economic and Social Resources	
Poverty rate	Percentage of individuals living in households with incomes below 100 percent of the federal poverty threshold, reversed (ACS)
Public assistance rate	Percentage of households receiving cash public assistance or food stamps/ Supplemental Nutrition Assistance Program, reversed (ACS)
Homeownership rate	Percentage of owner-occupied housing units (ACS)
High-skill employment	Percentage of individuals aged 16 and older employed in management, business, financial, computer, engineering, science, education, legal, community service, health care, health technology, arts, and media occupations (ACS)
Median household income	Median income of all households (ACS)
Single-headed households	Percentage of family households that are single-parent headed, reversed (ACS)

CDC = Centers for Disease Control or Prevention. EPA = U.S. Environmental Protection Agency. NAEYC = National Association for the Education of Young Children. USDA = U.S. Department of Agriculture.
Source: Noelke et al. (2020).

The 29 indicators reported in exhibit 2 were combined into an overall index of child neighborhood opportunity using weights. Before combining the indicators, each indicator was standardized using 2010 means and standard deviations. Their weighting scheme combined unit weights with empirical weights based on how important a given factor was in predicting four child outcomes:

- Mean household income rank in adulthood for children whose parents' income was at the 50th percentile (median) of the income distribution (Chetty et al., 2018b).
- The probability of living in a low-poverty census tract in adulthood for children whose parents' income was at the 50th percentile (median) of the income distribution (Chetty et al., 2018b).
- Mental health not good for 14 or more days among adults aged 18 and older (CDC, 2017).
- Physical health not good for 14 or more days among adults aged 18 and older (CDC, 2017).

Noelke et al. (2020) estimated correlations among the 29 indicators and the four child outcomes, with stronger predictors of better child outcomes receiving greater weight. Some larger weights were shrunk to avoid giving too much influence to any one indicator. Average correlations between the 29 indicators and four child outcomes and the final weights are reported in table 5 of Noelke et al. (2020).

COI 2.0 data are available at the census tract level for 2010 and 2015. Besides raw indicators and z-scores, COI 2.0 index data are available as two metrics for applied users, Child Opportunity Levels and Child Opportunity Scores. Each metric is available normalized nationally, by state, and by metropolitan area.

Crime Data

Local police departments collect crime data as incident events. They report the data to the Federal Bureau of Investigation (FBI) as part of the Uniform Crime Reporting (UCR) program. Using an index developed by the FBI, the single crime considered the most severe during the criminal incident is used to classify the incident as a single event, although many other crimes may have been committed during the same incident. The classification of the crime(s) committed in an incident may differ between the local jurisdiction and the UCR description, but the use of the UCR classification allows for broad-level standardization among the thousands of police jurisdictions in the United States. Using UCR-classified data is important because it allows for comparison between different jurisdictions.

Part I crimes include major events such as criminal homicide, forcible rape, robbery, aggravated assault, and other highly serious crimes (FBI, 2004).

Data Description and Maps

In this section, we describe the data used for our data analysis example and report summary statistics along with maps.

Data Description

We analyze census tract data for the cities of Chicago and Dallas and an Opportunity Atlas income outcome for children whose parents' incomes were at the 25th percentile nationally within birth cohorts. The income outcome is measured by the income percentile of the children when they reach adulthood. This variable is defined as "mean household income rank for children whose parents were at the 25th percentile of the national income distribution. Incomes for children were measured as mean earnings in 2014–2015, when they were between the ages of 31 and 37 years old (Chetty et al., 2018a, 1). The income outcome estimates we analyze are pooled for all races and both genders.

We also analyze the nationally normed COI 2.0 index z-score for 2015 and Part I crime rates per 10,000 population for 2017. We used 2013–2017 American Community Survey 5-year population data for computing crime rates.

Summary Statistics

Summary statistics by city are reported in exhibit 3. The mean Opportunity Atlas income outcome is .371 in Chicago; this indicates that on average, a child born into a household at the 25th percentile would be observed in the 37th percentile in adulthood. The corresponding mean in Dallas is slightly higher, at .388. The standard deviations in income outcomes are approximately equal in both cities.

Exhibit 3

Summary Statistics (1 of 2)

Variable	City	N	Mean	Std Dev	Min	Median	Max
Opportunity Atlas income outcome (percentile ranking)	Chicago	793	0.371	0.078	0.083	0.372	0.709
	Dallas	272	0.388	0.077	0.251	0.37	0.691
	Dallas, propensity score weighted based on Opportunity Atlas data	272	0.373	0.080	0.251	0.372	0.691
COI 2.0 nationally normed index	Chicago	792	-0.021	0.039	-0.106	-0.019	0.052
	Dallas	272	-0.012	0.035	-0.098	-0.016	0.06
	Dallas, propensity score weighted based on COI 2.0 data	272	-0.020	0.040	-0.098	-0.019	0.060
Tract population	Chicago	793	3,432.66	1,849.45	341	3,067	19,015
	Dallas	272	4,323.53	1,935.55	510	4,064	10,448
Part I crime count	Chicago	793	145.462	159.878	6	109	2,492
	Dallas	272	151.89	119.447	9	129	1,313

Exhibit 3

Summary Statistics (2 of 2)

Variable	City	N	Mean	Std Dev	Min	Median	Max
Tract Part I crime rate per 10,000 population	Chicago	793	474.909	395.003	33.241	362.641	4,502.68
	Dallas	272	377.245	268.613	52.57	301.598	1,725.60
	Dallas, propensity score weighted based on Opportunity Atlas data	272	413.016	302.364	52.570	315.582	1725.601
	Dallas, propensity score weighted based on COI 2.0 data	272	411.670	279.568	52.570	339.355	1725.601

COI = Child Opportunity Index. Dev = standard deviation. Max = maximum. Min = minimum. N = number of census tracts.
Sources: U.S. Census Bureau 2013–2017 American Community Survey 5-year data; Dallas OpenData; Chicago Data Portal; OpportunityInsights.org; DiversityDataKids.org

The mean nationally normed COI 2.0 index is -0.021 in Chicago. The national standard deviation in this variable is .032, which implies that the average Chicago neighborhood is about .7 standard deviations below the national average. A typical Dallas neighborhood is approximately .4 standard deviations below the national average. The variance in the COI 2.0 index is about the same in both cities.

Mean Part I crime rates per 10,000 population are 475 in Chicago and 377 in Dallas, and the standard deviation is much larger in Chicago compared with Dallas.

Maps

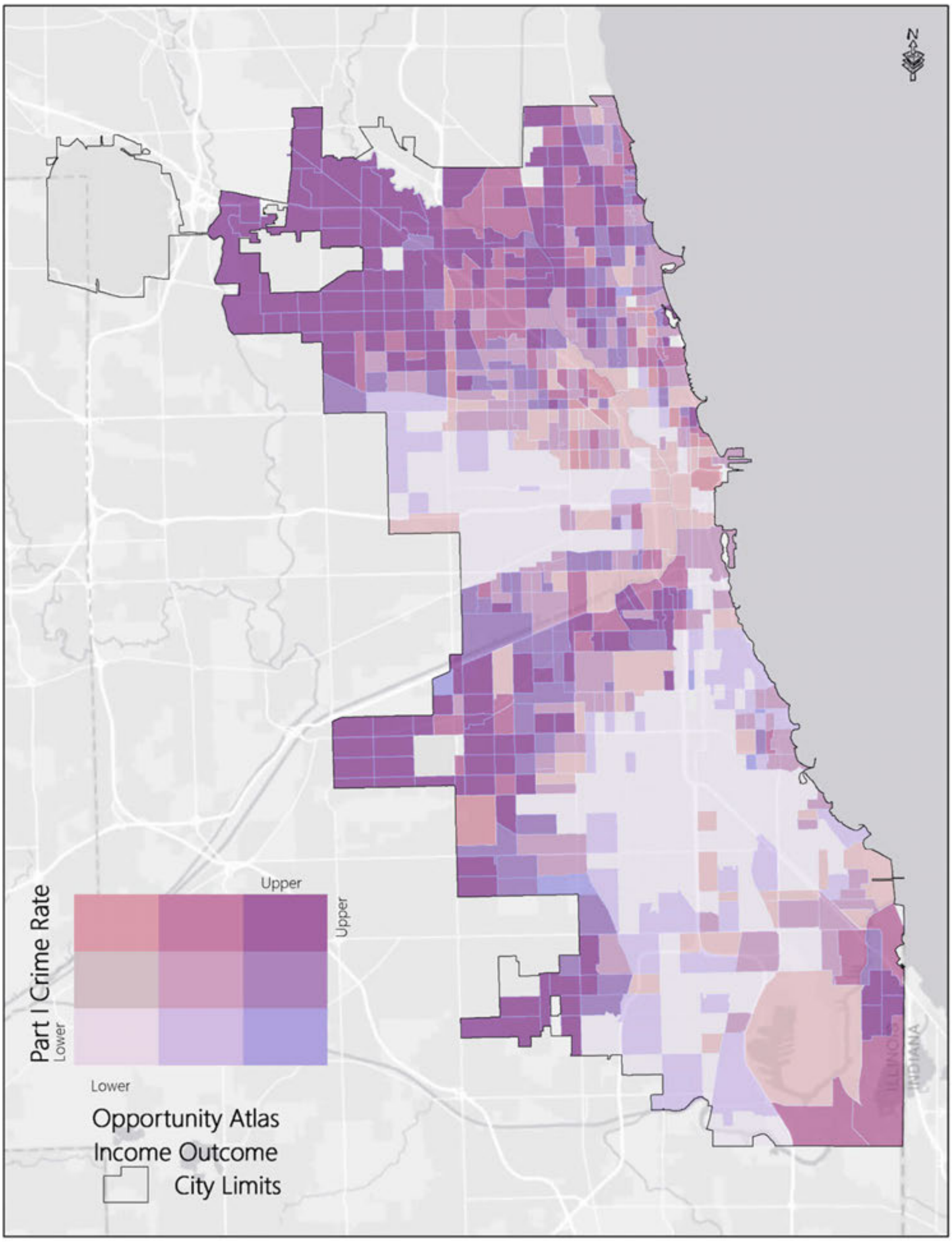
Exhibit 4 presents a bivariate map of the Opportunity Atlas income outcomes and Part I crime rates for Chicago, and exhibit 5 reports a bivariate map of COI 2.0 index values and Part I crime rates for Chicago. Corresponding Dallas maps are reported in exhibits 6 and 7.

Bivariate maps show two normalized variables. In each of our bivariate maps, a neighborhood opportunity measure (Opportunity Atlas income outcome or COI 2.0 index) and Part I crime rates are normalized into percentiles that are then categorized into tertiles. For the Opportunity Atlas income outcome and the COI 2.0 index, the upper tertile contains tracts with the greatest neighborhood opportunity. For the Part I crime rate, we reversed percentile rankings before categorizing into tertiles so that the upper tertile has tracts with the lowest crime rates. Neighborhoods in the lowest tertiles for both variables have the lowest neighborhood opportunity and highest crime rates.

The bivariate map in exhibit 4 shows Opportunity Atlas income outcome and Part 1 crime rate tertiles for Chicago. Census tracts with the darkest color, at the top right of the legend, are in the top third of income outcome values and bottom third of Part I crime rates. These are the areas traditionally thought to have the greatest opportunity. Census tracts in the lowest tertiles of income outcomes and Part I crime rates, at the bottom left of the legend, are shown with the lightest color and have the lowest income outcomes and highest crime rates.

Exhibit 4

Bivariate Map of Opportunity Atlas Income Outcomes and Part I Crime Rates for Chicago



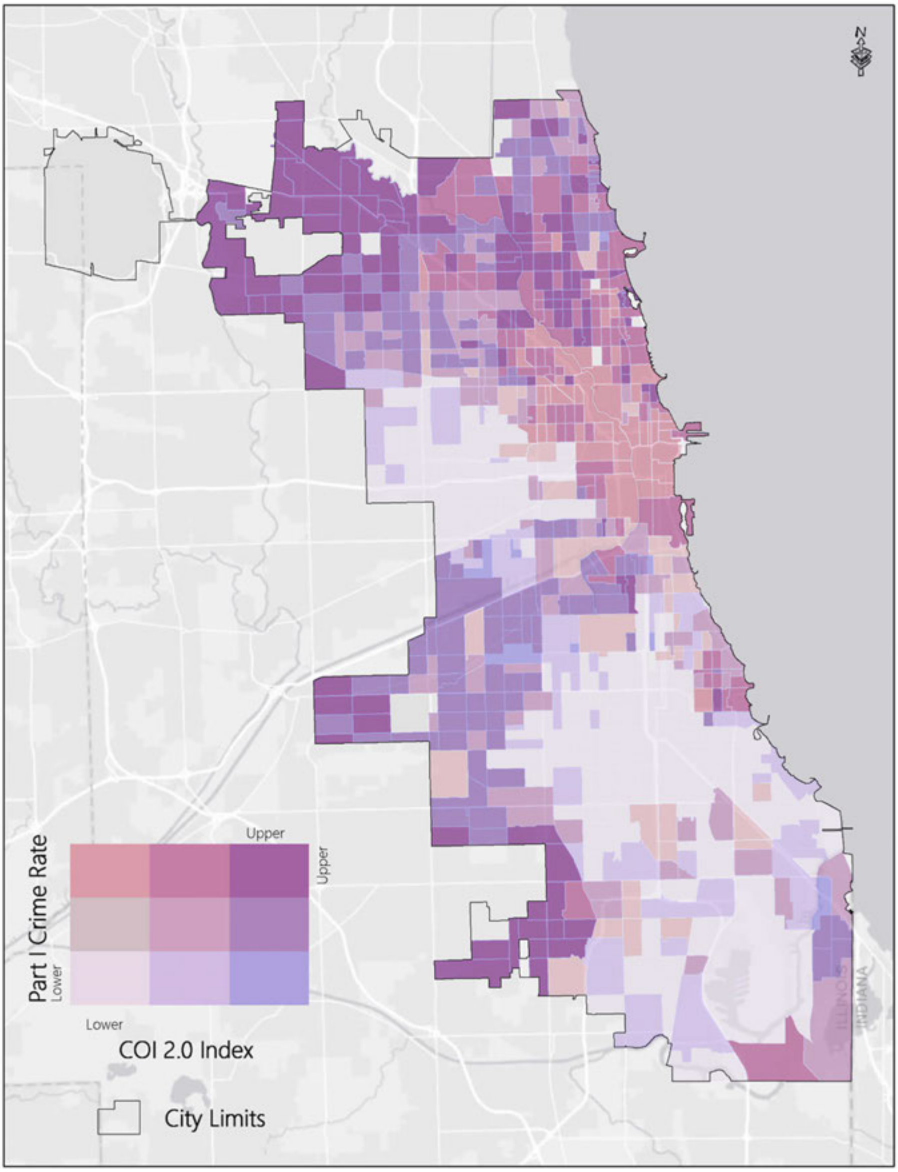
Sources: U.S. Census Bureau 2013–2017 American Community Survey 5-year data; Chicago DataPortal; OpportunityInsights.org

There are noticeable geographic patterns in the exhibit 4 map, such as areas of greater opportunity in northern and western Chicago and areas of less opportunity in the southern and upper-central western area of Chicago. Census tracts in the other seven categories have mixed Opportunity Atlas income outcome values and Part I crime rates; those areas are found throughout Chicago but seem concentrated in the transition areas, such as the far south side of Chicago, downtown, and along the shore of Lake Michigan.

Exhibit 5 reports a bivariate map of the COI 2.0 index and Part I crime rates in Chicago, which reveals similar geographic patterns to those in exhibit 4. In the north and southwestern areas of Chicago are areas of increased COI 2.0 index values and lower Part I crime rates. In the south and west of Chicago, there are areas of lower COI 2.0 index values and higher Part I crime rates. In the far south side of the city, downtown, and along the shore of Lake Michigan are primarily mixed opportunity areas. In particular, the area around downtown has higher crime rates but also has higher COI 2.0 index values.

Exhibit 5

Bivariate Map of Child Opportunity Index 2.0 Index and Part I Crime Rates for Chicago

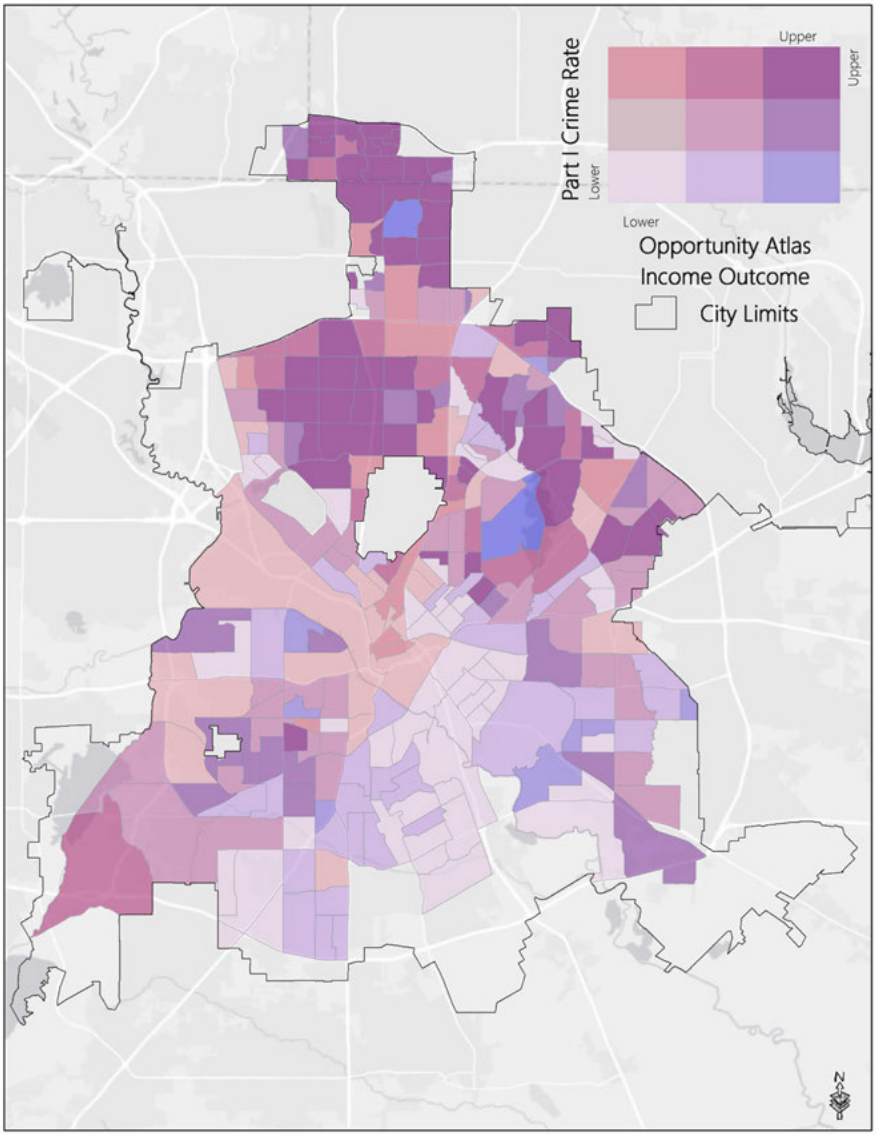


Sources: Chicago Data Portal; DiversityDataKids.org; U.S. Census Bureau 2013–2017 American Community Survey 5-year data

The bivariate map in exhibit 6 reports Opportunity Atlas income outcome and Part I Crime rate tertiles for Dallas. Areas in northern and northwestern Dallas have most of the higher income outcome and lower Part I crime rate neighborhoods, whereas southern Dallas contains most of the lower income outcome and higher Part I crime rate neighborhoods. Areas in southwestern and eastern Dallas have mixed income outcome and crime rate neighborhoods.

Exhibit 6

Bivariate Map of Opportunity Atlas Income Outcomes and Part I Crime Rates for Dallas

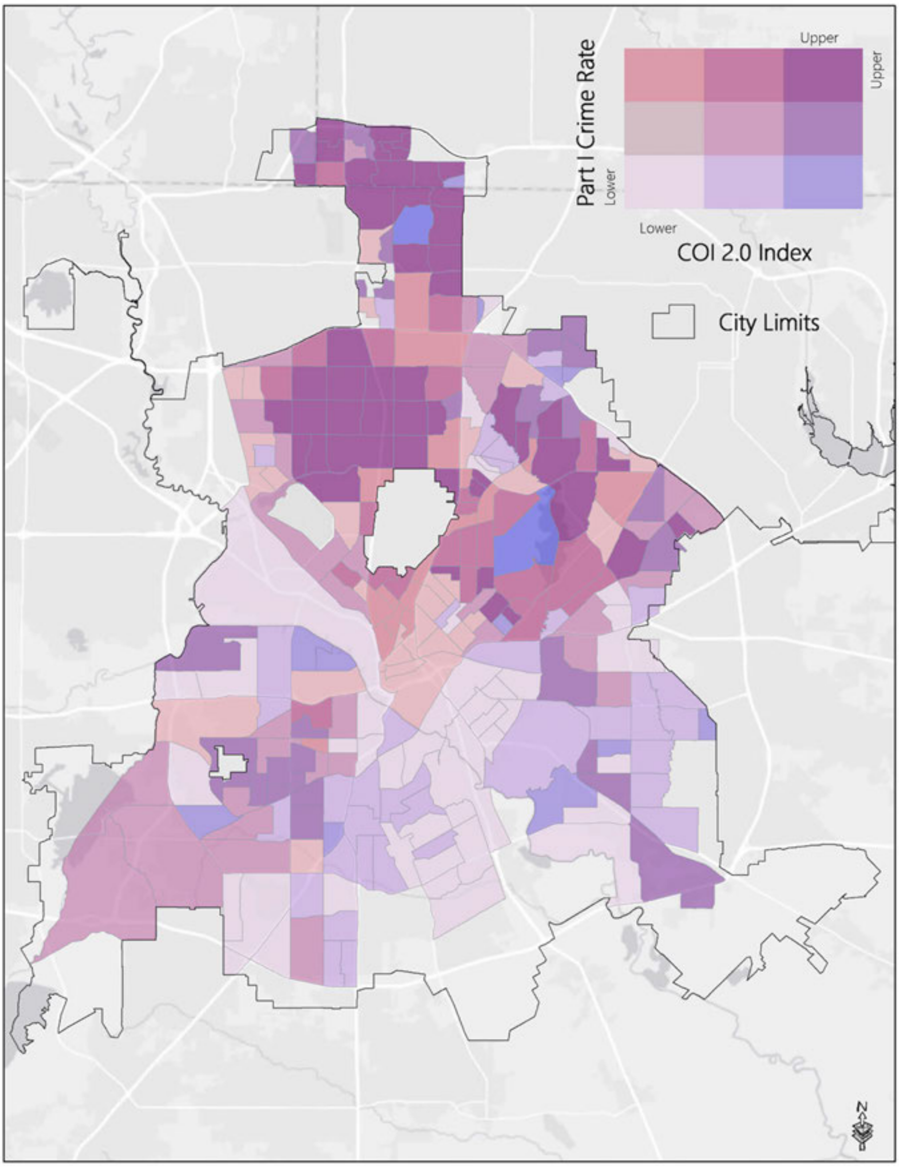


Sources: Chetty et al., 2018b; Dallas OpenData; U.S. Census Bureau 2013–2017 American Community Survey 5-year data

The bivariate map in exhibit 7 reports the COI 2.0 national index and Part I Crime rates tertiles for Dallas. Generally, the geographic patterns in exhibit 6 persist in exhibit 7 in areas of greatest and least opportunity, although mixed neighborhoods differ. Northern Dallas has greater COI 2.0 index values and lower Part I crime rates, whereas southern Dallas has lower COI 2.0 index values and greater crime rates. Neighborhoods in the west, southwest, and east sections of Dallas tend to have mixed COI 2.0 index values and crime rates.

Exhibit 7

Bivariate Map of Child Opportunity Index 2.0 Index and Part I Crime Rates for Dallas



Sources: Dallas OpenData; DiversityDataKids.org.; U.S. Census Bureau 2013–2017 American Community Survey 5-year data

Tabulations of census tract neighborhood opportunity tertiles and Part I crime rate tertiles that we mapped in exhibits 4–7 are presented in exhibit 8.

Exhibit 8

Tabulation of Census Tract Neighborhood Opportunity Tertiles and Part I Crime Rate Tertiles

Chicago

Part I Crime Rate	Lower Tertile	Middle Tertile	Upper Tertile
Upper Tertile	7	85	164
Middle Tertile	73	12	71
Lower Tertile	184	59	21

Opportunity Atlas Income Outcome

Part I Crime Rate	Lower Tertile	Middle Tertile	Upper Tertile
Upper Tertile	10	129	117
Middle Tertile	74	98	92
Lower Tertile	180	36	48

Child Opportunity Index 2.0 Index

Dallas

Part I Crime Rate	Lower Tertile	Middle Tertile	Upper Tertile
Upper Tertile	8	28	55
Middle Tertile	34	38	19
Lower Tertile	48	25	17

Opportunity Atlas Income Outcome

Part I Crime Rate	Lower Tertile	Middle Tertile	Upper Tertile
Upper Tertile	12	29	50
Middle Tertile	36	32	23
Lower Tertile	42	30	18

Child Opportunity Index 2.0 Index

Sources: Chicago Data Portal; Dallas OpenData; DiversityDataKids.org; OpportunityInsights.org; U.S. Census Bureau, 2013–2017 American Community Survey 5-year estimate data

Data Analysis

In this section, we estimate what the Part I crime rate distribution for Dallas would be if its neighborhood opportunity distribution were more equal to that of Chicago. We do so using both the Opportunity Atlas income outcome and COI 2.0 index as measures of neighborhood opportunity and then compare results.

Exhibit 9 presents frequency counts and percentages of census tracts in 20 categories of the Opportunity Atlas income outcome (roughly based on a histogram for Chicago with 20 categories) for both cities. The lower bounds for the income outcome categories in exhibit 9 are percentiles (0th, 5th, …, 95th) of the income outcome for Chicago, and the upper bounds are roughly the 5th, 10th, …, 100th percentiles for Chicago.

Exhibit 9

Opportunity Atlas Income Outcome Frequencies and Propensity Score Weights

	Chicago		Dallas		Propensity Score Weight	Dallas, Propensity Score Weighted	
Range	Count	Percentage	Count	Percentage		Weighted Count	Weighted Percentage
0–0.264	40	5.0	2	0.7	6.800	13.6	5.0
0.265–0.276	42	5.3	4	1.5	3.400	13.6	5.0
0.277–0.282	39	4.9	2	0.7	6.800	13.6	5.0
0.283–0.291	38	4.8	6	2.2	2.267	13.6	5.0
0.292–0.300	37	4.7	12	4.4	1.133	13.6	5.0
0.301–0.312	41	5.2	5	1.8	2.720	13.6	5.0
0.313–0.327	40	5.0	22	8.1	0.618	13.6	5.0
0.328–0.342	39	4.9	27	9.9	0.504	13.6	5.0
0.343–0.360	40	5.0	35	12.9	0.389	13.6	5.0
0.361–0.372	42	5.3	24	8.8	0.567	13.6	5.0
0.373–0.384	39	4.9	23	8.5	0.591	13.6	5.0
0.385–0.396	43	5.4	18	6.6	0.756	13.6	5.0
0.397–0.405	36	4.5	5	1.8	2.720	13.6	5.0
0.406–0.414	41	5.2	8	2.9	1.700	13.6	5.0
0.415–0.426	38	4.8	8	2.9	1.700	13.6	5.0
0.427–0.438	40	5.0	9	3.3	1.511	13.6	5.0
0.439–0.456	39	4.9	12	4.4	1.133	13.6	5.0
0.457–0.474	40	5.0	12	4.4	1.133	13.6	5.0
0.475–0.498	40	5.0	14	5.1	0.971	13.6	5.0
0.499–1.000	39	4.9	24	8.8	0.567	13.6	5.0

Source: OpportunityInsights.org

The proportion of Dallas census tracts in income outcome category j in exhibit 9, pj, can be used as a nonparametric estimate of the propensity score of being in the same income outcome category as a Chicago census tract. This nonparametric propensity score matching technique was introduced by Barskey et al. (2002).

We construct nonparametric propensity score weights based on the Opportunity Atlas income outcome equal to .05/pj, which are presented in exhibit 9. The sum of weights is 272 (the number of Dallas census tracts), and exhibit 9 presents weighted counts and percentages of Dallas census tracts in each income outcome category. The weighted percentage of Dallas census tracts in each income outcome category in exhibit 9 is 5 percent (roughly the same percentage as the census tracts in each category in Chicago).

After propensity score weighting Dallas census tracts, the distribution of income outcome categories in exhibit 9 is almost identical in Dallas and Chicago, and any remaining differences in income outcome distributions are due to differences within income outcome categories.

Propensity score-weighted income outcome summary statistics for Dallas are presented in exhibit 3. The weighted mean income outcome is .373, which is very close to the Chicago mean of .371. The standard deviations in income outcomes are very close in the two cities regardless of propensity score weighting.

Frequency counts and percentages for the COI 2.0 index are presented in exhibit 10, along with propensity score weights based on the COI 2.0 index and propensity score-weighted counts and percentages for Dallas.

Exhibit 10

Child Opportunity Index 2.0 Index Frequencies and Propensity Score Weights

	Chicago	Dallas		Propensity Score Weight		Dallas, Propensity Score Weighted	
Range	**Count**	**Percentage**	**Count**	**Percentage**		**Weighted Count**	**Weighted Percentage**
-1.000 to -0.087	41	5.2	9	3.3	1.511	13.6	5.0
-0.086 to -0.075	35	4.4	15	5.5	0.907	13.6	5.0
-0.074 to -0.069	40	5.0	13	4.8	1.046	13.6	5.0
-0.068 to -0.060	40	5.0	26	9.6	0.523	13.6	5.0
-0.059 to -0.051	38	4.8	13	4.8	1.046	13.6	5.0
-0.050 to -0.042	44	5.5	23	8.5	0.591	13.6	5.0
-0.041 to -0.036	35	4.4	22	8.1	0.618	13.6	5.0
-0.035 to -0.030	42	5.3	10	3.7	1.360	13.6	5.0
-0.029 to -0.024	40	5.0	18	6.6	0.756	13.6	5.0
-0.023 to -0.018	37	4.7	4	1.5	3.400	13.6	5.0
-0.017 to -0.015	42	5.3	7	2.6	1.943	13.6	5.0
-0.014 to -0.009	37	4.7	5	1.8	2.720	13.6	5.0
-0.008 to -0.003	41	5.2	2	0.7	6.800	13.6	5.0
-0.002 to 0.003	43	5.4	9	3.3	1.511	13.6	5.0
0.004 to 0.012	43	5.4	18	6.6	0.756	13.6	5.0
0.013 to 0.018	36	4.5	18	6.6	0.756	13.6	5.0
0.019 to 0.027	38	4.8	9	3.3	1.511	13.6	5.0
0.028 to 0.033	44	5.5	11	4.0	1.236	13.6	5.0
0.034 to 0.039	39	4.9	17	6.3	0.800	13.6	5.0
0.040 to 1.000	37	4.7	23	8.5	0.591	13.6	5.0

Source: *DiversityDataKids.org*

Propensity score-weighted COI 2.0 index summary statistics for Dallas are presented in exhibit 3. The Dallas weighted mean COI 2.0 index of -0.020 is almost identical to the Chicago mean of -0.021, and the standard deviations in the COI 2.0 index are also very similar in both cities when propensity score weighting the Dallas data.

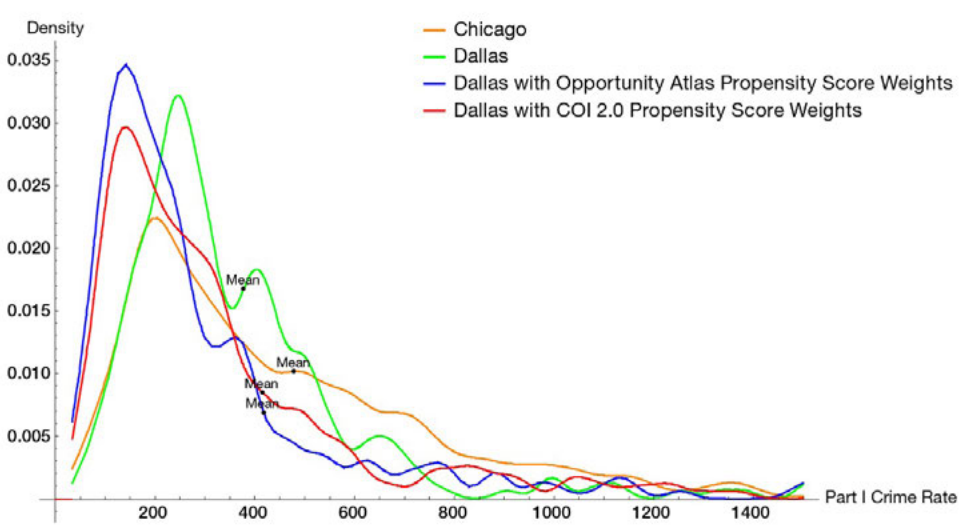
Propensity score-weighted Part I crime rate summary statistics are also presented in exhibit 3. Weighting by Opportunity Atlas-based weights, the mean crime rate is 413, and the standard deviation is 302. When weighted by COI 2.0-based weights, the mean crime rate is 412 and the standard deviation is 280. Although both weighted means are closer to the Chicago mean of 475 than the unweighted Dallas mean, both weighted means are still well below the Chicago mean.

Weighting by Opportunity Atlas-based weights, the standard deviation in Part I crime rates is 302 in Dallas, compared with 395 in Chicago. When weighted by COI 2.0-based weights, the standard deviation in crime rates in Dallas is 280, which is higher than the unweighted standard deviation of 269 but still much lower than the Chicago standard deviation.

Exhibit 11 presents kernel densities of the Part I crime rates in Chicago and Dallas, along with propensity score-weighted kernel densities for Dallas, weighting with both Opportunity Atlas and COI 2.0-based weights. Although the Dallas crime rate means and standard deviations are closer to those in Chicago when propensity score weighting, the weighted Dallas distributions are still far apart from the Chicago distribution. It is not obvious from visually inspecting the kernel density plots whether the Opportunity Atlas or COI 2.0 propensity score matching does a better job of explaining differences in the crime distributions in the two cities; the Part I crime rate distribution for Chicago has a much thicker upper tail compared with any of the Dallas kernel densities in exhibit 11.

Exhibit 11

Part I Crime Rate per 10,000 Persons Kernel Densities



Sources: Chicago Police Department; Dallas Police Department; DiversityDataKids.org; OpportunityInsights.org

We numerically compared the similarity of the Chicago and Dallas crime distributions by integrating[6] the common areas under the Chicago kernel density and each of the Dallas kernel densities in exhibit 11. The common area under the Chicago kernel density and unweighted Dallas kernel density equals .807. The corresponding areas under the Chicago kernel density and the Dallas kernel densities weighted by the Opportunity Atlas and COI 2.0 propensity score weights, respectively, are .708 and .774. Thus, our results indicate that the unweighted Dallas crime rate distribution more closely matches the Chicago distribution than either of the propensity score-weighted Dallas distributions.[7]

In summary, although the Dallas crime rate means and standard deviations are closer to those in Chicago when propensity score weighting, the Dallas distribution more closely matches the Chicago distribution when the Dallas distribution is not propensity score weighted. Differences in neighborhood opportunity explain little of the differences in crime rates in the two cities, regardless of whether neighborhood opportunity is measured by Opportunity Atlas or COI 2.0 data.

Conclusion

In this article, we introduced readers to two datasets measuring neighborhood opportunity: the Opportunity Atlas data and the Child Opportunity Index (COI) 2.0 data. The Opportunity Atlas data measure neighborhood longitudinally, based on outcomes in adulthood for children in different neighborhoods.

As an example of how the data might be used, we analyze the relationship between the COI 2.0, an Opportunity Atlas measure of children's income in adulthood, and Part I crime rates in two cities: Chicago and Dallas. Opportunity Atlas and COI 2.0 neighborhood opportunity measures tend to be greater in Dallas compared with those in Chicago, and Part I crime rates tend to be much higher in Chicago compared with those in Dallas.

We estimate what the Part I crime rate distribution in Dallas would be if Dallas' neighborhood opportunity distributions (based on both the Opportunity Atlas and COI 2.0 data) were more similar to Chicago's, using Barskey et al.'s (2002) nonparametric propensity score-matching method.

Our results indicate that differences in neighborhood opportunity explain only a small portion of the differences in Part I crime rate means and standard deviations in the two cities, and whether the propensity score weighting used to account for differences in neighborhood opportunity was based on Opportunity Atlas or COI 2.0 data made little difference. The Dallas crime rate distribution more closely matched Chicago when the Dallas distribution was not propensity score weighted.

[6] Our kernel densities and numerical integration were computed with Mathematica 12.1 software. Although the maximum crime rate for the kernel density plots in exhibit 11 is 1,500, the maximum used to compute and integrate the kernel densities was 4,550.

[7] We could estimate whether the differences in our point estimates are statistically significant by computing bootstrap confidence intervals.

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Balancing the Trade-off Between Urban Development and Preservation: Experience from South Korea[1]

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Abstract

Urban regeneration is a potent catalyst to advance more prosperous, inclusive, and equitable cities. Across the globe, cities are seeking innovative strategies for planning and mobilizing resources to revitalize struggling and neglected neighborhoods and transform underused land in declining commercial and industrial areas. Without careful planning and attention to preserving local culture, however, urban regeneration projects can accelerate displacement, gentrification, and loss of cultural heritage.

This case study focuses on the Korean approach to urban regeneration that preserves unique local and regional identity while simultaneously putting safeguards in place to prevent commercial gentrification, protecting small businesses, and promoting local industry. Public financial support and planning regulations have been effective in revitalizing declining urban areas, preserving regional historical assets, and preventing gentrification. Additionally, appropriate compensation for personal property loss minimizes opposition and enables the pursuit of public interest to preserve historical and cultural assets. This study details the strategic leveraging of regeneration projects to achieve broader urban goals for local economic development and cultural heritage preservation.

[1] This work draws from a paper prepared for a joint research initiative between the Korea Housing and Urban Guarantee Corporation (HUG) and the Woodrow Wilson International Center for Scholars, "Comparative Study of Public Financial Support for Urban Regeneration Projects in Korea and the United States," presented on September 9, 2020.

Introduction

Urban growth and decline are inevitable, and the coexistence of thriving and blighted areas within cities has created growing gaps in the distribution of physical and human capital. Various negative externalities associated with urban blight—including low income, insufficient educational opportunities, negative health impacts, and poor living environments—reduce social capital and the possibilities for class mobility (Atkinson and Kintrea, 2001; Musterd and Andersson, 2005; Musterd and De Winter, 1998).

The public sector has promoted urban regeneration policies to reduce these inequalities and negative externalities. Mitigating this gap has the advantage of preventing urban ghettoization and the concentration of poverty (Musterd and Andersson, 2005; Ostendorf, Musterd, De Vos, 2001).

In the case of areas with relatively little resistance to development, securing the financial feasibility of projects can be the greatest obstacle, which paves the way for urban regeneration once removed. To this end, the public sector provides subsidies, tax credits, and financial support to revitalize declining urban areas, with the goal of spurring active participation of the private sector in regeneration projects.

Regional characteristics with unique historical contexts and landscapes, however, are at risk of disappearing with development-oriented urban regeneration that demolishes and replaces existing structures. Revitalizing an area rich in cultural and historic assets gives rise to an ongoing debate about the value and benefits of preservation and the potential losses resulting from regeneration efforts.

In Korea, a country that has achieved remarkable economic growth over the past several decades,[2] many urban areas have fallen behind with changing urban functions and deteriorating physical environments. During the economic growth period, the public and private sectors traditionally preferred the demolish-and-rebuild approach to improving declining urban areas, and as a result, gentrification occurred while precious cultural and historic heritage sites were damaged.

To remedy the mistakes of the past, the Korean state is now asking local governments to actively consult with residents and examine the use of local assets when establishing urban regeneration plans.[3] Bottom-up urban regeneration planning through public hearings is intended to minimize damage to local assets and promote local vitality.

This article details public policies and financing to revitalize Korean cities while also preserving the characteristics of historical and cultural assets and implementing countermeasures to prevent *commercial gentrification*, the crowding out of small merchants by large-scale capital.

[2] Korea's gross domestic product per capita increased from $158 in 1960 to $10,400 by 1994. This rapid economic growth is known as the Miracle of Han River.

[3] In accordance with the *Special Act on Promotion of and Support for Urban Regeneration*, local governments must establish an Urban Regeneration Strategy Plan that sets comprehensive urban regeneration goals in the metropolitan area and an Urban Regeneration Revitalization Plan, with plans for each project site included in the Strategy Plan.

Case Study

About the Study Area

The spatial scope of the study is an urban regeneration and revitalization area[4] spanning 100 acres in front of Changdeokgung Palace,[5] located in the Jongno-gu District in the center of Seoul.[6] The site is adjacent to the Central Business District (CBD), with relatively high land prices in an area rich with historic and cultural sites, such as Changdeokgung Palace and Unhyeongung Palace, Ikseon-dong Hanok[7] Village, Nagwon Arcade,[8] and Jewelry Industry Street.

Exhibit 1

Map of East Palace (Changdeokgung) (1830)

Source: Changdeokgung Palace Management Office of Cultural Heritage Administration, cdg.go.kr/eng/

[4] The name of the area and the urban regeneration revitalization plan is *The Heart of Old Seoul in front of Changdeokgung Palace*.

[5] Changdeokgung Palace, a royal palace of the Joseon Dynasty, is included in the United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage List (Ref. 816).

[6] Seoul City is the capital of the Joseon Dynasty and the Republic of Korea and is the administrative and business center of the country.

[7] A Hanok is a traditional Korean house.

[8] Nagwon Arcade is a modern shopping mall built after demolishing illegal buildings and Nagwon Market in the 1970s. It is the largest musical instrument retail cluster in Korea.

Exhibit 2

Hanok Village

Source: Seoul City Aerial Photograph Service, as of 1973

Exhibit 3

Nagwon Arcade

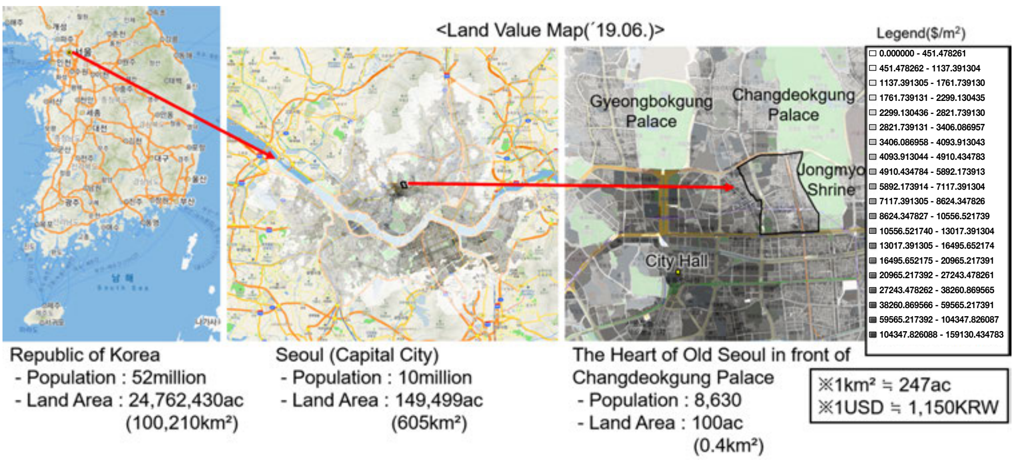
Source: Seoul History Archives

Although the site has high land prices due to its central location and the expectation that asset values will increase in the future, regulations established to preserve historic and cultural assets in the area have had the negative effect of sluggish redevelopment.

This study was undertaken from 2015 through 2020, with some differences in variables, depending on the availability of quantitative data at the time of analysis.

Exhibit 4

Land Value Map (as of June 2019)



\$/m² = price per square meter. ac = acres. km² = square kilometer. KRW South Korea won. USD = U.S. dollar.
Source: Background maps, Kakao Map

History of the Area

Seoul was the capital of the Joseon Dynasty and has accumulated rich cultural assets through numerous historical periods during the past 600 years. The site of this study was the geographic and political center of the Joseon Dynasty, with traces of old palaces and royal culture remaining in the area today.

In the 1930s,[9] the site changed into a Hanok village (residential area with traditional Korean housing) connected by narrow alleys to accommodate an increasing population. After the Korean War (1950–1953), Seoul grew rapidly as many moved to the city in search of employment opportunities.

Since then, the site has become a neighborhood commercial district serving the growing population and has transformed with the influx of the musical instrument retail industry (1960s) and jewelry craft industry (1970s).

These changes in urban function led to a rapid rise in land prices, but as the period of remarkable economic growth passed and local industries began to decline, a downturn loomed over the region.

Adding to the challenge, it became difficult to secure the financial viability of development projects due to high land prices caused by the desirable location of the site and its promising future development possibilities.

[9] The Joseon Dynasty was invaded by Japan in 1910 and, after 35 years of colonial rule, the Republic of Korea was founded in 1945.

Support from the Public Sector

Both the public and the private sectors invested in the area during the period under study. Public support to facilitate private sector investments can be categorized into budgetary programs, grant/tax incentives, and public financial support.

The Seoul City government carried out budgetary programs defined in the urban regeneration revitalization plan (Seoul City, 2015b). The government makes initial investments such as infrastructure improvements and supplies anchor facilities to spur private sector participation.

Grants and tax incentives, including interest-free financing and property tax abatements for projects to build, repair, or improve Hanoks, are designed to reduce the financial burden on the private sector.

Public financial support that the National Housing and Urban Fund (NHUF)[10] provides offers long-term loans at low-interest rates. With this support, business owners can reduce their initial financial burden. In addition, enhanced credit ratings and lowered risk with guarantees for urban regeneration loans of Korea Housing and Urban Guarantee Corporation (HUG)[11] enable the private sector to participate actively in urban regeneration projects.

Exhibit 5

Public Support for Revitalizing the Changdeokgung Palace Area

Project	Details
Budgetary programs	• Hard infrastructure: Donhwamun traditional music theater, an urban block renewal project, jewelry industry support center, etc. • Soft infrastructure: Reproduction of a royal march, a commemorative festival for the March First movement, Hanok preservation community support, etc.
Grant/Tax incentives	• Grants for building, repairing, and improving Hanoks • Interest-free loans for building, repairing, and improving Hanoks • Tax reduction for the Hanok property
Public financial support	• Urban regeneration loans (National Housing and Urban Fund) - Guarantee for urban regeneration loans (Korea Housing and Urban Guarantee Corporation)

Budgetary Programs

To address the deterioration and decline of the site, Seoul City established an Urban Regeneration Revitalization Plan in 2015.

The revitalization plan defines four major regeneration projects with special consideration of the historic and geographical context for the area. The plan also includes measures to execute the budgetary programs (about $13 million assigned to the Department for Historic City Center

[10] NHUF is a national public fund that seeks to enhance residential welfare and revitalize urban regeneration by providing financial resources for residential service providers and consumers and for urban regeneration projects.

[11] HUG is a trustee of NHUF and provides various public guarantees necessary for residential welfare and urban regeneration.

Regeneration), cooperative projects (about $110 million designated for other departments of Seoul City), and other grant-aided projects.

Exhibit 6

Historical Regeneration Projects

Project	Methods to revitalize	Execution strategies
The Way to Palace "Donhwamunro"	Building the pathway used by the King in the Changdeokgung Palace area to create pedestrian walkways for citizens to meet.	Attract people with pedestrian roads and recover the prestige of the area.
Remembering the March First Movement[12] "3.1 Daero (Blvd.)"	Organize 3.1 Daero, a place to commemorate the March First independence movement.	Shed new light on the importance of the March First movement by creating a space for remembrance.
Creating a Cultural Hub "Nagwon ~ Ikseon"	Create space along the street for recreation, food, clothing, shelter, and entertainment inspired by royal culture.	Support for leading new cultural activities and creating space enables expansion and a connection to living culture.
Reviving Jewelry Industries "Seosulla-gil"	Establish a specialized handicraft district that serves as a cultural destination where artisans can demonstrate their skills and sell their crafts to visitors.	Support and enhance the existing jewelry industry by encouraging creativity and innovation.

Source: Urban Regeneration Revitalization Plan (2015)

The Way to Palace Donhwamunro consists of hard infrastructure projects, including an urban block renewal project, the Donhwamun traditional music theater, and creating space where people can experience royal culture. Soft infrastructure includes support for royal events and tour programs and the operation of a cultural asset training center.

The 3.1 Daero (Blvd.) project set out to establish a trail, build a memorial hall, improve the surrounding environment of Tapgol Park, and create a commemorative festival for the March First movement.

The Nagwon-Ikseon project is composed of environmental improvements, cultural and art events in the Nagwon Arcade area, support for costs to repair Hanoks to preserve the unique characteristics of the Hanok village, and support for the village community and businesses through which people can experience Hanoks.

The Seosulla-gil (road) project includes organizing a specialized handicraft street and a Hanok handicraft workshop and building a jewelry industry support center.

Such grant-aided projects aim to promote urban regeneration in the targeted area and ultimately attract private sector involvement in urban regeneration projects.

[12] A non-violent national independence movement on March 1, 1919, declared the annulment of the Japan-Korea Annexation Treaty and the independence of Korea.

Exhibit 7

Donhwamun Traditional Music Theater

Source: Seung-Hyun Ha (2020)

Exhibit 8

Royal Parade

Source: Urban Regeneration Revitalization Plan (2015)

Exhibit 9

Cultural Events at Nagwon Arcade

Source: Urban Regeneration Revitalization Plan (2015)

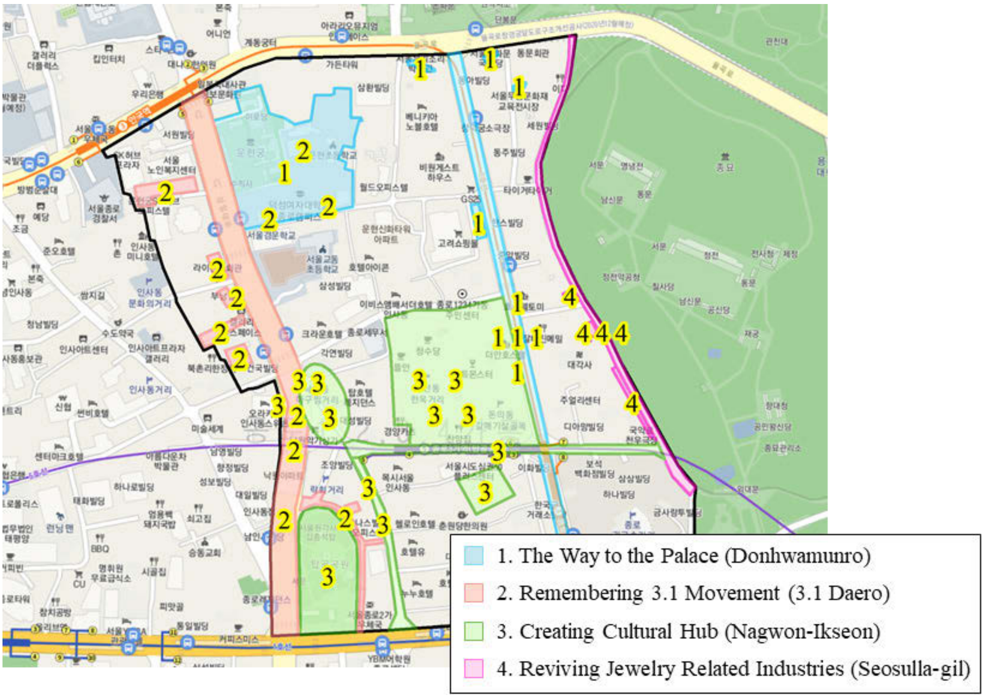
Exhibit 10

Jewelry Industry Support Center

Source: Seung-Hyun Ha (2020)

Exhibit 11

Geographical Distribution of Major Regeneration Projects



Source: Background map, Kakao Map

Grant/Tax Incentives

Grants and tax incentives are mainly related to the Hanok project mentioned earlier. In 2009, the Seoul Metropolitan Government enacted the “Ordinance on value enhancement of Hanok and other architectural assets in Seoul” to help compensate for development restrictions and lower the threshold for new investment; these goals are met through city-provided grants and interest-free loans[13] for building, repairing, or improving Hanoks. At the municipality level (Jongno-gu), property tax reduction incentives[14] were offered to encourage Hanok preservation.

The Hanok grant amount depends on whether it is for new construction, full repair, or partial repair, and whether it is for exterior or interior construction. Hanok grants and loans can be used when needed. If a new Hanok is constructed, grants up to $70,000 are available for the exterior construction, and loans of $17,000 can be provided for the interior design. Newly constructed Hanoks located within the preservation area are allocated an extra 50 percent in grant and loan amounts. In other words, the builder or homeowner can receive a grant up to $105,000 and loans up to $25,500, totaling up to $130,500 in financial support for new construction of a Hanok.

[13] A loan payable in 10 years after a 3-year grace period.

[14] Ordinance on Gu-tax reduction in Jongno-gu, Seoul Metropolitan City—Article 4 (Tax reduction of Hanok in historic district in Jongno-gu).

In the case of a full repair, a $52,000 grant and a loan of $17,000 can be provided for exterior construction and $35,000 for interior improvements. For partial repairs, a $17,000 grant and an $8,700 loan are offered for exterior improvements. For repair projects within the Hanok preservation area, an additional 50 percent is offered, as is the case for building a new Hanok.

The purpose of this subsidy for Hanoks is to support construction, repair, and improvements. The use of Hanoks that receive subsidies is not specified—repaired or improved Hanoks can be used as housing or as commercial space.

Public Financial Support with NHUF and HUG

Grants and tax incentives detailed earlier are considered public support to lift the financial burden from Hanok owners or those who plan to use Hanoks in the future. The policy has a somewhat limited reach and impact because the support can only be provided for Hanoks. Accordingly, investment, loans, and guarantees used for general urban regeneration projects in Korea fall within the category of public financial support in this study. This support is provided for urban regeneration projects undertaken in the urban regeneration revitalization area and for building and remodeling new Hanoks.

Public financial support consists of loans from the NHUF for small-scale urban regeneration projects and loans guaranteed by HUG.

The loans, provided at lower rates compared to commercial loans, reduce the initial cost for business owners involved in urban regeneration projects and are made possible with the public funds provided by NHUF.

Loan guarantees help business owners who cannot finance urban regeneration projects with their own capital. Because general secured loans do not finance amounts larger than the value of the collateral, loan applicants cannot carry out projects if the estimated project cost exceeds the cap of the secured loan they can receive. In this case, loan guarantees allow them to secure additional loans so that they can receive financing.

The terms and conditions of the loans and guarantees are as follows: Loans can be provided up to 80 percent of the total project cost at a 1.5-percent interest rate for a maximum of 10 years; for guarantee products for loans, the limit is the same, with the default insurance premium ranging from 0.26 to 3.41 percent a year.

As of October 2019, $14 million of loan products were provided to seven projects: four establish co-working spaces and the remaining three create commercial space for small shops that is privately developed and owned, and rented at restricted rates.[15] One-half of the amount is secured loans and the other half is for loans backed by guarantees.

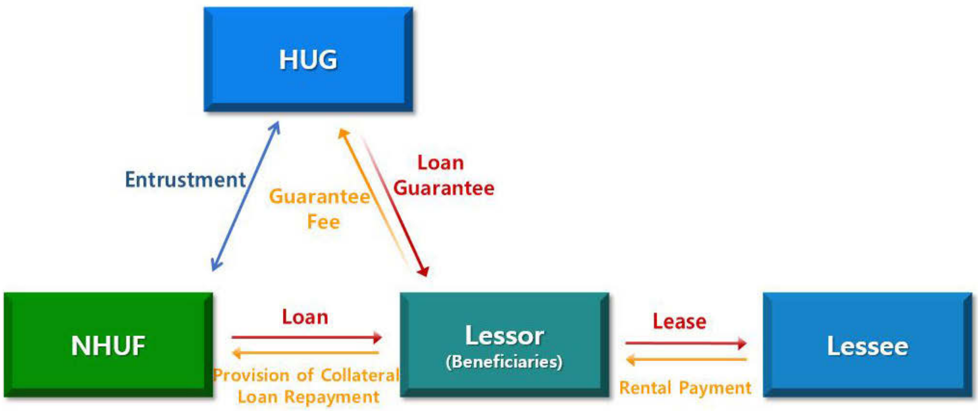
The following case is a project to which a $1 million loan was provided with the aim of building a rental store. The area of the project is 98.84m². The total project cost is $2 million. In return

[15] “Rental stores” are constructed or remodeled using NHUF long-term, low-interest loans and are subject to restrictions on the rate of rent increase as a counter benefit for financial support. Support for these stores is a gentrification countermeasure.

for the long-term loan at a low-interest rate, the beneficiary can increase the rent only up to 2.5 percent a year. The rental increase rate is capped during the loan period.

Exhibit 12

Financing Structure of Urban Regeneration Loans and Loan Guarantees



HUG = Korea Housing and Urban Guarantee Corporation. NHUF = National Housing and Urban Fund.
Source: Seung-Hyun Ha (2020)

Exhibit 13 shows a typical Hanok, originally used for housing and remodeled as an urban regeneration project to serve as a restaurant.

Exhibit 13

Hanok Remodeling Project Supported by NHUF and HUG

Before (As of March 2016) After (As of January 2020)

HUG = Korea Housing and Urban Guarantee Corporation. NHUF = National Housing and Urban Fund.
Sources: NAVER Map (2016); Seung-Hyun Ha (2020)

Gentrification Countermeasures

Because urban regeneration projects economically revitalize deteriorated and declining areas and improve living conditions, they are considered to have an overall positive impact. Regeneration projects risk contributing to the collapse of communities, however, due to the displacement of residents and small business owners and the loss of the unique identity of the region. In the case of the Changdeokgung Palace area regeneration project, commercial gentrification is a bigger challenge than residential gentrification. Policy measures to prevent and respond to such commercial gentrification, with the goal of supporting small businesses and preserving local industry, are examined in this study.

The Seoul City Comprehensive Plan for Gentrification (2015) uses various policies, public support, and urban planning regulations to manage gentrification and promote shared prosperity.

Public support includes financing for commercial rental space and a strategy to capitalize stores. Public rental shops established by the public sector offer space to commercial tenants to rent for long periods of time at lower rates, reducing their risk. Capitalization of stores is a strategy to help tenants get their own stores by providing them with long-term loans at low-interest rates. Additionally, landlords and tenants are encouraged to reach win-win agreements that maintain rental rates and premiums at an acceptable level (Seoul City, 2015a).

District unit planning regulations do not allow large-scale shopping malls or franchises to enter the area. This measure also limits the maximum size of the development scale (330m^2 and below) to protect the local commercial area.

Land and buildings in the Hanok preservation area were largely owned by individuals. Because large-scale commercial capital is likely to be invested in this preservation area with a variety of benefits for Hanoks, concerns arose that the commercial streets might lose their attractiveness due to gentrification. To preemptively address such concerns, Seoul City established the district unit plan,[16] which defines and restricts land usage that can potentially induce gentrification within the district.

The restrictions prohibit land use for multi-unit dwellings, sports centers, and adult entertainment outlets. In addition, restaurants, cafés, and bakeries operated as chain stores or franchise businesses as defined by the Korean national government *Fair Transactions in Franchise Business Act* and *Franchise Business Promotion Act* are restricted in this area.

[16] Seoul City (2018), Ikseon district unit plan area and planning decision.

Exhibit 14

Aerial Photograph of Ikseon District Unit Area

Source: Seoul City Aerial Photograph Service, as of 2019

Protection of Cultural Assets

The Ikseon district unit plan specifies not only gentrification countermeasures but also establishes policies to preserve cultural assets of the region. The plan designates a Hanok preservation area, prohibiting the construction of structures other than Hanoks to maintain the historic landscape. It is necessary to consider the development of the region to understand how the plan came to designate the Hanok preservation area.

Hanoks, built since the Joseon Dynasty, are concentrated in this area. Because this Hanok village was established well before contemporary concepts of urban planning were adopted, Hanoks were constructed on narrow parcels with poor infrastructure. Located near the central business district, this commercial area experienced economic growth requiring large-scale demolition and redevelopment.

To that end, Seoul City designated the area as an urban environment improvement district in 2004, and community residents established a committee to execute the Ikseon urban environment improvement project in 2005. The execution committee proposed demolishing Hanoks in the Ikseon unit district plan area (now the Hanok preservation area) and replacing them with a 14-story mixed-use complex.[17] See exhibit 15 for a rendering of the proposed complex.

Exhibit 15

Rendering of the Proposed Ikseon Urban Environment Improvement Area

Source: Jongno-gu Council (2010)

Rejecting the proposal, the Seoul City Urban Planning Committee recommended that the district unit-level planning be revised to preserve Hanoks rather than construct high-rise buildings; this recommendation was to consider the unique characteristics of the area where a number of historic assets are located. As the interests of the public sector and residents clashed, the district unit-level planning and urban environment improvement project were delayed. During this period of nearly a decade of dispute over plans, the area continued to experience neglect and decay. The execution committee for the project was voluntarily dissolved in 2014 and the public sector intervened.

[17] A development plan combining residential, office, tourism, and commercial functions was put forward by the execution committee of community residents.

While the improvement plan was at a standstill, the land value of nearby tourist attractions[18] including Bukchon Hanok Village and the Insa-dong shopping and dining district increased, bolstering strong cultural and tourism functions in Ikseon-dong.

Seoul City began to explore how to preserve the historic identity of the region while revitalizing deteriorated areas. With these goals in mind, the city developed an urban regeneration policy using historic and cultural assets in the Ikseon district (Hanok preservation area) to enhance the attraction of the region with Hanoks and vitalize the area as a commercial destination, while avoiding construction of modern buildings defined as a high density and vertical development (Seoul City, 2018).

The infringement of individual property rights was a controversial policy issue because restraining redevelopment could prevent potential capital gains of individual owners. The city provided various incentives including grants and interest-free loans for building or repairing Hanoks and reduced property taxes for Hanoks.

In addition, the district unit plan provides guidelines for the shape and exterior of Hanoks to manage the streetscape. It allows only one-story buildings to be constructed and also regulates exteriors with special criteria for roofs, building structures, outer walls, fences, and gardens. For example, Korean-style roof trusses and roof tile, called Kiwa, must be used and may not be polished. For Hanoks, only Korean-style wooden structures are allowed.

Impact

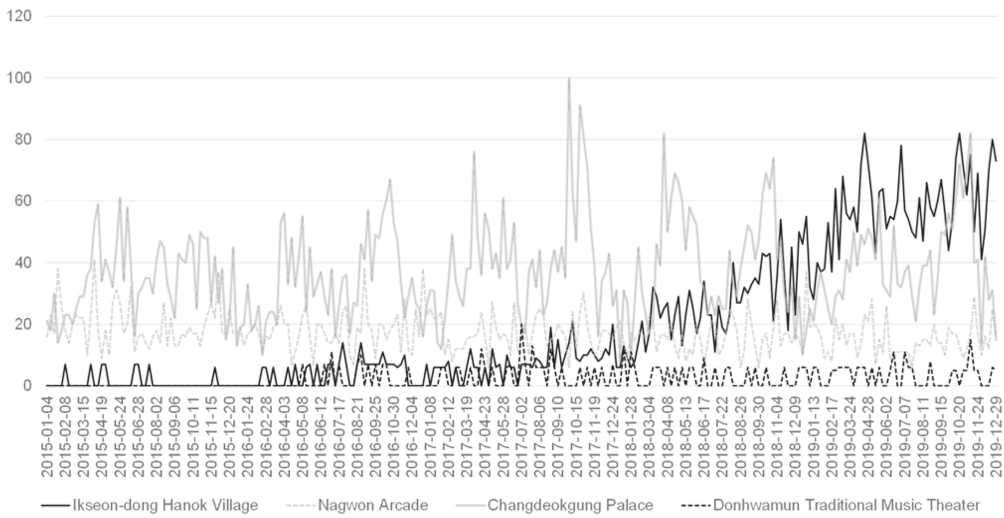
Various socioeconomic indicators were reviewed to assess the effect of public financial support for urban regeneration in the project area considered by this study.

First, interest in the region has changed. Google trends in keyword searches related to the project area, such as Donhwamun Traditional Music Theater, Nagwon Arcade, and Ikseon-dong Hanok Village, reflect changes in interest. Changdeokgung Palace, Nagwon Arcade, and Donhwamun Traditional Music Theater have maintained similar levels of interest. On the other hand, interest in Ikseon-dong Hanok Village has gradually increased from 2015 to 2019 as the regeneration project was implemented.

[18] Bukchon and Insa-dong are tourist attractions that feature traditional Korean culture.

Exhibit 16

Changes in Project Keyword Search Volume (2015–2019)



Source: Google Trends

Another indicator analyzed to assess the effect of the urban regeneration projects is the change in land value. Official census area data[19] published in September 2016 and August 2019 were compared in a before-and-after study. Only identical area data (2,501 area units) were used for the comparison.[20]

The price per unit area land value is listed in exhibit 17. The summarized value of the data at the time of appraisal is presented in the table.

Exhibit 17

Summary Table (unit: $/m²)

Date	Min.	1Q	Median	Mean	3Q	Max.
September 2016	0	2,628	3,748	5,236	7,081	33,852
August 2019	0	3,304	5,028	6,584	8,689	38,957
Difference	-53.90%	21.03%	25.73%	25.49%	31.95%	94.98%

$/m² = price per square meter.
Max. = maximum. Min. = minimum. Q = quarter.
Source: Seung-Hyun Ha (2020)

The land price changes that appear in the same census output data range from a minimum of -53.90 percent to a maximum 94.98 percent.

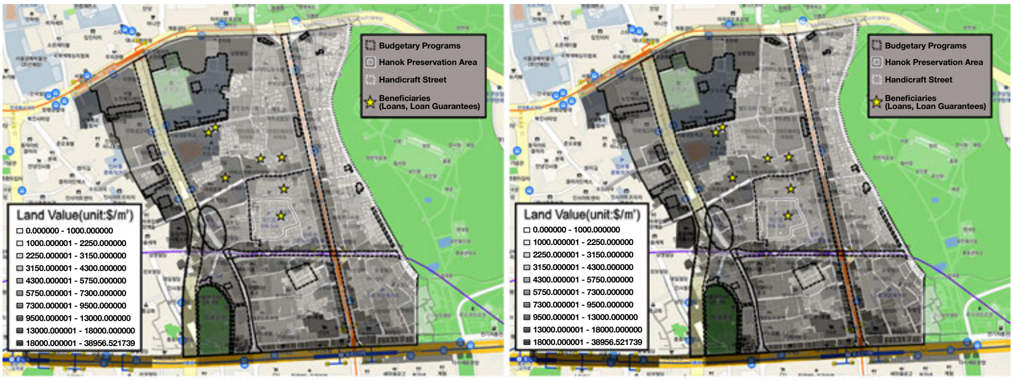
[19] A minimum area unit for statistics set by Statistics Korea.

[20] Due to changes in the shape of some census areas, the number of census areas was 2,598 in September 2016 and 2,552 in August 2019. This study analyzes the 2,501 census areas that remained the same in 2016 and 2019.

Exhibit 18 shows the distribution of the land value, illustrating the increase in land prices from September 2016 (map on the left) to August 2019 (map on the right). To examine the changes in further detail, the fluctuation rate[21] of the official land value was calculated.

Exhibit 18

Distribution of Land Value in September 2016 and August 2019

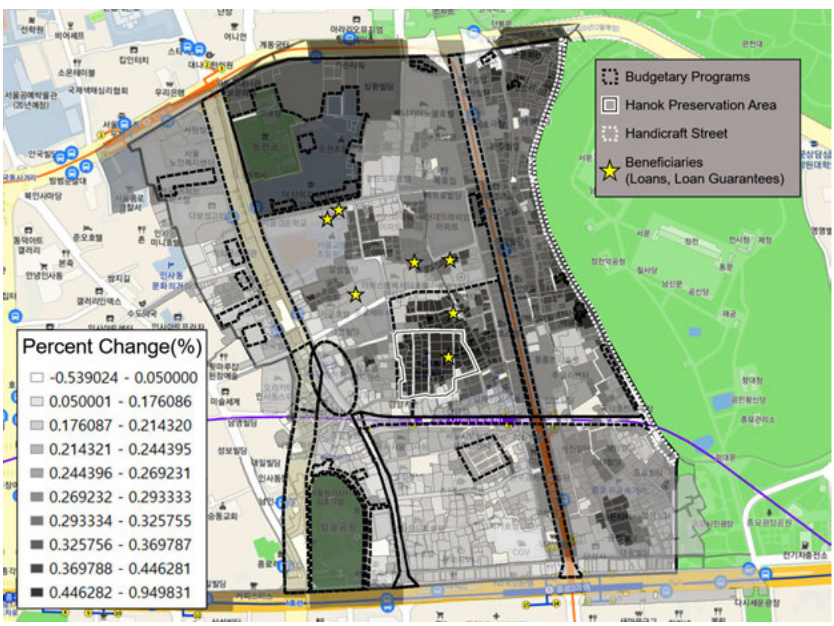


Land Value (as of September 2016) Land Value (as of August 2019)

Source: Background maps, Kakao Map

Exhibit 19

Changes in Land Value



Source: Background maps from Kakao Map

[21] Fluctuation rate indicates (Land Value in August 2019–Land Value in September 2016) / Land Value in September 2016.

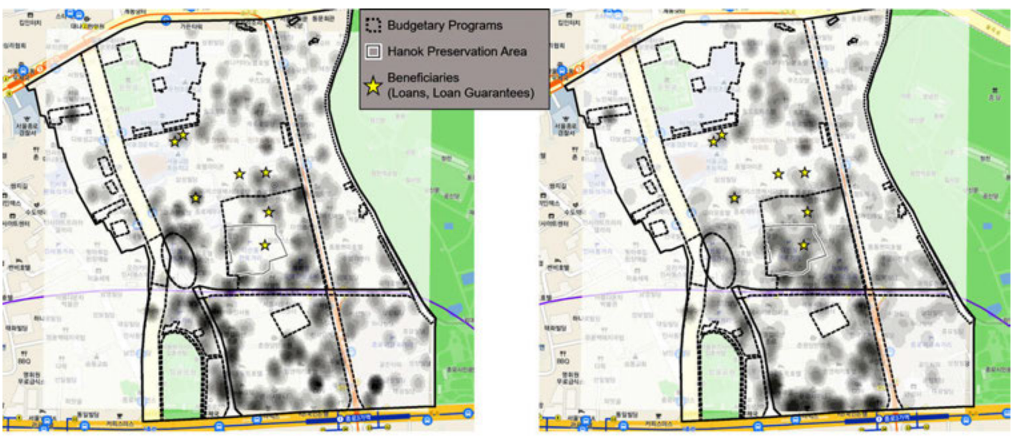
In terms of the land price, projects receiving grants, indicated by the darker dashed line in exhibit 19, have experienced minor positive change. In particular, the Hanok preservation area, outlined by the triple-line, has demonstrated the largest increase in land prices. The long commercial area connected from northeast to southeast, indicated by the dashed white line, is currently being developed as a handicraft street.

Lastly, the number of stores and their distribution was calculated to assess the effect of the urban regeneration project on revitalizing the local economy. Statistical data on the number of stores in the area of study in December 2015 and June 2019 were compared. The total number of stores in the case area was 1,756 in December 2015 and reached 1,893 in June 2019, demonstrating an 8.42-percent increase. The number of restaurants grew from 420 to 533, the biggest increase among all types of businesses. Retail stores increased 10.76 percent from 911 to 1,009, but other types of stores such as real estate agencies, laundries, and so on decreased from 415 to 351.

The number of stores has increased as a result of the promotion of the historic and cultural assets of the area, making it a tourist destination. Commercial growth has depended on location. Exhibit 20 illustrates the changes in the density of restaurants. The number of stores in Tapgol Park and Nagwon Arcade located in the southwestern part of the map has decreased. On the other hand, a new restaurant cluster has been formed in the Hanok preservation area.

Exhibit 20

Density Changes of Restaurants (Kernel Density)



Density of restaurants (as of December 2015) | Density of restaurants (as of June 2019)

Source: Background maps from Kakao Map

Hanoks, which were originally used for housing, have been transformed to all types of use, including restaurants, cafés, clothing and accessory retail shops, and recreation facilities, with the use of grants for Hanok repair and improvement and public financial support. Exhibit 21 shows how urban regeneration projects have changed the streets from March 2016 to January 2020.

Exhibit 21

Hanoks Transformed from Houses to Restaurants and Retail Stores, 2016 to 2020

Sources: NAVER Map (2016); Seung-Hyun Ha (2020)

Implications

Urban decline is caused by a variety of factors, and appropriate policy response requires a deep understanding of local assets and the socioeconomic context of the area. Because such regional characteristics and factors cannot be fully grasped at the national level, the Korean government requires each municipality to designate economically distressed areas and establish appropriate countermeasures for each area.

The urban regeneration revitalization plan seeks to supply anchor facilities and attractions and infrastructure improvements through intervention at the local level. The Korean government is promoting the smooth progress of these projects by providing grants and public financing.

In regenerating the Changdeokgung Palace area, Seoul City established the revitalization plan to enhance the economic vitality of the region while preserving rich historical and cultural assets.

The case study provides a model for overcoming obstacles that often delay or deter urban redevelopment, such as high land prices and conflict of interest among property owners, to achieve successful urban regeneration. The experience also offers an alternative to subsidy-dependent Korean urban regeneration projects in several ways.

First, public financial support removes some of the burden of the initial cost from the private sector. In other urban regeneration projects, public financial resources are dedicated first to revitalizing the local industry, enhancing the regional asset value, and inducing greater demand for tourism, with the expectation that new investment from the private sector will follow. The approach highlighted in this article addresses the challenge of insufficient public financial resources to cover all costs required for urban regeneration projects and is aimed at ensuring the sustainability of the project.

Long-term loans at low-interest rates, made possible with public funds, expanding credit with loan guarantees for urban regeneration projects, and risk reduction, decrease the burden of the financial costs to the private sector and attract private investment. These policies are intended to share the burden for urban regeneration projects between the private and public sectors.

Second, preventing chain stores and restricting the types of businesses that can obtain permits to operate deters commercial gentrification and helps the area preserve its unique characteristics.

These gentrification countermeasures enable local communities to remain and keep their livelihoods and enable visitors to experience a unique commercial district[22] that only this area can provide. In addition, the designation of the Hanok preservation area has enabled the preservation of Hanoks and the historical and cultural assets of the area. The public sector provides grants or loans with generous terms as compensation for potential losses that the private sector may suffer as a result of the preservation regulations.

This study offers a model for balancing preservation of historical and cultural heritage with local economic development, goals which are often thought to be incompatible. The harmony of public investment to revive the vitality of the region, supply financial support to attract private investment, provide proper compensation for private property losses, integrate historic preservation into urban planning, leverage cultural assets, and implement safeguards against commercial gentrification with targeted support for small local business and industry offers an innovative way to regenerate cities.

Acknowledgments

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Authors

Seung-Hyun Ha is a research fellow of the Housing Urban Finance Institute at HUG in South Korea.

Allison Garland is Project Director of the Urban Sustainability Laboratory at the Wilson Center in Washington, DC.

[22] Tourists are attracted by restaurants, cafés, and retail shops in Hanok buildings found in narrow, irregular alleys. ("'Ikseon-dong alleyway' more special because it is small," http://opengov.seoul.go.kr/mediahub/11725820)

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Graphic Detail

Geographic Information Systems (GIS) organize and clarify the patterns of human activities on the Earth's surface and their interaction with each other. GIS data, in the form of maps, can quickly and powerfully convey relationships to policymakers and the public. This department of Cityscape includes maps that convey important housing or community development policy issues or solutions. If you have made such a map and are willing to share it in a future issue of Cityscape, please contact alexander.m.din@hud.gov.

The Effect of COVID-19 on Income Among Households in HUD's Housing Choice Voucher Program

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. Government.

Abstract

Measures put in place to prevent the spread of COVID-19 have severely disrupted the U.S. labor market. This article examines the impact of COVID-19 on households in the U.S. Department of Housing and Urban Development's (HUD) Housing Choice Voucher (HCV) program by calculating the number and proportion of HCV households that experienced a decline in income pre- and post-COVID-19.

Background

As of October 2020, nearly 7.2 million cases of COVID-19 had occurred in the United States, with more than 200,000 deaths (CDC COVID Data Tracker, 2020). In the early months of the pandemic, measures put in place to prevent the spread of the virus—including social distancing and travel restrictions—resulted in severe labor market disruptions and job losses (U.S. Bureau of

Labor Statistics, 2020). Research has indicated that lower income Americans, particularly women and non-Whites, were more likely to lose their income in the first month of the pandemic than Americans in higher income brackets (Bertrand et al., 2020). HUD houses 4.6 million of the nation's most vulnerable and disadvantaged households, who are arguably those residents most at risk for the deleterious economic impacts of COVID-19.

HUD has multiple housing subsidy programs, including the Housing Choice Voucher (HCV) program. The HCV program is different from the other HUD programs in that the subsidy is tied to the household, allowing households to enter the private rental market. Eligibility for the HCV program and the amount of subsidy a household receives depend on their income and household composition. After enrollment, HCV households must undergo an annual recertification. HCV households can request an interim recertification mid-year if their household composition or income changes.

Methodology

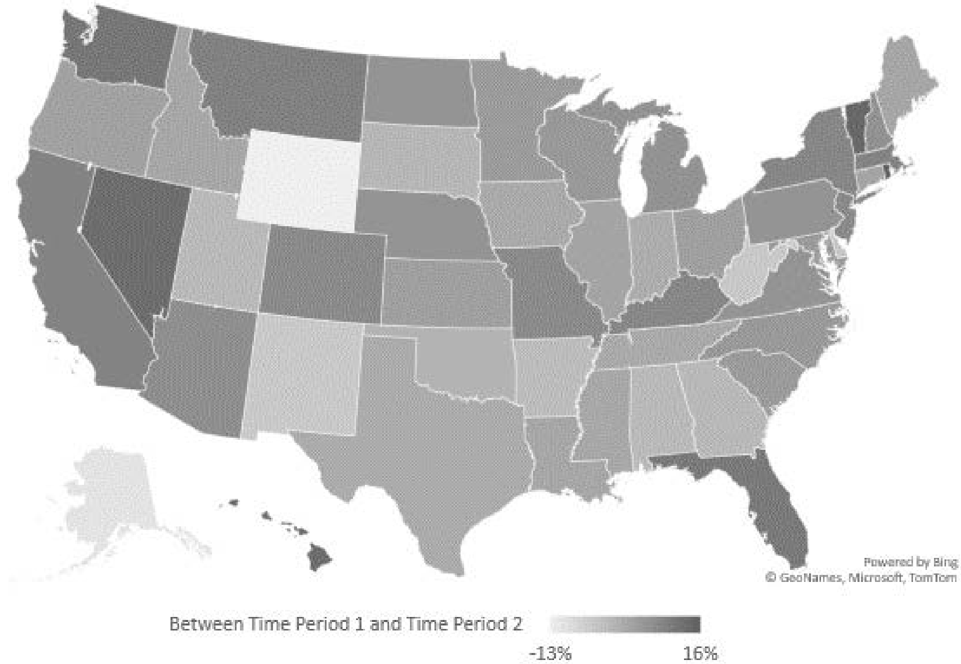
The goal of this analysis is to examine the impact of COVID-19 on income among assisted households in the HCV program. The analysis is restricted to HCV households that had an interim recertification between March 1 and August 4, 2020. Using HUD's Public and Indian Housing (PIH) Information Center (PIC) data, I calculated the number and proportion of HCV households that had a decline in household income before the onset of COVID-19, between January 1 and February 28, 2020 (Time Period 1), and after the onset of COVID-19, between March 1 and June 8, 2020 (Time Period 2) and between June 9 and August 4, 2020 (Time Period 3). Using these three time periods, I was then able to identify HCV households that experienced a decline in income before and amidst the COVID-19 pandemic.

Analysis and Results

Approximately 533,500 HCV households had an interim recertification between March and August 2020 (Time Periods 2 and 3 of the COVID-19 pandemic). Of these households, 31.7 percent had a decline in income from the prior quarter. Exhibit 1 depicts the change in the proportion of recertified HCV households that reported an income decline before and immediately after the onset of COVID-19 (Time Periods 1 and 2). At the beginning of March, as jobs were lost and the economy weakened, 39 states experienced an increase in the proportion of recertified HCV households with an income decline, compared with Time Period 1. Rhode Island had the largest increase in the proportion of recertified households experiencing a decline in income. Nationwide, the proportion of recertified HCV households that experienced an income loss increased 5.5 percent.

Exhibit 1

Change in the Percentage of Housing Choice Voucher (HCV) Households with a Reported Income Decline Between Time Period 1 and Time Period 2, 2020

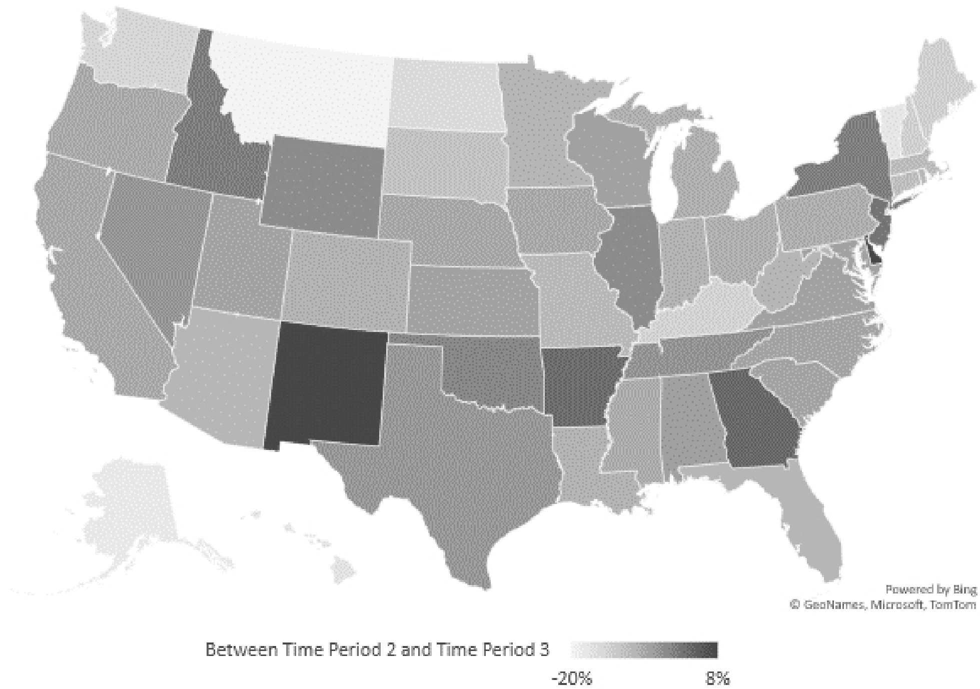


Notes: Time Period 1 = January 1 to February 28, 2020. Time Period 2 = March 1 to June 8, 2020.
Source: PIH PIC data

Exhibit 2 illustrates the change in the proportion of recertified HCV households that reported a decline in income amidst the COVID-19 pandemic (Time Period 2 and Time Period 3). As states and the District of Columbia slowly began to lift their restrictions, the proportion of recertified HCV households reporting lost income declined from its peak, with only Arkansas, Delaware, the District of Columbia, Georgia, New Jersey, and New Mexico reporting a continued increase in the proportion of recertified HCV households with lost income. Nationwide, the percentage of recertified HCV households experiencing a loss of income between Time Period 2 and Time Period 3 decreased 4 percent. Despite this national decrease, however, 14 states had a greater proportion of recertified HCV households in Time Period 3 compared with Time Period 1.

Exhibit 2

Change in the Percentage of Housing Choice Voucher (HCV) Households with a Reported Income Decline Between Time Period 2 and Time Period 3, 2020



Notes: Time Period 2 = March 1 to June 8, 2020. Time Period 3 = June 9 to August 4, 2020.
Source: PIH PIC data

Discussion

As COVID-19 continues, HUD-assisted tenants remain a vulnerable group, disproportionately at-risk to the deleterious economic effects of the virus. Since the onset of COVID-19, the proportion of recertified HCV households reporting an income decline has had a net increase. In both Time Period 2 and Time Period 3, the proportion of recertified HCV households that had an income decline and received unemployment hovered around 7 to 8 percent. Between March and June 2020, on average, the amount of money a recertified HCV household received in unemployment made up for two-thirds of its lost wages. This proportion increased between June and August 2020 as, on average, the amount of money a recertified HCV household received in unemployment made up for 95 percent of its lost wages. Those calculations would raise concerns if unemployment benefits were to be decreased for this vulnerable group during COVID-19.

Data Source

Analyses used December 2019 and March, June, and August 2020 extracts from the Public and Indian Housing (PIH) Information Center (PIC).

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HUD Crosswalk Files Facilitate Multi-State Census Tract COVID-19 Spatial Analysis

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. Government.

Abstract

The coronavirus COVID-19 has infected millions of Americans. Datasets like the national county-level aggregation of COVID-19 case counts that Johns Hopkins University & Medicine assembled have been widely used, but few analyses have been performed at the local level due to the low supply of data. Like many things American, the distribution of COVID-19 data varies due to differing state, county, and local government reporting policies. The result is a patchwork of COVID-19 data at the local level, mostly aggregated to ZIP Codes due to ease of data processing rather than census tracts which are a better geographical unit for analysis. Local level COVID-19 data are rare and often only available for small areas. In this article, we demonstrate how the U.S. Department of Housing and Urban Development (HUD) Crosswalk Files can be used to assemble a census tract-level dataset of COVID-19 case rates in the Washington, D.C. Metropolitan Statistical Area across multiple states.

Coronavirus Data

The most common COVID-19 dataset used for geospatial analysis has been the county-level aggregation of COVID-19 cases that Johns Hopkins University assembled.[1] This dataset has national coverage, but the observations are counties, which are not granular and vary greatly in

[1] https://github.com/CSSEGISandData/COVID-19

size, shape, and demographics. For the few states and local governments that have released local-level COVID-19 data, most datasets are compiled at the ZIP Code-level.[2] Data aggregations to ZIP Codes are common because ZIP Codes are commonly recorded with patient record files, and tabulation at these geographies, which frequently contain thousands of households, helps to preserve privacy. In contrast, determining the census tract for a patient requires geocoding patient addresses, a process that requires a sophisticated geographic information system, technical staff, and operating costs.

Much local-level COVID-19 spatial analysis has focused on ZIP Code analysis of COVID-19 cases in New York City (NYC). While NYC was experiencing the first outbreak in the United States, the NYC Health Department began providing COVID-19 data to the public.[3] This release of data led to a number of studies focusing on NYC, suggesting the NYC subway spread the virus (Din and Wilson, 2020a; Harris, 2020); indicating that neighborhoods with greater rates of certain occupations experienced greater rates of COVID-19 cases (Almagro and Orane-Hutchinson, 2020); per capita income is negatively correlated with COVID-19 case rates (Olmo and Sanso-Navarro, 2020); and patients living in poorer neighborhoods or areas with a greater Black or immigrant population were more likely to test positive but less likely to get tested (Borjas, 2020). A search of Google Scholar for "zip code coronavirus" from 2020 onward will yield results mostly discussing NYC.

Local-level analysis in other jurisdictions are few and far between. In Milwaukee, COVID-19 case counts were greater in predominantly Black neighborhoods (Rast, 2020). In Texas, poverty rates were strongly correlated with COVID-19 cases in Bexar County/San Antonio, whereas workers using public transportation were highly correlated in Harris County and Fort Bend County, and socially vulnerable populations were positively correlated across all jurisdictions (Chen and Jiao, 2020).

Washington, D.C. Metropolitan Statistical Area

Two commonalities happen among many local-level spatial analyses of COVID-19. First, analyses typically use ZIP Codes because they are convenient for data aggregation even though they are frequently inadequate for spatial analysis (Beyer, Schultz, and Rushton, 2007; Cudnick et al., 2012; Grubesic and Matisziw, 2006; Krieger et al., 2002; Oregon Health Authority, 2020; Sadler, 2019; Wilson, 2015) Second, local-level analyses focus on few areas, mostly NYC. Although it is difficult to get publicly available COVID-19 data in many jurisdictions, we demonstrate, as a new example, that such data are available across the vast majority of the multi-state Washington, D.C. Metropolitan Statistical Area (MSA) and its component jurisdictions in the District of Columbia, Maryland, and Virginia. We also demonstrate that it is possible to adequately estimate such data at the census-tract level by cross-walking the ZIP Code counts to census tracts to avoid the geographic problems that occur with ZIP Codes (see Din and Wilson, 2020b; Wilson and Din, 2018, for more on crosswalking ZIP Code data).

[2] It is worth noting that Wisconsin provides COVID-19 data at the census-tract level and perhaps could offer technical assistance to other states and jurisdictions for how to aggregate and distribute census tract data. https://data.dhsgis.wi.gov/datasets/40a25761793c4501a291852b7d39432b_9

[3] https://github.com/nychealth/coronavirus-data

The Washington, D.C. MSA is unique because it is centered around the District of Columbia, a federal district that is a city that operates like a county and state but is legally neither, and the bulk of the region's population is outside of the city in suburban Maryland and Virginia, and a small portion in West Virginia. The state-equivalents must frequently work together on issues that affect the region due to their high level of interconnection, but such cooperation is often difficult due to differing data standards and policies. During the COVID-19 pandemic, as the nation shut down, each jurisdiction enacted and enforced restrictions and procedures separately from each other. To complicate matters further, the state governments of Maryland and Virginia have allowed counties autonomy to remain in stricter lockdown procedures as the counties saw fit.

Data were collected cumulatively through October 1, 2020, from Maryland's iMap Open Data Portal (MD iMap), the Virginia Open Data Portal, and the District of Columbia's Coronavirus Dashboard, although the official first-reported COVID-19 cases varied across jurisdictions. Local-level data were unavailable for Jefferson County, West Virginia. Data from each jurisdiction were available in different formats.

Maryland offers multiple COVID-19 related datasets on MD iMap. COVID-19 case-count data are available as a cumulative daily count aggregated to ZIP Codes and are available via a modern, easily accessible Esri data portal.[4]

In Virginia, COVID-19 data are offered regarding positive COVID-19 cases, and COVID-19 testing encounters aggregated to ZIP Codes in a single dataset.[5] Data from Virginia included daily cumulative cases across the reporting time period and were available via multiple methods from a Socrata open data portal.

Data for the District of Columbia differed in multiple ways because they were available via a tabular download from the District's Coronavirus Dashboard,[6] providing only cumulative counts for the current day, and the data were aggregated to neighborhoods instead of ZIP Codes.

ZIP Code data for Maryland and Virginia were crosswalked to census tracts from ZIP Codes using the U.S. Department of Housing and Urban Development (HUD) U.S. Postal Service (USPS) Crosswalk Files,[7] a reasonable method for estimating data at the census-tract geography from ZIP Code geographies (Din and Wilson, 2020a). In the District, because neighborhoods are aggregations of census tracts, data were crosswalked to census tracts using proportional ratios of population between the neighborhood and its component census tracts using 2014–2018 American Community Survey (ACS) 5-Year Estimate data.

Results

Exhibit 1 and exhibit 2 map the rate of COVID-19 cases per 10,000 residents in census tracts across the Washington, D.C. area. Exhibit 1 shows higher rates of COVID-19 cases closer to and within the District, although there are pockets of higher case rates in northern and eastern

[4] https://data.imap.maryland.gov/datasets/mdcovid19-master-zip-code-cases/data

[5] https://data.virginia.gov/Government/VDH-COVID-19-PublicUseDataset-ZIPCode/8bkr-zfqv/data

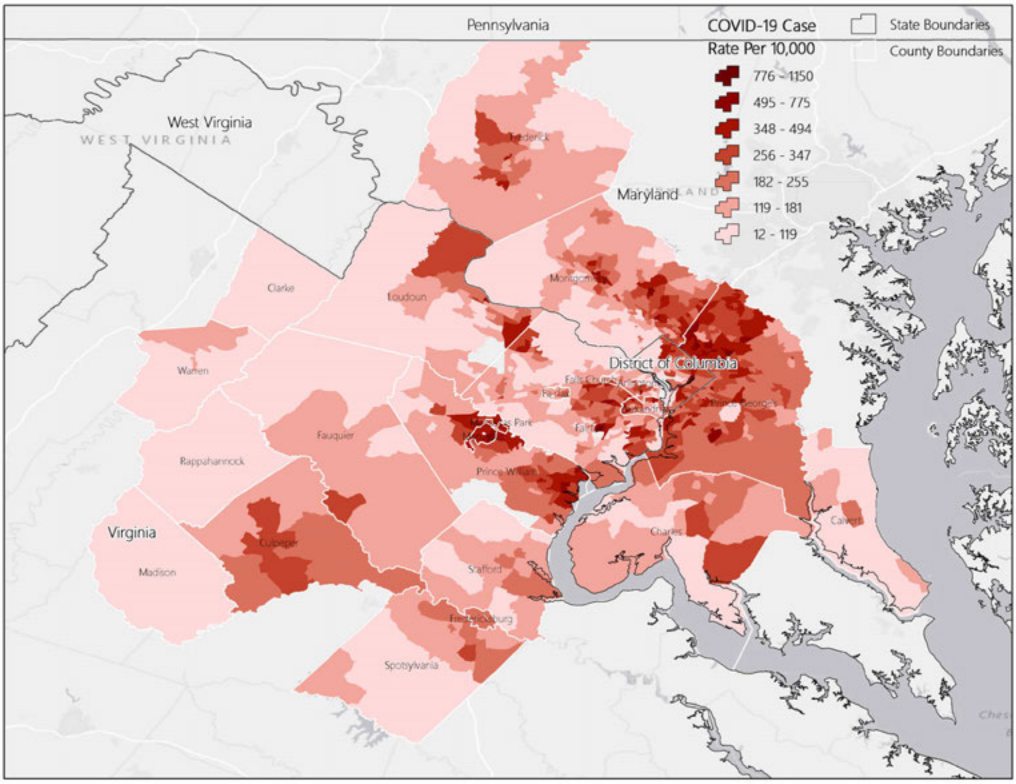
[6] https://coronavirus.dc.gov/data

[7] https://www.huduser.gov/portal/datasets/usps_crosswalk.html

Montgomery County, wide swaths of Prince George's County, eastern Fairfax County, Manassas and Manassas Park, and eastern Prince William County.

Exhibit 1

COVID-19 Case Rate Per 10,000 Population in the Washington, D.C. Metropolitan Statistical Area.

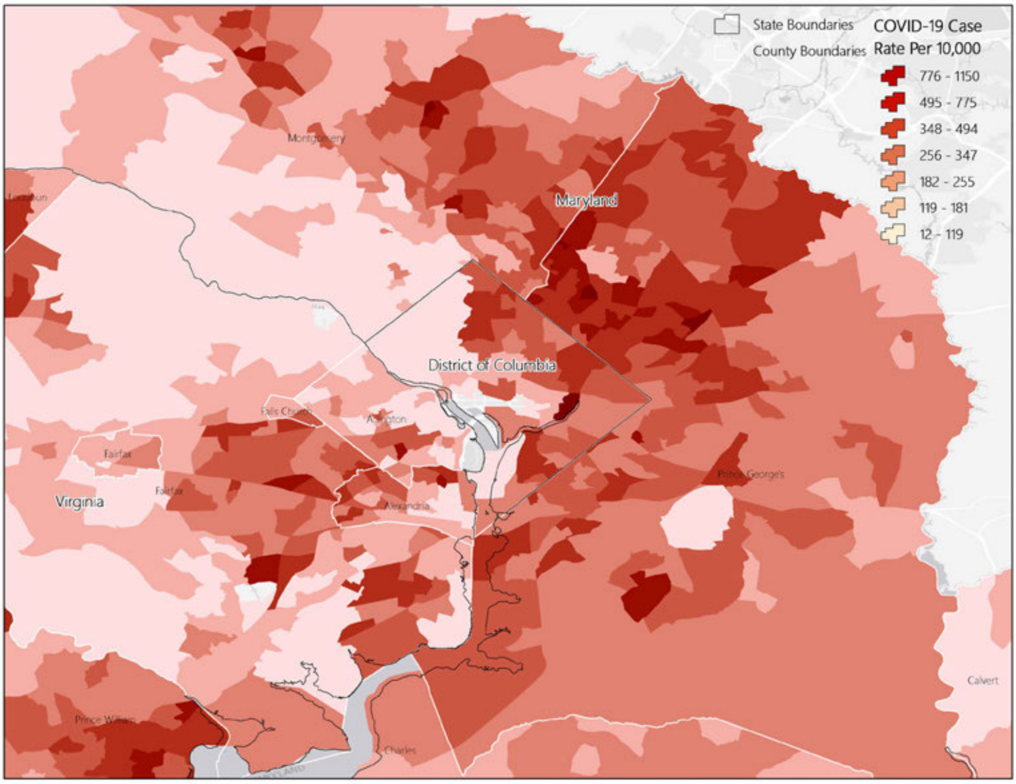


Sources: COVID case-rate data – District of Columbia Coronavirus Dashboard; Maryland iMap; Virginia Open Data Portal

Exhibit 2, which focuses on Washington, D.C., shows that, although much of the District has higher COVID-19 case rates, large swaths of census tracts in neighboring suburban counties have similar or greater case rates. In particular, northern Prince George's County has many census tracts that exceed the rate in the center of the metropolitan area. This area has been the regional center for many immigrant communities spanning several decades (Price et al., 2005).

Exhibit 2

COVID-19 Case Rate Per 10,000 Population in the Washington, D.C. and Nearby Suburbs.



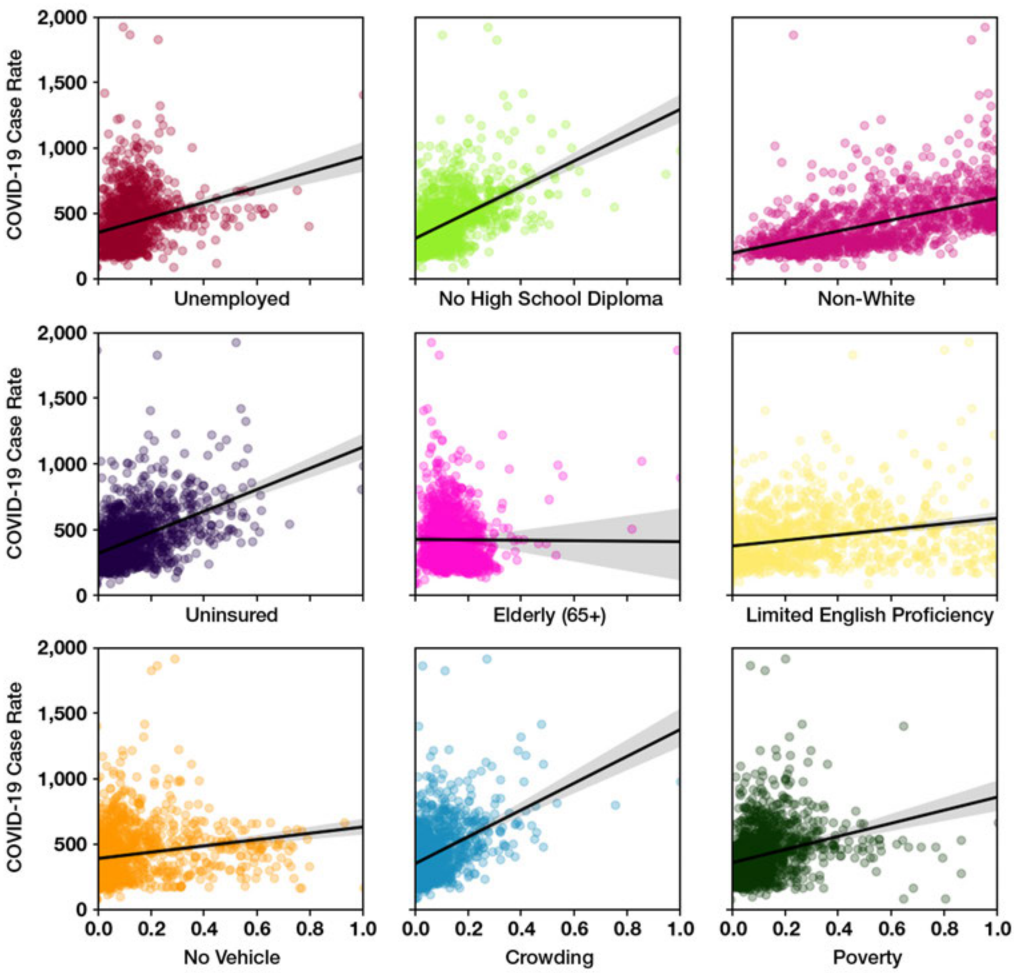
Sources: COVID case-rate data – District of Columbia Coronavirus Dashboard; Maryland iMap; Virginia Open Data Portal

Exhibit 3 is a set of regression plots comparing the COVID-19 case rate per 10,000 population to component variables in the Centers for Disease Control and Prevention Social Vulnerability Index[8] (SVI). Because the COVID-19 case rates have been estimated at the census-tract level, linking the SVI is a simple task because it is produced at the census-tract level. SVI variables were commonly used in analyses with COVID-19 across research articles and studies. Many of the SVI variables, particularly the rate of those without a high school diploma, those who lack medical insurance, and households with more members than bedrooms, correlate strongly with COVID-19 case rates. The rate of people aged 65 or older did not correlate strongly with COVID-19 case rates, but this may be due to the median age of COVID-19 patients declining as the pandemic progresses (Boehmer et al., 2020).

[8] https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html

Exhibit 3

Social Vulnerability Index Variables and COVID-19 Case Rate Per 10,000 Population.



Sources: Variables and COVID case-rate data – District of Columbia Coronavirus Dashboard; Maryland iMap; Virginia Open Data Portal; Centers for Disease Control

Summary

Our analysis shows that it is possible to estimate COVID-19 case rates without relying on the use of ZIP Codes. The results show much more detailed and robust map patterns to assess the distribution of infection rates across the region. The use of the estimates at the census-tract level also now allows for analyses with other data to explore the connections between infection rates and demographics.

Notes

The authors did not summarize all spatial research related to COVID-19 but merely intended to provide an overview of local level spatial research conducted.

Information for the Social Vulnerability Index rate variables is available at: https://svi.cdc.gov/Documents/Data/2018_SVI_Data/SVI2018Documentation-508.pdf

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The Foster Youth to Independence Program in Oregon

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Abstract

Youth homelessness in Oregon is a growing concern, as it is nationally. In an effort to support homeless youth, the U.S. Department of Housing and Urban Development (HUD) implemented the Foster Youth to Independence (FYI) program, which provides housing vouchers to former foster youth. In Oregon, 4 of the 24 public housing authorities have applied for and received FYI vouchers. In Oregon, and nationally, many former foster youth have yet to benefit from this resource.

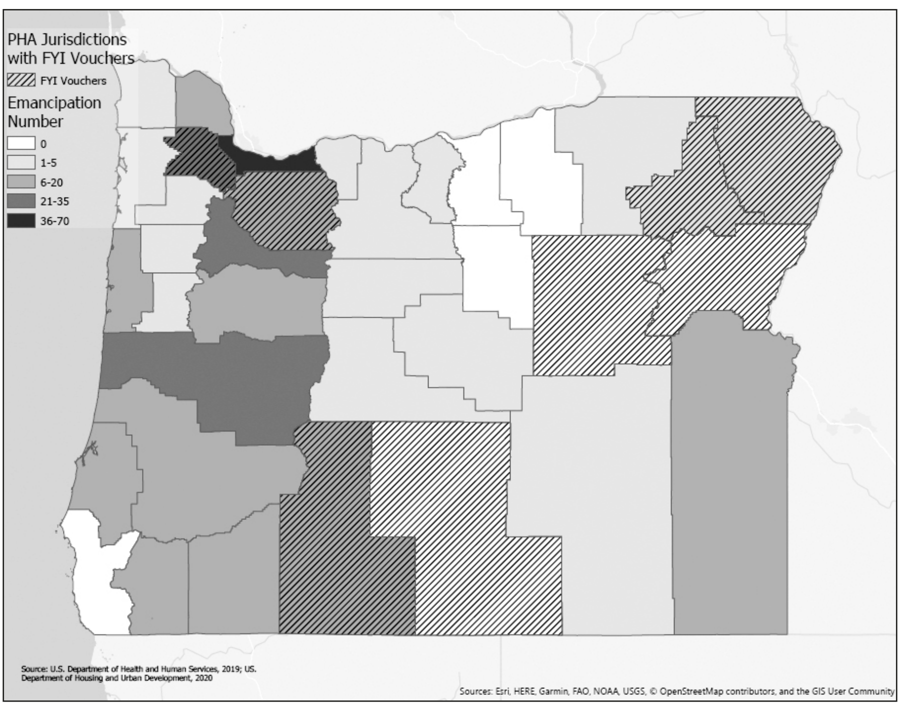
Each year, roughly 4.2 million adolescents in America experience some form of homelessness. Counting homeless youth is a challenge, in part because of the varying definitions of youth homelessness. For example, the Runaway and Homeless Youth Act, the McKinney-Vento Homeless Assistance Act, Oregon's Revised Statute 417.799, and HUD all have different definitions of youth homelessness. That discrepancy poses a challenge for creating and maintaining a coordinated data entry system, thereby making it even harder to obtain and track consistent and reliable data on youth homelessness in Oregon. HUD defines homeless youth as persons under age 25 who are not accompanied by a parent or guardian and are sleeping in emergency shelters or transitional housing for the homeless or in a place not intended for human habitation (HUD, 2014; Oregon Department of Human Services Homeless Youth Advisory Committee, 2016).

HUD requires Continuums of Care (CoCs) to conduct a Point-in-Time (PIT) count of the unsheltered and sheltered homeless populations on an annual basis (HUD, 2020a). Per the PIT count that took place in Oregon in 2019, the state has 1,696 homeless youth (661 unaccompanied or parenting homeless youth younger than age 18, and 1,035 unaccompanied or parenting homeless youth ages 18–24). Because of the challenges of counting youth homelessness, the tallies are different among agencies. Comparatively, the Oregon Department of Education reports that Oregon contained 24,237 homeless youth in the 2018–2019 school year—a substantial difference from the official PIT count numbers (Oregon Department of Education, 2019). Although those conflicting numbers reflect the challenge that exists in counting homeless youth, it also suggests a great need to support youth in Oregon.

Between 25 and 30 percent of young people who are homeless have had previous experience with foster care (Dworsky et al., 2019). In Oregon, 32 percent of youth who had been in the foster care system have experienced homelessness (National Youth in Transition Database, 2018). Young people who transition out of foster care often are unprepared to live on their own and are therefore at a higher risk of homelessness (National Youth in Transition Database, 2019). Of the 3,359 youth who left the foster care system in Oregon in fiscal year 2019, 293 youth (or 8.7 percent) emancipated, or "aged out," leaving those youth with a need for housing resources (U.S. Department of Health and Human Services, 2019). Exhibit 1 demonstrates the number of youths aging out of the foster care system in Oregon, per county. To support youth who are housing insecure after exiting the foster care system, HUD established the Foster Youth to Independence (FYI) program in 2019. The intent of this initiative is to support youth who have been in foster care by providing them with subsidized housing.

Exhibit 1

Oregon Foster Youth Emancipation by County and Public Housing Authorities (PHA) Receiving Foster Youth to Independence (FYI) Vouchers



On July 26, 2019, HUD's Secretary, Dr. Ben Carson, announced the initiation of the FYI program, which provides housing assistance to young people aging out of foster care who are at risk of homelessness (HUD, 2019. Youth younger than age 25 may receive an FYI housing choice voucher from their local public housing authority (PHA). Applying for vouchers in Oregon requires a partnership between the PHA, the Oregon Department of Human Services (ODHS), and the local CoC.[1] To apply for a voucher, ODHS must refer foster youth to a PHA for an FYI voucher. In addition to receiving the FYI voucher, recipients receive 36 months of supportive services, which are administered by their local public child welfare agency (HUD, 2020b).

Since the initiative launched, 31 states have received funding and 822 individuals have received vouchers, totaling more than $6.7 million in funds to support youth who might otherwise become homeless.[2] In Oregon, 30 youth have received FYI vouchers since the program began, with more vouchers in the works. Exhibit 1 illustrates the PHAs and their county jurisdictions that applied for and received FYI vouchers. The 22 PHAs have jurisdiction over the 36 counties in Oregon, with some PHAs representing multiple counties. Of the 22 PHAs in Oregon, 15 were eligible for FYI vouchers before the new notice came into effect in October 2020. As of October 2020, eligibility requirements have changed, making all 22 PHAs eligible for FYI vouchers, as long as certain metrics are met.[3] Four PHAs have received vouchers, representing eight counties, as shown by the hatched shading on the graphic. The remaining PHAs are eligible to apply for FYI vouchers but to date have not yet done so. PHAs, ODHS, and CoCs may coordinate the request for more vouchers, reflecting an important partnership that exists between the three types of entities. The graphic demonstrates the need for vouchers and the potential that many PHAs and their jurisdictions have in applying for FYI vouchers. In exhibit 2, the black bars indicate the PHAs that receive FYI vouchers.

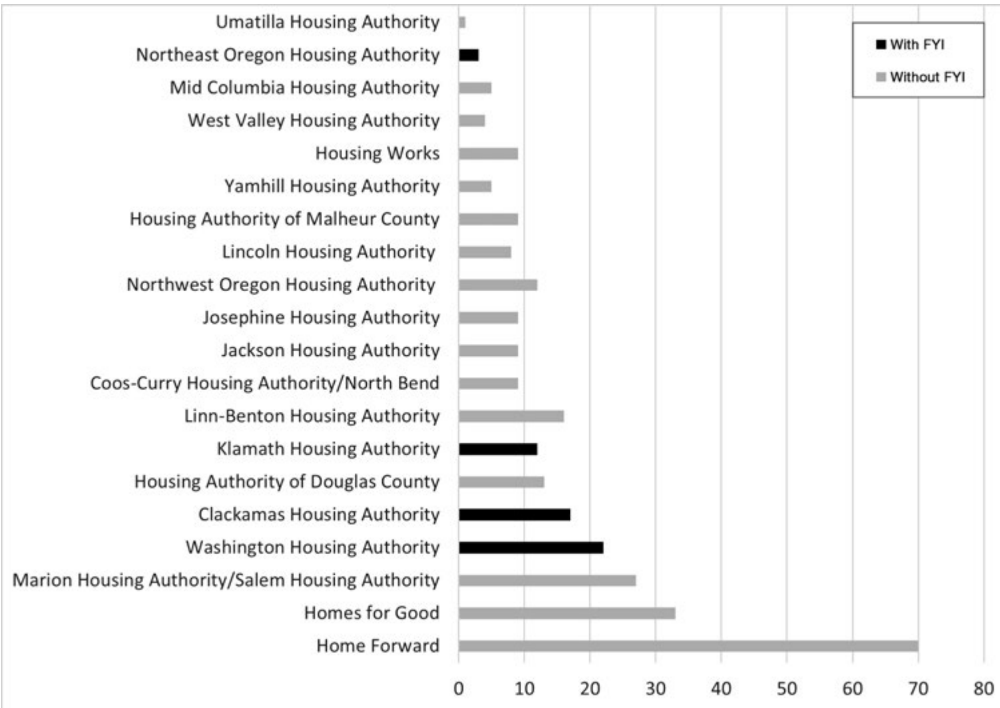
[1] HUD's Office of Field Policy and Management is tasked with supporting the relationship between CoCs, PHAs, and ODHS—a relationship that is necessary for a strong FYI program.

[2] The states that have received FYI vouchers include Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Hawaii, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Missouri, Montana, New Hampshire, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Virginia, Washington, and Wisconsin.

[3] PHAs who administer Family Unification Vouchers (FUP) must achieve 90-percent unit utilization of FUP vouchers to be eligible to apply for FYI vouchers.

Exhibit 2

Oregon Foster Youth Emancipation by Public Housing Authority Jurisdiction



FYI = Foster Youth to Independence.
Source: U.S. Department of Health and Human Services, 2019

Young people who have aged out of the foster care system will continue to require housing support. The partnership between PHAs, ODHS, and CoCs is a valuable one that will continue to support youth at risk of homelessness. Much of the state of Oregon is still eligible to receive FYI vouchers, and more work remains to be done to ensure that youth have access to this resource, particularly in counties with higher emancipation rates. Most PHAs in Oregon have not received FYI vouchers, demonstrating the need to use this resource fully.

Acknowledgments

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Impact

A regulatory impact analysis must accompany every economically significant federal rule or regulation. The Office of Policy Development and Research performs this analysis for all U.S. Department of Housing and Urban Development rules. An impact analysis is a forecast of the annual benefits and costs accruing to all parties, including the taxpayers, from a given regulation. Modeling these benefits and costs involves use of past research findings, application of economic principles, empirical investigation, and professional judgment.

Removal of the Ten-Year Home Warranty Requirement

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. Government.

Summary of Rule and Economic Analysis

A HUD final rule, effective in March 2019, removed a requirement to qualify for high loan-to-value (LTV) Federal Housing Administration (FHA)-insured mortgages on newly constructed single-family homes. Specifically, a loan will not have to satisfy the requirement that either the property meets preapproval requirements or that the borrower is covered by a HUD-accepted, insured 10-year protection plan. Other requirements, such as a Warranty of Completion of Construction on new construction, will be retained.

This deregulatory action introduced greater flexibility and allows consumers to pursue cost-minimizing strategies without measurably increasing the risk to FHA of affected loans. The primary economic benefit of the rule is to reduce the cost of an FHA loan—a change that should benefit borrowers. Eliminating the 10-year warranty requirement is anticipated to provide benefits from $21 million to $30 million in annual savings for borrowers. An additional $341,000 of savings is expected from reduced paperwork by lenders. A potential cost of relaxing the requirement is the greater risk to FHA; however, evidence to date shows that this is a minor concern. To guard against excessive risk, HUD retained the requirement that the Warranty of Completion of Construction be executed by the builder and the buyer of a “new construction” home as a condition for FHA mortgage insurance. Those safeguards are not expected to fail; however, an incremental increase of claims of approximately $1 million is possible, representing a transfer from FHA to borrowers with high-LTV loans for new construction.

Background of Rule

The National Housing Act was amended in 1979 to permit FHA to insure mortgages with high LTV ratios (more than 90 percent of the appraised property value) for newly built single-family homes if each of the homes satisfied at least one of the following two conditions:

- the dwelling was approved for mortgage insurance before construction.
- the dwelling is covered by a consumer protection plan or warranty plan acceptable to the Secretary and satisfies all requirements which would have been applicable if such dwelling had been approved for mortgage insurance prior to the beginning of construction.

In accordance with the 1979 Amendments, HUD published a final rule on October 5, 1990, that set forth the requirements for a consumer protection plan. The rule required high-LTV mortgages to be accompanied by a 10-year consumer protection plan to be eligible for FHA mortgage insurance (if the dwelling was not approved for insurance before construction).

A "ten-year warranty," also referred to as a "ten-year protection plan," is an agreement between the borrower and a plan issuer that contains warranties regarding the construction and structural integrity of the borrower's dwelling that is securing the FHA-insured mortgage. The plan must be a HUD-accepted, insured, 10-year protection plan.

A Warranty of Completion of Construction is a 1-year warranty from the builder that guarantees that a home was built according to plans approved by FHA and that the builder will remedy flaws resulting from faulty workmanship. The Warranty of Completion is sometimes referred to as a *builder's warranty* and covers major building components, such as the structure, roof, heating, windows, and electrical systems.

The purpose of the requirement was to protect property owners from defects in construction quality and, thus, FHA against claims arising from foreclosures driven by an unexpected loss in value of the property. Issuers of warranty plans submit their warranty plans to HUD for review. HUD then examines the submitted plans and, if the plans followed regulations, approves them for future use by FHA borrowers.[1] HUD currently maintains a list of 14 approved 10-year warranty plan providers; the list generally has approximately 15 approved 10-year warranty plan providers.

The Housing and Economic Recovery Act of 2008 eliminated the requirements on high-LTV mortgages, including the requirement for a consumer protection plan or a warranty plan. HUD is no longer statutorily mandated to maintain those requirements for high-LTV mortgages—but not required to eliminate them. HUD's final rule clarified that neither the 10-year protection plan nor the preapproval conditions will be required for high-LTV mortgages on new construction.

HUD retained the requirement that the Warranty of Completion of Construction be executed by the builder and the buyer of a newly constructed home. This warranty provides assurance to FHA

[1] To maintain acceptance by HUD, providers must resubmit the warranty plans for review every 2 years.

that the home was built according to plan and protects the buyer against detectable defects in equipment, materials, or workmanship supplied or performed by the builder, subcontractor, or supplier. If the structure does not meet the applicable building codes and fails to pass inspection by an International Code Council (ICC)-certified inspector, then the warrantor agrees to fix and pay for the defect and restore any component of the home damaged in fulfilling the terms and conditions of the warranty.

Justification for Rule

Reducing risk to borrowers and the FHA of substandard construction was the primary purpose of requiring the purchase of a home warranty for high-LTV originations. Much has changed in the more-than-20-years since the requirement was established. The utility of requiring consumer protection plans appears to have diminished. The quality of housing and building technology has improved. Uniform building codes and building code enforcement are more common. Jurisdictions increasingly rely on inspections performed by Residential Combination Inspectors (RCIs) or other qualified individuals, as is required by this rule. Those positive trends should mitigate HUD's previous concerns regarding the risk of construction defects. The combination of construction codes, educated inspectors, building technology, and statutes of repose provide adequate protection for FHA-insured homes against construction defects.[2]

At the time the original rule was promulgated, long-term warranties were predicted to significantly reduce the risk for FHA; however, requiring long-term warranties is no longer believed to be optimal. In most cases, requiring protection plans increases the expected cost of buying a home without necessarily providing a commensurate benefit to FHA borrowers or FHA.

The Market for Home Warranties

Home warranties can cover a variety of defects. A third-party home warranty (previously required by FHA) is comparable to a service contract. The warranty specifies how a defect will be remediated and the causes of failure that are excluded from coverage. Warranties vary by whether they cover existing homes or new construction, whether they are short- or long-term, the level of co-payments, and the extent of coverage. Short-term (1- or 2-year) warranties are designed to cover specific defects to specific systems and appliances. Long-term (10-year) warranties cover structural defects in load-bearing systems, including roof framing, walls, beams, columns, foundation, and floor framing. The expected lifetime of most of those items is well beyond the term of the warranty (National Association of Home Builders [NAHB] and Bank of America Home Equity, 2006). Generally, construction defects must be addressed if the home is unsafe; otherwise, no mitigation is required. Home warranties are different from homeowner's insurance: insurance covers financial damage due to an unexpected external catastrophe (or "peril"), whereas a warranty covers latent defects that were unobservable at the time of purchase. The warranty required by FHA includes a

[2] A "statute of repose" is a law that imposes an ultimate deadline on a homeowner suing a builder for a construction defect. The period of time allowed for making a claim typically begins at the completion of construction and extends for 10 years, although the specifics vary significantly by state. A statute of repose is different than a statute of limitation, which restricts the time a homeowner has to make a claim from the date of discovery of the defect.

1-year warranty against defects in equipment, materials, or workmanship and materials supplied and a 10-year warranty against construction, systems, and structural defects.

Warranties are usually offered by builders or sellers to generate confidence on the part of buyers. In the case of a third-party warranty, the insurer—not the seller of the home—is liable for repairs. A third-party warranty ensures that a major defect will be mitigated even if the builder has gone out of business. Real estate brokers are the primary sales channel of home warranties (Colonnade Advisors, 2018). Third-party home warranties can also be purchased directly by homebuyers, builders, and title agents. Sellers may purchase warranties to reduce risk while the home is on the market.

Whether a home warranty is worth the cost is the subject of some disagreement (Vandervort, 2016) The recommendation by consumer advocates depends on the type of warranty and the coverage offered. Some recommend warranties for new homes but not existing homes. Consumers' Checkbook recommends against warranties for existing homes primarily because repairs for major defects are not covered in the warranties for existing homes (Brasler and Giorgianni, 2019).[3] Adding to the undesirability of home warranties, repairs require co-pays from the homeowner, and homeowners are not given a choice of which contractors to use. Warranty companies can deny claims if the company determines that the defect was preexisting, a system was not properly maintained, or the damage is due to weather. Many companies impose ceilings on liability. Upgrades required by law (e.g., asbestos removal) are not covered. Some people have suggested that saving for repairs can be a better strategy for a homeowner (Brasler and Giorgianni, 2019; Consumer Reports, 2014).

Even for new homes, whether a warranty is a good choice will depend on the characteristics of the warranty. For short-term warranties, the average consumer is already protected by warranties on appliances (Ericson, 2017). If anything does happen, then the costs of fixing most of the systems covered under a short-term warranty are affordable to consumers; however, the short-term warranty may be desirable because it covers a period for which the consumer is likely to be financially strained.

Long-term warranties (10 years) covering structural defects of newly built homes meet greater approval by consumer advocates (Sichelman, 2014). Remediating a construction defect can be extremely costly. According to Warranty Week (2016), builders in 2015 set aside $2,500 per new construction for warranty claims, most of which is spent in the first year or two. The cost of a claim could be much greater. An industry study, as described by the Professional Warranty Service Corporation (2015), finds the average cost to investigate and repair a structural failure is $42,500. Significant costs arising from faulty foundations can be larger, costing an average of $200,000. Such amounts would constitute a financial shock to most households.

Construction defects cannot be prevented through responsible household maintenance. Most accepted structural claims are from damage to the foundation, which is harmed by soil movement (Short, 2015). Only 10 percent of structural claims occur in the first 2 years (Short, 2015)—one-

[3] One reporter (Vandervort, 2016) recommends warranties for existing homes because the probability of a breakdown increases with age, but he notes that consumers are "usually disappointed" with the coverage on existing homes when repair is needed.

half of what one would expect if conditional claim rates were evenly distributed across the years. Even if state law allows a homeowner to demand redress from a builder, a builder—especially of faulty homes—may be defunct or may lack the resources for a structural repair. The home warranty serves a useful purpose in providing peace of mind to risk-averse homebuyers and as a means for sellers to reduce the time on market of a unit; however, the ultimate value of the protection plan depends on the specifics of the warranty contract and consumer.

Data

Loans for homes that are either under construction or a new construction represent 10.6 percent of all FHA loans. Only the loans that are high LTV (90 percent and above) could potentially be affected. Those high-LTV loans on new (or under) construction number 85,000; represent 9.6 percent of high-LTV FHA single-family loans; and make up 6.5 percent of all FHA single-family loans (including refinance). Not all the 85,000 loans will likely be affected by the rule because some local jurisdictions have requirements concerning inspections that are as rigorous as those of FHA.[4]

Benefits from the Elimination of the Warranty Mandate

Benefits from the deregulatory action stem from three sources: savings to consumers because they are no longer being required to buy 10-year warranties; reduced costs to lenders of reviewing the warranty purchase; and reduced administrative costs to HUD. The greatest of those savings are to consumers and vary based on the extent to which consumers demand long-term warranties independent of the requirement.[5]

Benefits to Consumers

Eliminating the requirement to purchase a 10-year home warranty (or meet preapproval requirements) benefits consumers who would use resources devoted to the warranty more efficiently. The maximum gain to those consumers could be measured by the total expenditures on the home warranty.

To understand the *potential* gain to consumers, I approximate the resources devoted to the purchase of home warranties. On an annual basis, 50,000 to 60,000 warranties are issued to FHA borrowers (data provided by FHA). The analysis uses 55,000 to represent a typical year. The average coverage of the mandated warranty plans is $200,000. HUD staff estimated that the average premium charged under the plans is $2.70 per $1,000 of coverage. The average annual cost per homeowner is approximately $540 ($2.70/$1,000 x $200,000). Over 10 years, the net present value of the stream of $540 annual payments would range from $4,060 (at 7 percent) to $4,740 (at 3 percent).[6]

[4] Although HUD lacks data on enforcement of building codes through permitting and inspections, most states have adopted recent versions of the International Residential Code (IRC). Twenty states have adopted the 2015 edition and 12 more the 2012 version (ICC, 2018).

[5] Consumer safety regulations often are motivated by the argument that consumers lack enough information to protect themselves adequately.

[6] The net present of a stream of payments over 10 years (starting this year) is given by [(1+r)/r] x [1 – (1/(1+r)^10)], where r is the discount rate.

If the home warranty were a regulatory burden of no utility, then the annual savings to consumers from no longer complying would equal the full amount of the estimated annual fee, approximately $540. The aggregate annual savings would be approximately $30 million ($540 per home x 55,000 loans). Homebuyers and sellers would share in the savings, the degree to which would depend on characteristics of the market (price elasticities of supply and demand of settlement services). A greater proportion of the savings are passed through to borrowers, as demand is more inelastic and supply, elastic.

The gain to consumers is likely less than the estimate of $30 million. Probably some homebuyers would demand, and some sellers would offer, a long-term warranty even when not required by FHA. If a buyer is extremely risk averse or if a seller prefers to use home warranties to facilitate sales, then the purchase of the home warranty would be unaffected by a rule not requiring it. Although the purchase of a home warranty is not recommended unconditionally as the most cost-effective strategy (Consumer Reports, 2014), it would be justified in specific circumstances. An accounting of the economic impact of the deregulatory action must allow for the possibility that some homeowners derive utility from the home warranty. Economic theory identifies several motivations for offering warranties on products and services. The first and most obvious motivation is as insurance against product failure. For insurance to be a justifying factor, consumers must be risk averse, and a measurable chance of failure must exist. The demand for a warranty and the length of the warranty would then be correlated with the degree of risk aversion and the chance of failure. A second justification for offering warranties is as a signal of product quality to consumers (Spence, 1977). Producers would use the warranty as a signal of quality when asymmetric information is present. Because a warranty is costlier to provide when the product is of lower quality, the duration of the warranty is a way for sellers to overcome the market failure that would otherwise inhibit sales. Finally, a warranty can serve as a purchase incentive when the real estate market is slow (Hayunga, 2018).

Estimates of the prevalence of home warranties vary. A consultancy firm (Colonnade Advisors, 2018) reports a market penetration of 10 percent of home sales. One study of the Richmond housing market (Contat and Waller, 2017) finds that 16 percent of all homes sold offered a home warranty. Short (2015) cites an estimate that 30 percent of newly built homes include a home warranty; whether those figures represent home warranties, builder warranties, or both is not clear.[7] This article uses a range of 10 to 30 percent. If 10 percent (30 percent) would have purchased a long-term warranty without the requirement, then the consumer savings is $27 million ($21 million).

In the preceding analysis, there are two types of borrowers: those who receive no utility from the warranty and those who value the warranty at the average market price. There will be a spectrum: most would not buy a warranty at the break-even price but value one at a fraction of the market price. Brewster et al. (1980) surveyed residents to evaluate a prospective FHA-mandated 2-year home warranty. The researchers found that only one-fifth would be willing to pay a price that the researchers estimate to be below the break-even price, and only 2 percent would be willing to pay

[7] A builder warranty is offered by the builder, covers most structural issues, and is usually short term. A home warranty is provided by a third party. Many home warranties cover only appliances and systems within the home (plumbing, electrical, and heating, ventilation, and air conditioning [HVAC]), whereas others cover structural issues or both. The duration of coverage varies. Comparison with FHA's approved plan is difficult without significant detail concerning the product.

a break-even price. If a home warranty has value, then it should be revealed by hedonic studies of the housing market; however, hedonic studies of the housing market fail to find a statistically significant positive effect on the sales price of a seller-offered home warranty (Contat and Waller, 2017; Salter, Johnson, and Anderson, 2004).[8]

There are several explanations for this finding of non-capitalization. One is that the risk of a deficiency is too low to have a significant effect on the property market. The combination of building inspections and standards may drive the perceived probability of failure close to zero. Also, the households that would demand a warranty may not be able to influence the single-family housing market. Empirical research of the demand for automobile warranties (Dohmen et al., 2011) found that low-income consumers are more risk averse but cannot afford to pay the higher prices for a warranty; whereas the higher income consumers, who can afford a warranty, are less risk averse. Although demand may exist for home warranties as a form of insurance, low-income households will not be able to significantly influence the price for single-family homes in such a way as to reflect their value of a warranty.

The role of the warranty as a signal may be neutralized by certain aspects of the property market. Warranties can play a role in signaling quality only when the duration of warranties varies significantly and repairing a lower quality good is costlier. In contrast, the duration of home warranties is standardized and so cannot be used effectively as a signal of quality. Also, if homebuyers are not aware of some of the causes of product failure, such as foundation damage from shifts in soil (Murphy, 2010), then a signal of the builder's confidence in the building's resilience could be less effective. Finally, if local building codes and inspection requirements provide confidence in building quality, then the warranty, as a signal of unobserved effort, would not be as vital to the market (Gwin and Ong, 2000).

The weak evidence of capitalization could also be explained by consumers' attitudes toward the warranty itself. Possibly, homebuyers do not have the expertise to evaluate the warranty and so are suspicious that it will be valuable in the event of product failure.

The weak evidence of the capitalized benefits of a home warranty should support the assumption of full savings ($30 million). By eliminating the 10-year warranty requirement, annual savings to borrowers could be as high as $30 million (or as low as $21 million). The rule creates at least qualitative savings for all FHA-insured borrowers buying new homes. Those who opt to purchase warranties will be able to choose from the entire market of warranty providers and not just those approved by HUD. Those who choose to save for repairs will earn interest and may choose contractors they trust when needed.

Alternative Methods of Compliance

Providing evidence of a 10-year protection plan is not the only way to satisfy FHA's requirements for warranties and inspections of high-LTV loans to purchase new construction. For all types of

[8] A study sponsored by ServiceMaster Company, LLC, found that homes sold with American Housing Shield warranties sell for $2,300 more and spend less time on the market. Although the study was verified by a third-party accounting firm, it was not a hedonic study but a comparison of averages.

construction (proposed construction, under construction, and recently built homes), a building permit and certificate of occupancy can take the place of the 10-year protection plan. A certificate of occupancy verifies that a building complies with local building codes and is judged by an inspector to be safe. The certificate of occupancy is most commonly required for new construction; however, only some jurisdictions require a certificate of occupancy. For homes bought in those jurisdictions, complying with FHA requirements is not an additional burden. This could explain the difference between the number of warranties (52,000 in 2016) and high-LTV new construction loans (85,000 in 2016).

Other alternatives (depending on the stage of construction) include additional inspections or appraisals. Those methods seem to be less popular than the 10-year protection plan, however, perhaps because they do not provide the same level of benefits to consumers as does a protection plan.

Required Documentation

Required documents for high-LTV loans for new construction include a Builder's Certification of Plans, Specifications, and Site; a Warranty of Completion of Construction; required inspections; and, in affected areas, a Wood Infestation Report and water analysis. The rule did not relax those requirements. The only documentation requirement that was relaxed is the one stating that the borrower must provide evidence that the property was preapproved or is covered by a 10-year warranty plan. For preapproval, the dwelling must have been approved for mortgage insurance before construction.[9] This alternative is unfeasible for many lenders because very few could know that the ultimate purchaser would be FHA insured. Nonetheless, in isolated cases, preapproval may be chosen; thus, relaxing both the preapproval and the warranty requirement is necessary to ensure that the regulatory burden is reduced for all consumers. Which method of compliance is the most cost effective may vary by borrower.

Paperwork Reduction

Lenders face paperwork burden from reviewing the home warranty before closing. HUD estimated that a lender requires 0.1 hours to process one warranty. Loan officers earn a median hourly wage of $31 (U.S. Bureau of Labor Statistics, 2020); the opportunity cost of their time would be twice[10] that, or $62 per hour. The burden per warranty is $6.20 (0.1 hours x $62). At a volume of 55,000 warranties, the total paperwork burden relieved is $341,000.

Savings would extend to the U.S. government. The elimination of the warranty requirement eliminates the cost to HUD associated with review of the warranty plans submitted for approval and renewal. Administrative burdens to HUD include a review of warranty plans for acceptance, review of plan renewals, and maintenance of HUD's home warranty webpage.

[9] With the preapproval process, the local jurisdiction reviews and approves the plans, specifications, and construction materials before the start of construction and inspects the project during construction. The preapproval provides protection because the local jurisdiction enforces building codes, resulting in a high level of construction quality, which makes protection or warranty unnecessary.

[10] This estimate includes benefits, management overhead, rent, employer taxes, and equipment.

Costs from Elimination of Warranty Mandate

Eliminating the requirement of construction warranties for high-LTV loans presents a potential risk to FHA. A major structural defect would adversely affect the value of a property and potentially lead to a foreclosure. Borrowers with little equity (high-LTV loans) could be pushed into a situation of negative equity and would be more likely to default (HUD, 2010; Jones and Sirmans, 2015). FHA would bear the cost of the claim directly.[11]

When evaluating whether FHA would face a significant risk, HUD must consider, first, whether other safeguards without the requirement are sufficient to protect FHA; and second, whether not requiring a builder warranty for high-LTV loans could lead to any risk-inducing behavioral changes on the part of buyers, sellers, or builders.

The source of many construction defects is human error: construction defects can arise from deviations from design, poor management of construction, inferior workmanship, or latent defects in material. Building inspectors are expected to notice building code violations, buildings not built to design, or an obviously faulty system—but may fail. Latent defects, such as those governed by a long-term warranty, are difficult or impossible to detect until they cause an overt problem.

High levels of construction quality should limit FHA exposure to risk. That advances in building technology should yield longer lasting homes now than were being built 40 years ago, when consumer protection was mandated by Congress, would seem intuitive. Substantial evidence that the probability and cost of construction defects has decreased over time, however, is difficult to find. Indeed, the evidence is mixed.

A study by the National Association of Home Builders (NAHB) and Bank of America Home Equity (2006) finds that “the average life expectancy for some components has increased during the past 35 years because of new products and the introduction of new technologies, while the average life of others has declined.” Another discussion (NAHB Research Center, 2003) blames the uneven quality of construction on the insufficient training of trade contractors. If builders rely on temporary workers, then those builders have little incentive to invest in upgrading the workers’ skills. Confirming those suspicions concerning the contribution of labor, one study (Harper et al., 2010) finds negative trends of labor productivity in the construction industry. One positive trend is the use of prefabricated components. Compared with more traditional methods, using preassembled components reduces the potential for human error, construction waste, and onsite hours (Shields, 2016). Standardizing processes using digital technology should lead to less variation in construction quality (for example, see ETH Zürich, 2018). Better evaluations by geologists using improved technology could more easily identify potential hazards (NAHB, 2016).

Examining the cost of providing a warranty provides informal evidence that construction quality has improved. Brewster et al. (1980) estimate that the break-even price of providing a comprehensive 2-year home warranty would be $340 for FHA loans in 1977, which is equivalent to $1,410 in 2017 USD, or approximately $730 per year (discounted at 7 percent). That estimate is higher than the $540 charged by home warranty companies today for FHA loans, suggesting that

[11] If systemic, those mounting costs of operation would lead to higher premiums.

less risk is present now.[12] An overall positive trend in resilience, however, does not void the necessity of considering the variations from that trend that could present significant risk to homeowners.

Despite any improvements in the quality of the average home, the housing sector will remain exposed to downside risk. One source of risk is the introduction of unproven technologies. An example of a failed building technology is aluminum wiring, which was discovered to be a fire hazard. Complete replacement is estimated to cost as much as $8,000 per home (Romano, 2006). More relevant to structural integrity is the unexpected decay of fire-retardant plywood roofing used in the 1980s (Salmon, 1990).

Another source of risk can be a building boom: high-volume construction places stress on the industry to maintain the quality of new construction. An example from the most recent building boom is the use of faulty drywall, manufactured in China. Market demand for drywall surged in 2006, fueled by both a nationwide boom in residential construction and the need for extensive post-hurricane reconstruction along the Gulf Coast. Some of the drywall imported from China during that period has since been found to be problematic due to its ability to corrode metal in homes. Some homeowners complained of odors due to drywall emissions, sometimes comparing the odor to the smell of rotten eggs (HUD, 2012). Another recent example of widespread faulty construction is the deterioration of concrete used in the foundations of homes built near a quarry in Connecticut. According to the Connecticut State Department of Housing, the foundations of at least 35,000 homes in Connecticut in 41 towns face an irreversible process of cracking, flaking, bowing, and separation that can only be remediated by replacing the foundation, costing as much as $250,000 per home (Connecticut State Department of Housing, n.d.). The underlying cause is the presence of a mineral, pyrrhotite, that occurs naturally (2-10 Home Buyers Warranty, 2018b). A spokesman for the concrete companies blamed the problems on careless installation by builders during the building boom of the 1980s (Hussey and Foderaro, 2016). As of 2016, cracking appeared in houses built between 1983 and 2015. A home warranty would cover such a calamity[13] but only if the construction defect were discovered before the expiration of the warranty.

Finally, natural disasters can expose construction defects by putting greater stress on a structure.[14]

The potential cost to FHA of eliminating the warranty requirement is an increased incentive for defaults and thus, the cost of claims for FHA. If not repaired, then structural damage will reduce the value of a property; thus, caution is merited for high-LTV loans. For example, significant damage in excess of $20,000 to a $200,000 home with a loan of $180,000 would move the homeowner into a situation of negative equity. In general, negative equity is associated with a higher probability of default (Jones and Sirmans, 2015); however, there are reasons to doubt that damage would force a default and subsequent foreclosure. Negative equity arising from physical damage is unlike negative equity caused by a decline of the local housing market. First, a homeowner can retrieve the lost value by repairing the home, whereas one household cannot re-orient an entire market. Second, a household will always need a place to live. The strategic

[12] Some of the difference could be explained by advances in consumer information concerning the value of warranties.

[13] See 2-10 Home Buyers Warranty (2018a) for recommendations concerning a warranty company.

[14] When damage from an adverse event results from multiple contributing causes, and one of them is a construction defect, state law varies on the responsibility of the home insurance company.

default is made easier if the alternatives are affordable, as they would be in a collapsing market. If the damage were isolated to the household's unit, however, then the alternatives may be more expensive than repairing the unit.

Few formal studies have been conducted of the effect of unexpected physical damage on default. A notable exception is Anderson and Weinrobe (1986), who examine defaults by owners of uninsured homes suffering earthquake damage. The researchers found that the extent of negative equity was the most significant explanatory variable of the probability of default for homes. That finding does not imply, however, that damage causes defaults, only that those homeowners behave similarly to each other. Unfortunately, the authors do not compare damaged homes to those that were not damaged, so extracting the incremental effect of an uninsured catastrophe is impossible. When the authors attempt to model earthquake damage as an explicit explanatory variable, they find that the influence of the damage variable on defaults was positive, but that their overall empirical model of the probability of default was inferior. Anecdotal evidence from the foreclosure crisis suggests that whether shoddy construction was a motivator or an excuse for default is not clear (Roney, 2007). A report by HUD on faulty drywall found that, although a structural defect could increase the incentive to default, it is reasonable to expect that only a fraction of the total number of homes with problem drywall would result in a completed foreclosure (HUD, 2012).

The economic theory of risk and uncertainty is helpful, given the lack of conclusive empirical evidence concerning the cost of repair and its effects on borrower behavior. Kau and Keenan (1996) developed an option-theoretic model of mortgage default; incorporated a random process of negative shocks to the building value; and simulated the impact of the randomly occurring catastrophe on default probability and the expected cost of a mortgage insurance claim. As would be expected, the expected cost of a claim increases with the loan-to-value ratio, the likelihood and severity of the catastrophe, and the length of exposure. A few insights from the study stand out. First, the probability of default occurring from a catastrophe, even at high levels of severity, is lower than the chance of the catastrophe itself. This probability is because termination may occur for other reasons, such as pre-payment or non-catastrophic default, both of which may preempt catastrophic damage. Also, if a catastrophe occurs, any default motivated by the unexpected and precipitous decline of property value could preempt termination for other reasons. Second, the severity of damage from a catastrophe interacts with other motivators for default. At low levels of severity, such as a 10-percent loss in value, the occurrence of a catastrophe is not likely to result in a claim, even when the pre-catastrophe LTV is as high as 90 percent. The finding would be consistent with real option theory, which stresses the value of being able to postpone irreversible decisions when the future is uncertain. Households would wait to learn whether market-level appreciation is enough to compensate them for the one-time catastrophic loss. A high level of severity (80-percent loss in value) would dominate the default decision. A household would not expect to be rescued by appreciation. The middle ground (a catastrophic loss of 25 percent of the building's value) is where the catastrophic price decline would interact with typical market trends to determine the household's decision. If market fluctuations were such that prices had already decreased (increased), then the motivation to default would be reinforced (weakened).

The standardization and enforcement of building codes have greatly mitigated concerns of defective construction that might result from eliminating the warranty requirement. Economic theory (Gwin and Ong, 2000) finds that building codes are a second-best policy response to imperfect information concerning builders' efforts and a viable substitute for builder warranties. When this rule was promulgated, most states had adopted recent versions of the International Residential Code (IRC); 20 states had adopted the 2015 version and 12 the 2012 version (ICC, 2018).[15] All states require that builders assume responsibility for major construction defects. The obligation for major repairs of construction depends on state law and varies from 4 years (Tennessee) to 15 years (Iowa) after completion. As of May 2017, the most common "period of repose" is 10 years, and the median period across all states is 8 years.[16] Most claims occur within 7 years (2-10 Home Buyers Warranty, 2018a). The degree to which a borrower will want a home warranty thus depends on state law and confidence in the builder.

An outstanding question for FHA is whether no longer requiring a 10-year warranty would lead to a change in behavior by builders, sellers, or homebuyers that would lead to an increase in construction defects. The rule is not anticipated to increase systemic risk to the building sector. Given the stringency of building codes and inspections, that any builder would intentionally build defective homes in response to this rule is doubtful. FHA-insured borrowers are such a small part of the market for new homes that neither builders nor sellers have any incentive to change their business strategies.[17]

Transfers from Elimination of Warranty Mandate

Because FHA single-family mortgage insurance is based on the mutual insurance model, and except in exceptional stress situations is fully financed by premiums, the rule could be viewed as a transfer of risk from specific FHA borrowers to the rest of FHA-insured borrowers. The extent of the transfer will depend on the magnitude of the economic effects discussed in previous sections of this article. High-LTV borrowers purchasing new buildings will pay a lower cost because of reduced upfront fees. The risk to FHA is the cost of a claim arising from structural defaults. Currently, those risks are internalized (limited to the borrower) through the protection plan, which behaves as insurance. Without the requirement for a protection plan, FHA will have to pay those costs by raising its mortgage insurance premium.

The simulations of Kau and Keenan are useful to derive the impact of the warranty on FHA claim liabilities. Parameters of the model are claim period in years, loan-to-value ratio, probability of catastrophe, and catastrophe severity. The analysis provides estimates for 2-year, 4-year, 8-year, and 20-year periods; loan-to-value ratios of 80 percent, 85 percent, and 90 percent; an average annual

[15] For a complete list, see the appendix.

[16] Those figures were calculated from data retrieved from 2-10 Home Buyers Warranty (2018c). The most common type of action addressed by state law is construction defects. When a state has different periods of repose for different types of action (for example, "construction defects-tort"), the author uses the period of repose for the action that most closely resembles "construction defects-written contract" or latent defects in creating those descriptive statistics. A summary of the data is included in the appendix of this report.

[17] Although new construction and high-LTV FHA loans are only a small part of the housing market, FHA's approval of warranty companies could positively influence the transparency of all warranty plans.

probability of catastrophe of 0 percent, 0.3 percent, or 0.9 percent; and catastrophic severity of 10 percent, 25 percent, and 80 percent of home value. The 8-year period is chosen because it is closest to the 10-year lifetime of the warranty and a 90-percent LTV because the loans under consideration are characterized by a high LTV. The warranty company is assumed to pay all costs of damage in the event of a catastrophe, so the baseline annual probability of catastrophe is effectively 0 percent. HUD records do not document that even one claim has ever been made by a borrower or lender against a warranty company for a failure to resolve defects in new construction. Claims by lenders involve other reasons but never because the builder or the warranty provider refused to repair or pay a claim award related to the warranty. Between 1984 and 2017, all lender claims and foreclosures have occurred because of other reasons; none have been because of a warranty issue. Scenarios are presented for both the 0.3 percent and 0.9 percent average annual probability of defect. The author's calculations find that, based on the Poisson distribution, the probability of at least one catastrophe occurring over 30 years is between 10 percent and 25 percent, depending on the annual rate (0.3 percent and 0.9 percent, respectively). That range is consistent with the probability of structural damage. Industry experts (Short, 2015) present evidence that the risk of structural distress of any kind is 25 percent during the lifetime of the building and that the risk of a severe and major failure is 5 percent. The author considers both 10 percent and 25 percent of value for catastrophic severity. The primary estimate will be a 10-percent loss: in 2016 and 2017, the average claim settled by a warranty company on an FHA loan was $19,000, which is nearly 10 percent of the average $200,000 home. The estimates of the expected increase in mortgage insurance claims range from $440,000 to $7.2 million, with a primary estimate of $1.3 million. The estimates are calculated from Table 2 of Kau and Keenan (1996) and adjusted for 55,000 loans on a $200,000 home.

Exhibit 1

Incremental Change in Expected Mortgage Insurance Liabilities

Loss Severity (%)	Annual Probability of Catastrophe (%)	Change in Expected Liability per Loan ($)	Change in Aggregate Expected Liability ($)
10	0.0	0	0
	0.3	8	440,000
	0.9	24	1,320,000
25	0.0	0	0
	0.3	44	2,420,000
	0.9	132	7,260,000

These results are only suggestive. For a more extensive analysis, some parameters of the model would have to be updated to the current economic conditions and regulatory environment. A more representative model, however, will not change the basic conclusion that FHA will experience a small increase in risk from abandoning the warranty requirement.

Conclusion

The final rule relaxed a regulatory requirement concerning the settlement of some FHA-financed single-family properties. Some of the savings are quantifiable. By eliminating the 10-year warranty requirement, lenders are expected to save $340,000 in administrative costs of reviewing and submitting home warranties for loan approval. The greater flexibility introduced by the deregulatory action allows borrowers to take advantage of cost-minimizing strategies. FHA borrowers and lenders are expected to save $21 million to $30 million from no longer being required to purchase a 10-year warranty plan to secure an FHA-insured mortgage. How those savings are distributed depends on the relevant price elasticities of demand and supply.

The cost savings can be achieved without significantly increasing the risk to FHA. Stringent building code and inspection requirements will mitigate the risk of removing the warranty requirement. Advances in detecting the causes of structural failure reduce both the probability and the cost of any structural failure. To ensure that no observable construction defects are present in newly built homes bought by FHA-insured borrowers, HUD retained the requirement that the Warranty of Completion of Construction (form HUD-92544) be executed by the builder and the buyer of the home, as a condition for FHA mortgage insurance. In addition, to further mitigate risk, the rule required that inspections be performed by Residential Combination Inspectors (RCIs), Combination Inspectors (CIs), or—in the absence thereof—other qualified individuals. If all those safeguards fail, the estimated average aggregate loss to FHA (a transfer of risk) is $1.3 million, which is far less than the consumer benefits generated by the rule.

Appendix: State Regulations

Exhibit A1 displays the version of the International Residential Code (IRC) adopted by each state. A number indicates the specific code edition that is adopted as a mandatory state minimum. For example, “2015” indicates the 2015 edition. An “X” indicates that the IRC is not used as a standard for all buildings but that one or more state or local agencies or jurisdictions have adopted an edition of the code. A “—” indicates that the IRC has not been adopted by any state agency or local jurisdiction in the state.

Exhibit A1

International Residential Code, by State (1 of 2)

State	Edition of IRC
Alabama	2015
Alaska	X
Arizona	X
Arkansas	2012
California	2015
Colorado	X
Connecticut	2012
Delaware	X
District of Columbia	2012
Florida	2015

Exhibit A1

International Residential Code, by State (2 of 2)

State	Edition of IRC
Georgia	2012
Hawaii	2006
Idaho	2012
Illinois	X
Indiana	2003
Iowa	2015
Kansas	X
Kentucky	2012
Louisiana	2015
Maine	2015
Maryland	2015
Massachusetts	2015
Michigan	2015
Minnesota	2012
Mississippi	2012
Missouri	X
Montana	2012
Nebraska	2012
Nevada	X
New Hampshire	2015
New Jersey	2015
New Mexico	2015
New York	2015
North Carolina	2009
North Dakota	2015
Ohio	2009
Oklahoma	2015
Oregon	2015
Pennsylvania	2009
Rhode Island	2012
South Carolina	2015
South Dakota	X
Tennessee	2009
Texas	2000
Utah	2015
Vermont	X
Virginia	2012
Washington	2015
West Virginia	2015
Wisconsin	—
Wyoming	X

Source: "International Codes—Adoption by State (May 2018)." (International Code Council, 2018). These data are updated regularly by the ICC.

Exhibit A2 summarizes the periods of repose against defects in residential construction by type of action for all states and the District of Columbia except for Hawaii.

Exhibit A2

Statutes of Repose for Residential Construction, by State (1 of 2)

State	Type of Action	Period of Repose
Alabama	Construction defects	7 years
Alaska	Construction defects	10 years
Arizona	Construction defects—contract, implied warranty	8 years
Arkansas	Construction defects—injury to property	5 years
	Construction defects—personal injury and wrongful death	4 years
California	Construction defects—patent defects	4 years
	Construction defects—latent defects	10 years
Colorado	Construction defects	6 years
Connecticut	Construction defects—contract	6 years
	Construction defects—tort	3 years
Delaware	Construction defects	6 years
District of Columbia	Construction defects	10 years
Florida	Construction defects	10 years
Georgia	Construction defects	8 years
Idaho	Construction defects—tort	6 years
	Construction defects—written contract	5 years
Illinois	Construction defects	10 years
Indiana	Construction defects	10 years
Iowa	Construction defects—tort and implied warranty	15 years
Kansas	Construction defects	10 years
Kentucky	Construction defects	7 years
Louisiana	Construction defects	5 years
Maine	Construction defects	6 years
Maryland	Construction defects	10 years
Massachusetts	Construction defects	6 years
Michigan	Construction defects	6 years
Minnesota	Construction defects	10 years
Mississippi	Construction defects	6 years
Missouri	Construction defects	10 years
Montana	Construction defects	10 years
Nebraska	Construction defects	10 years
Nevada	Construction defects	6 years
New Hampshire	Construction defects	8 years
New Jersey	Construction defects	10 years
New Mexico	Construction defects	10 years
New York	Construction defects	6 years
North Carolina	Construction defects	6 years
North Dakota	Construction defects	10 years
Ohio	Construction defects	10 years

Exhibit A2

Statutes of Repose for Residential Construction, by State (2 of 2)

State	Type of Action	Period of Repose
Oklahoma	Construction defects	10 years
Oregon	Construction defects	10 years
Pennsylvania	Construction defects	12 years
Rhode Island	Construction defects—contract and implied warranty	10 years
	Construction defects—tort	10 years
South Carolina	Construction defects	8 years
South Dakota	Construction defects	10 years
Tennessee	Construction defects	4 years
Texas	Construction defects	10 years
Utah	Construction defects—contract and warranty	6 years
	Construction defects—other than contract and warranty	9 years
Vermont	Civil actions	6 years
Virginia	Construction defects	5 years
Washington	Construction defects	6 years
West Virginia	Construction defects	10 years
Wisconsin	Construction defects	10 years
Wyoming	Construction defects	10 years

Source: 2-10 Home Buyers Warranty (2018c)

Construction defects range from minor defects to major failures of design, materials, and completion of a housing structure or any of its systems. The period of repose may vary by type of defect. A patent defect is one that is obvious; whereas a latent defect is not likely to be discovered until the outward manifestation of the defect. A contract or warranty defect represents a violation of an explicit contractual agreement between the builder and homebuyer. The concept of an implied warranty imposes a broader responsibility on the builder to provide a habitable structure, built to code, and to generally accepted standards. The damages for a tort claim can be more expansive than a contract or warranty claim and include any economic loss resulting from the construction defect. Vermont does not have a statute of repose specific to construction defects. Instead, the 6-year limit on civil actions related to a breach of contract applies. Arkansas imposes a shorter period of repose personal injury than for damage to property arising from construction defects.

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The Countercyclical Nature of the Federal Housing Administration in Multifamily Finance

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Abstract

Since the mortgage crisis of 2007–2008 and the resulting Great Recession, recognition has been growing of the importance of the Federal Housing Administration's (FHA) countercyclical role in supporting the nation's home mortgage lending market. Although much of the focus of this countercyclical role has been on FHA single-family mortgage insurance, this article examines the similar role that FHA plays for multifamily housing finance. Specifically, we examine FHA multifamily lending during the Great Recession. The paper begins with a high-level overview of the role FHA plays in multifamily financing and how an FHA-insured mortgage differs from conventional multifamily financing and multifamily mortgages insured by the government-sponsored enterprises, Fannie Mae and Freddie Mac. To provide real-world examples, we present two case studies: (1) the role FHA played in energy-affected markets during the oil price boom and bust in North Dakota and (2) an FHA-insured property under the Section 220 program in St. Louis that revitalized investment in the surrounding neighborhood. The report concludes with a discussion of FHA's current place in the multifamily financing space and looks forward to where it might be headed.

FHA Multifamily Finance

Overview

Multifamily housing is a vital component of the real estate market, as approximately 27 percent of U.S. households reside in multifamily housing. In fiscal year 2019, the Federal Housing Administration (FHA) had an insured portfolio of more than 11,500 loans with a total unpaid principal balance of $98.7 billion; it is still dwarfed, however, by the FHA single-family insurance portfolio, which totaled $1.3 trillion.

Since the mortgage crisis of 2007–2008 and the resulting Great Recession, recognition has been growing of the importance of the FHA's countercyclical role in supporting the nation's home mortgage lending market. Although much of the focus of this countercyclical role has been on FHA single-family mortgage insurance, this paper examines the similar role that FHA plays for multifamily housing finance. Specifically, we examine FHA multifamily lending during the Great Recession. This report begins with a high-level overview of the role FHA plays in multifamily financing and how an FHA-insured mortgage differs from conventional multifamily financing and multifamily mortgages insured by the government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac. To provide real-world examples, we present two case studies: (1) the role FHA played in energy-affected markets during the oil price boom and bust in North Dakota and (2) an FHA-insured property under the Section 220 program in St. Louis that revitalized investment in the surrounding neighborhood. The report concludes with a discussion of FHA's current place in the multifamily financing space and looks forward to where it might be headed.[1]

FHA: Historical Background

The Federal Housing Administration (FHA) was established in 1934 as a response to the Great Depression to help strengthen the housing market. The National Housing Act of 1934 created FHA and included two programs, Section 203 and Section 207. Section 203 insured lenders against losses on single-family homes, and Section 207 provided insurance on large-scale rental projects for low-income individuals, both for a fee or premium charge. Initially, FHA's Section 207 mortgages were not popular with builders because the large, amortizing mortgages on multifamily projects were new (Glick, 2016).

The single-family amortizing loan was commonplace, but those types of loans for multifamily housing were not. FHA attempted to encourage Section 207 borrowing by offering Large Scale Housing Bonds, which had a single Section 207 project as collateral. These federally issued government bonds were the first step toward collateralized mortgage-backed securities and were

[1] For examples of the recognition of FHA's countercyclical role, see the following:
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offered for FHA rental programs, not single-family housing. To further encourage the purchase of these Section 207 bonds, FHA allowed commercial banks to hold Section 207 bonds and not to classify them as investment securities, exempting these bonds from restrictions under the Glass-Steagall Act of 1933. The government, however, continued to have difficulty placing the bonds and raising financing for low-income rental housing (synonymous with multifamily housing at the time) even through the national mortgage associations the 1934 National Housing Act created. Consequently, the government created its own, the Federal National Mortgage Association (FNMA), which later became known by its nickname, Fannie Mae. According to Jesse Jones, chairman of the Reconstruction Finance Corporation, which created FNMA, Fannie Mae was primarily intended to provide money for private enterprise, which planned large-scale housing projects (Federal Home Loan Bank Board, 1938).

Further innovation of multifamily finance occurred in the years that followed, as new program authorities were added in subsequent legislation. In 1938, Congress created Section 210 to insure advances (that is, construction loans) of multifamily units, instead of just insuring mortgages for the finished product. The same year, FHA also created Section 608, which insured loans for multifamily veterans' housing. In December 1946, President Truman issued a statement to "increase the proportion of rental units" and, in addition, authorized the issuance of $1 billion in FHA mortgage insurance to "be used primarily for rental housing" (Truman, 1946). Partly as a result, the number of multifamily units insured by FHA jumped from 45,571 during 1940–1944 to 265,213 during 1945–1949, and valuation increased from $188,466,000 to $2,022,878,000 (exhibit 1). In 1948, Congress passed Title VII of the National Housing Act to guarantee the interest for mortgages of rental housing, and in 1949, Section 803 was added to insure mortgages on rental housing for active-duty military personnel. In 1950, financing for cooperatives was added through Section 213, and in 1954, Sections 220 and 221 were added to provide rental housing in urban renewal districts. The Housing Act of 1956 added FHA insurance for rental housing targeted to individuals aged 60 and older, and in 1961, Section 239 was added to insure loans for condominium development. All those programs boosted FHA's involvement in multifamily finance. "From 1934 to 1958, the FHA insured…39.7 percent of all multifamily construction. In the postwar years…the agency insured well over 70 percent of the multifamily market" (Glick, 2016).

Exhibit 1

Multifamily Housing Mortgages Insured by Federal Housing Administration, 1935–1979 (dollar amounts in thousands) (1 of 2)

Year	Grand Total	
	Units	Amount
1935-39	29,777	114,429
1940-44	45,751	188,446
1945-49	265,213	2,022,878
1950-54	327,601	2,555,582
1955-59	172,946	2,387,437

Exhibit 1

Multifamily Housing Mortgages Insured by FHA, 1935–1979 (dollar amounts in thousands) (2 of 2)

Year	Grand Total	
	Units	Amount
1960-64	279,350	4,491,855
1965-69	268,290	4,270,387
1970	200,660	3,256,795
1971	222,685	3,983,829
1972	188,224	3,447,750
1973	120,414	2,286,175
1974	54,820	1,213,460
1975	38,044	976,252
1976	78,292	2,314,957
1977	109,882	2,817,762
1978	121,712	3,270,380
1979	95,154	2,727,723
Total	**2,615,448**	**42,406,103**

Source: U.S. Department of Housing and Urban Development (1979)

In the third quarter of 2019, multifamily residential mortgage assets totaled $166.2 billion, with $52.9 billion held by GSEs (Board of Governors of the Federal Reserve System [U.S.], 2020a, Table F.219). By comparison, single-family, one- to four-family residential mortgages totaled $335.8 billion during the third quarter of 2019, of which $213.5 billion in assets were held by GSEs (Board of Governors of the Federal Reserve System [U.S.], 2020a, Table F.218). Multifamily mortgage loans are still viewed by some people as riskier than single-family mortgages because multifamily property values, vacancy rates, and rents are more closely correlated to local economic conditions. Consequently, multifamily loan performance may be more sensitive to economic conditions than the single-family mortgage market (HUD's Regulation, 2000). GSEs have a larger presence in much of the single-family mortgage market, compared with the multifamily market, as highlighted in the preceding data.

How FHA Works

FHA provides mortgage insurance on loans made by FHA-approved lenders and insures loans made for single-family homes, multifamily properties, residential care facilities, and hospitals. The mortgage insurance protects lenders against the default of a property owner, and FHA will pay the unpaid balance of the loan to the lender of a defaulted mortgage. Borrowers pay mortgage insurance premiums to FHA, and those premiums provide income to the mortgage insurance fund.

FHA mortgage insurance allows lenders to carry less risk, and consequently, loan terms are generally attractive. Most multifamily FHA loans have a 40-year amortization term, a fixed interest rate, and are nonrecourse, which means that if the borrower defaults, his or her personal assets are not at risk. In addition, borrowers can lower their mortgage insurance premium (MIP) costs by meeting certain LEED[2] standards; however, FHA multifamily financing has offsetting challenges. The underwriting process is generally slower than conventional financing, and borrowers generally must meet Davis-Bacon wage requirements,[3] which can raise overall construction costs. Despite those challenges, the multifamily FHA mortgage insurance program is attractive to many developers.

Once an FHA-insured multifamily loan closes, the lender sells the loan in the secondary market, where it may be bundled with other loans into a mortgage-backed security (MBS), a process similar to the single-family mortgage market. The Government National Mortgage Association, known as Ginnie Mae, is the primary guarantor for FHA-insured multifamily loans packaged into MBS. During the mid-1990s, the share of multifamily mortgage debt guaranteed by Ginnie Mae increased slightly, from 3.8 percent in 1995 to 4.1 percent in 1997 (Bradley, Nothaft, and Freund, 1998). At the time, Segal and Szymanoski (1997) found that—

> Compared to single-family loans, multifamily loans confound[ed] investors with greater cash flow uncertainty and, hence, greater risk. Specific difficulties include the following: (1) the loans are often not homogeneous with regard to type of collateral, interest rate, amortization, covenants, subordinated financing layers, etc.; (2) underwriting standards often differ among originators; (3) loans are relatively large and therefore a single defaulted loan can constitute a relatively large fraction of a mortgage pool; (4) there is a lack of available information about the historical performance of similar loans; and (5) financial information about borrowers is sometimes unaudited or not prepared carefully. (p. 23)

As a result, FHA's role in multifamily lending was muted for some time. In 1973, a general moratorium was placed on HUD assistance programs by the Nixon Administration because of increasing budgetary outlays and perceived program management issues. Subsequently, Congress responded with sweeping legislation in 1974, which included the Multifamily Coinsurance Program, to correct some of the deficiencies. That program, however, had some very problematic aspects, leading to losses of approximately $10 billion. "Most observers agree that by the early 1990s, FHA had ceased to be an important player in the multifamily mortgage market" (Schnare, 2001: 12).

Following those challenges, the role of FHA in multifamily finance has surged in more recent years, particularly since the mortgage collapse in the late 2000s and the subsequent Great Recession. By the fourth quarter of 2019, the FHA multifamily portfolio had approximately 11,800 active loans,

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[2] Leadership in Energy and Environmental Design (LEED) is the most widely used green building rating system in the world (see usgbc.org/help/what-leed).

[3] Davis-Bacon requirements ensure prevailing wage rates are paid for federal jobs. Davis-Bacon wage rates apply because of labor provisions in HUD's "Related Acts", such as the U.S. Housing Act of 1937, the National Housing Act, the Housing and Community Development Act of 1974, the National Affordable Housing Act of 1990, and the Native American Housing Assistance and Self-Determination Act of 1996. The Related Acts are often referred to as the Davis-Bacon and Related Acts or DBRA." This information can be found at: https://www.hud.gov/sites/documents/4812-LRGUIDE.PDF, on page 1-1.

with an unpaid principal balance of $104.6 billion—increases of 24 and 176 percent, respectively, since the end of the Great Recession. FHA multifamily insurance is used in a wide range of rental markets throughout the nation; however, the majority of units in properties with an initial endorsement in the past several years have been in Core Based Statistical Areas (CBSAs) with large populations. CBSAs with a population greater than two million accounted for 53 percent of all units with an initial endorsement date from 2015 through 2019; this proportion increases to 55 percent of units endorsed under the 221(d)(4) new construction/substantial rehabilitation program (HUD, 2020a). Nationwide, the most popular FHA multifamily programs during the period were 223(f) refinance/purchase apartments (representing 46 percent of all units), followed by 221(d)(4) new construction/substantial rehabilitation apartments (representing 20 percent of all units).

How FHA Differs from Fannie Mae and Freddie Mac

The primary difference between FHA and Fannie Mae and Freddie Mac is that FHA provides mortgage insurance for single-family and multifamily loans made by approved lenders, whereas Fannie Mae and Freddie Mac are more directly involved in multifamily finance, primarily by buying multifamily loans and packaging and selling those loans in MBSs.

In 1970, Fannie Mae and Freddie Mac began selling MBSs made up of FHA multifamily loans (Schnare, 2001). Fannie Mae and Freddie Mac had relatively limited roles in multifamily finance, with a combined market share of 5 percent of all outstanding multifamily debt in 1980, before slowly rising to about 9 percent by 1990. “Large losses in Freddie Mac’s portfolio—triggered by poor underwriting standards and a soft multifamily market—led that company to suspend its multifamily operations between 1990 and 1993, creating a drag on agency growth” (Schnare, 2001: 11). Since that time, Freddie Mac has reentered the multifamily market, and both GSEs have continued to grow, rising to nearly 32 percent of all multifamily residential mortgage debt in 2019 (Board of Governors of the Federal Reserve System [U.S.], 2020a, F.219).

Fannie Mae

Fannie Mae is the largest guarantor of multifamily loans in the United States (Fannie Mae, 2020a: F219). It provides the market with liquidity by purchasing loans for multifamily properties, such as apartment properties, condominiums, or cooperatives with five or more individual units. As described by Segal and Szymanoski (1997)—

> Fannie Mae’s basic multifamily operation consists primarily of (1) the Delegated Underwriting and Servicing (DUS) and Prior Approval programs; (2) negotiated transactions involving the purchase of existing portfolios through MBS swaps and certain REMIC [real estate mortgage investment conduit] executions; and (3) multifamily public finance activity, involving credit enhancement of housing bonds. (p. 44)

Fannie Mae uses the DUS program to work with a national network of participating lender customers, which allows lenders to share in the risk of the loans they sell to Fannie Mae (Fannie Mae, 2020b). Lenders can transfer their multifamily loans to Fannie Mae in one of two ways: (1)

sell the loan to Fannie Mae for cash or (2) take part in a swap transaction, in which the mortgage originator or note holder receives a Fannie Mae single-class MBS instead of cash. When a lender sells a loan for cash, it can use the proceeds to fund new lending activity. On the other hand, a lender may hold a swapped MBS and retain a portion of the interest payment as a fee, or the lender can sell the MBS to investors.

Freddie Mac

Freddie Mac's stated mission is to "provide liquidity, stability, and affordability to the U.S. housing market" (Freddie Mac, 2020a). Similar to Fannie Mae, Freddie Mac also purchases and securitizes loans. Both GSEs do not lend directly to borrowers but operate in the secondary market. Before 2009, Freddie Mac primarily held the mortgages it purchased, but it slowly began shifting to securitization. Today, about 90 percent of Freddie Mac's purchase volume is securitized, which shifts the loans off Freddie Mac's balance sheet and transfers the risk to MBS investors.

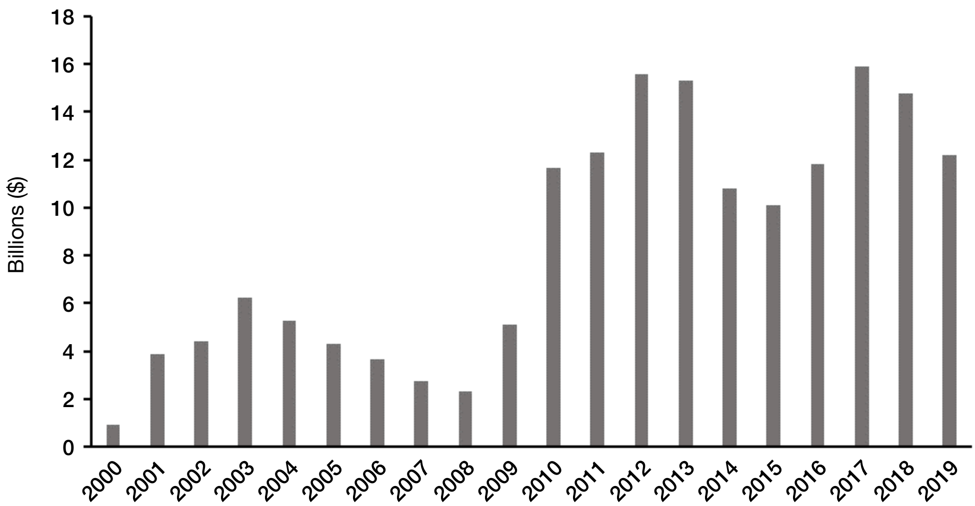
Freddie Mac's presence in the multifamily market is not as large as that of Fannie Mae. During the first quarter of 2020, Freddie Mac generated $10.0 billion in new multifamily activity, financing approximately 111,000 units (Freddie Mac, 2020b). By comparison, Fannie Mae "provided $14.1 billion in multifamily financing in the first quarter of 2020, which enabled the financing of 159,000 units of multifamily housing" (Fannie Mae, 2020a: 1).

Countercyclical Trends in FHA Multifamily Finance

The use of FHA in the multifamily finance industry is cyclical, with FHA being a more popular vehicle for multifamily finance when other financing options are limited. Typically, this occurs when lending becomes riskier, such as during recessionary periods, when housing demand tends to contract. A prime example of this at the national level was brought on by the Great Recession (December 2007 through June 2009), when the housing market collapsed and lending standards became extremely tight. During the third quarter of 2007, just before the Great Recession began, the net percentage of domestic banks tightening standards for commercial and industrial loans to large- and middle-market firms started to increase, with the percentage peaking at 83.6 percent in the fourth quarter of 2008 (Board of Governors of the Federal Reserve System [U.S.], 2020b). This measure of lending standard includes loans for multifamily residences, which fall into the commercial loan category because they are issued to businesses, not consumers, as loans for single-family residences are. As lending standards for commercial loans remained tight, the less risky nature of FHA loans became more desirable and the value of initial endorsements for multifamily residences insured by FHA skyrocketed—doubling in 2009 from the previous year and doubling again in 2010, as shown in exhibit 2.

Exhibit 2

Federal Housing Administration Multifamily Initial Endorsement Value by Year



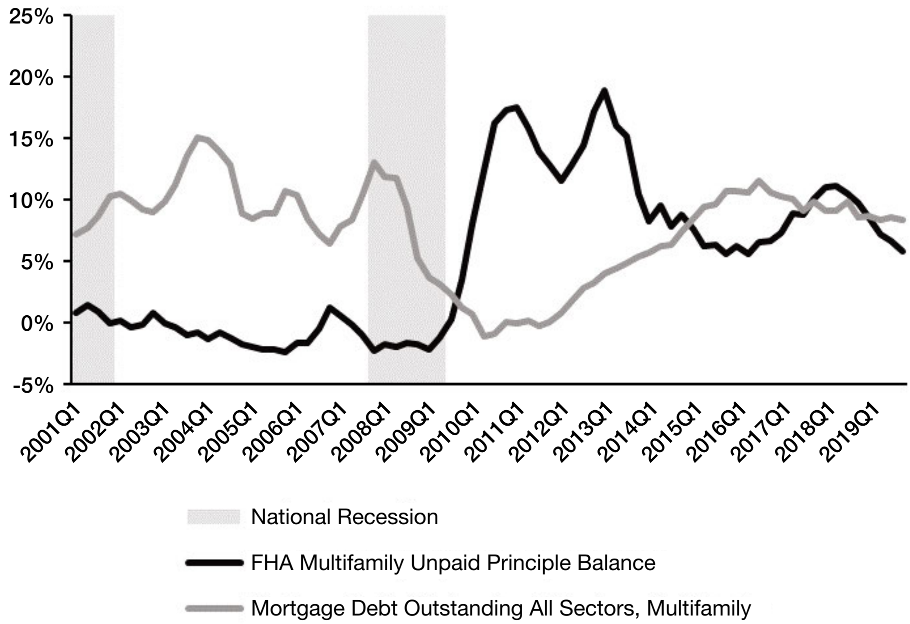
Source: Federal Housing Administration Office of Deputy Assistant Secretary for Risk Management & Regulatory Affairs

Although the Great Recession is well known for its effect on the home sales market in the form of home equity loss and a surge in foreclosures, the rental market was also negatively affected. Competition from single-family rentals and households doubling up pushed the apartment vacancy rate from 5.8 percent in the fourth quarter of 2006 to 7.8 percent in the fourth quarter of 2009, as the rental market softened (Axiometrics, a Real Page Company, 2020). Because the national rental market was soft during the recession, fewer apartments were built, and growth in mortgage debt outstanding for all multifamily sectors slowed precipitously; that growth slowed to an average annual rate of 4 percent—down from an average annual rate of 14 percent from 2001 through the third quarter of 2007. The unpaid principal balance for the FHA multifamily portfolio fared even worse than the industry as a whole, declining by an average annual rate of 2 percent during the recession, compared with an average annual decline of 1 percent from 2001 through the third quarter of 2007.

Although the United States exited the Great Recession in July 2009, the damaging effects of the housing market collapse lasted beyond that date, and lending standards, although relaxed somewhat, remained tight for several years. The rental market recovered before the home sales market, with the apartment vacancy rate beginning a downward trend in 2010. This period marked the beginning of the countercyclical rise in FHA multifamily lending, as the U.S. economy was still reeling from the Great Recession. The holdover of tight lending standards, combined with an improved rental market, contributed to a rapid rise in FHA multifamily lending, while industry-level measures of lending declined. In the second and third quarters of 2010, the mortgage debt outstanding for all multifamily sectors declined for the first time since 1995. By contrast, the unpaid principal balance of the FHA multifamily portfolio increased rapidly, filling the need for multifamily financing when industry lending cut back. Exhibit 3 shows the countercyclical trends in year-over-year growth for both the mortgage debt outstanding for all multifamily sectors and the unpaid principal balance of the FHA multifamily portfolio that occurred in the years following the Great Recession. As shown, a strong countercyclical pattern emerged in the unpaid principal balance of the FHA multifamily portfolio in the period after the Great Recession officially ended. From the fourth quarter of 2009 through the fourth quarter of 2011, the average annual rate of change in mortgage debt outstanding for all multifamily sectors was zero, whereas the unpaid principal balance for the FHA multifamily portfolio increased at an average annual rate of 16 percent. During that time, the number of active FHA multifamily loans increased by 666, and the unpaid principal balance increased by $13.7 billion.

Exhibit 3

Year-over-Year Percentage Change in FHA Multifamily Unpaid Principal Balance and Mortgage Debt Outstanding All Sectors, Multifamily



FHA = Federal Housing Administration. Q = Quarter.
Sources: National Bureau of Economic Research; FHA; Board of Governors of the Federal Reserve System (U.S.), 2020a

Regional Trends

The use of FHA to finance multifamily rental housing varies by HUD region, but the change in the value of FHA multifamily endorsements since 2000 has been spread proportionally across the regions (see exhibit 4). In 2019, the share of initial endorsements for multifamily residences insured by FHA was highest in the Southeast/Caribbean region, with 22.5 percent, followed closely by the Southwest region, with 18.5 percent. The regions accounting for the lowest share of initial endorsements for multifamily residences insured by FHA in 2019 were the Great Plains, at 2.0

percent, and the Northwest, at 4.0 percent. The aforementioned regions have generally remained in the top and bottom rankings for FHA multifamily endorsements since 2000.

Exhibit 4

Notes on Geography

1.	Guam, Puerto Rico, and the U.S. Virgin Islands are served by HUD programs but are not included in this analysis due to data limitations.
2.	HUD is organized into 10 regions [% of U.S. population, 2019 Census population estimates]:
	New England (Region I) [4.5%]: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont New York/New Jersey (Region II) [8.5%]: New York, New Jersey Mid-Atlantic (Region III) [9.3%]: Delaware, Maryland, Pennsylvania, Virginia, Washington, D.C., West Virginia Southeast/Caribbean (Region IV) [21.2%]: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, U.S. Virgin Islands Midwest (Region V) [15.9%]: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin Southwest (Region VI) [12.9%]: Arkansas, Louisiana, New Mexico, Oklahoma, Texas Great Plains (Region VII) [4.3%]: Iowa, Kansas, Missouri, Nebraska Rocky Mountain (Region VIII) [3.7%]: Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming Pacific (Region IX) [15.5%]: Arizona, California, Hawaii, Nevada Northwest (Region X) [4.3%]: Alaska, Idaho, Oregon, Washington

Note: Numbers may not add to 100 percent due to rounding.

In the years after the Great Recession, when endorsements for FHA multifamily properties were increasing rapidly, the number of units endorsed under the 221(d)(4) program that were new construction or substantial rehabilitation accounted for a growing proportion of multifamily construction in every region of the United States. In 2010, all but one region surpassed the average 2000–2019 ratio of new construction and substantially rehabilitated FHA multifamily units endorsed to multifamily units permitted. The highest proportion during that period was in the Mid-Atlantic region, where, in 2010, the ratio of new construction and substantially rehabilitated units insured by FHA to the number of multifamily units permitted was 51.0 percent. That ratio in the Mid-Atlantic region was only 5.5 percent in 2007. Other regions, where the ratio of new construction and substantially rehabilitated units insured by FHA to the number of multifamily units permitted was more than 30.0 percent in 2010, were the Southeast/Caribbean, Midwest, and Southwest regions. The respective shares for those three regions in 2007 were all less than 10.0 percent.

Regional Mini-Cycles and Case Studies

Two of the benefits of FHA multifamily insurance are that the insured loans have 40-year amortization and fixed interest rates and that they are nonrecourse. Those generous terms allow borrowers expense stability and afford HUD the ability to assume ownership of a multifamily asset in the event of a default. HUD generally sells the foreclosed asset to recoup losses and maintain solvency of the mortgage insurance fund. Those long-range loan terms potentially increase risk for FHA multifamily mortgage insurance proposals.

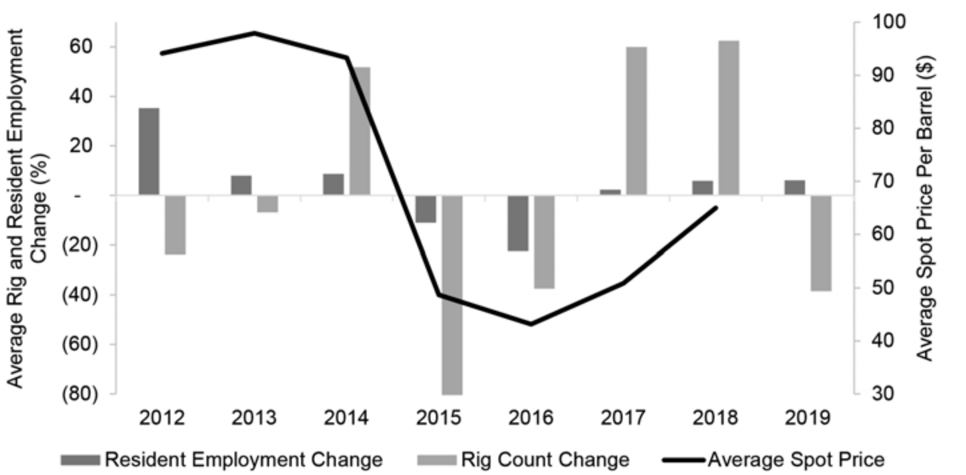
Case Study 1: Energy-Affected Markets

Multifamily developers are often interested in areas that experience sharp economic and population growth, such as energy-affected regions in Texas and North Dakota when energy prices were high. Energy development from hydraulic fracturing and directional drilling, funded by high energy prices, led to a boom in shale oil development in parts of the United States. From 2000 through 2005, oil spot prices averaged $35.24 a barrel annually before rising an average of 21 percent a year to an annual average of $91.91 a barrel from 2010 through 2014 (U.S. Energy Information Administration, 2020). The higher prices made shale oil reserves in the United States attractive for development, and energy companies flocked to areas such as North Dakota and Texas. Both states were most affected by upstream activities, which are characterized by recovering and producing crude oil and gas, including exploring for oil and gas, drilling wells, and operating the wells to deliver crude oil and natural gas to refining or distribution facilities.

The recovery and production of oil led to a sharp increase in the number of oil rigs and increased demand for energy-sector workers (see exhibits 5 and 6). According to the U.S. Bureau of Labor Statistics (2020), an average of 123,300 people were employed in the upstream oil and gas extraction sector from 2000 through 2005; that number increased 8.1 percent, annually, to an average of 181,900 from 2010 through 2014. During that period, the number of people employed in support activities for oil and gas operations rose 16.7 percent annually, from 124,800 to 270,300.

Exhibit 5

Crude Oil Spot Prices and Changes in Employment and Oil Rigs in Williams County, North Dakota

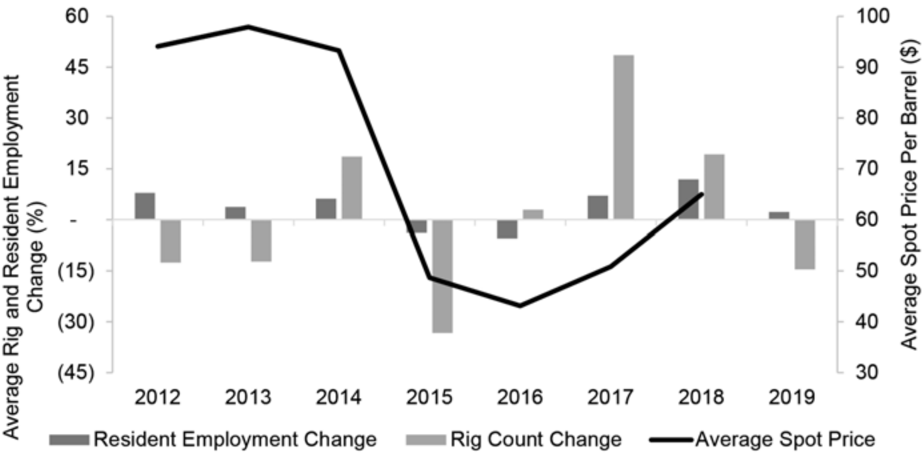


Notes: Resident employment based on 12-month averages. The Crude Oil Average Spot Price Per Barrel is based on the West Texas Intermediate (WTI) Cushing, Oklahoma price. Rig Counts are based on wells with a depth of 15,000 feet or less.

Sources: U.S. Bureau of Labor Statistics, 2020; U.S. Energy Information Administration Spot Prices for Crude Oil and Petroleum Products, 2020; Region Track Rig Count Web App 2020

Exhibit 6

Crude Oil Spot Prices and Changes in Employment and Oil Rigs in Midland Area, Texas



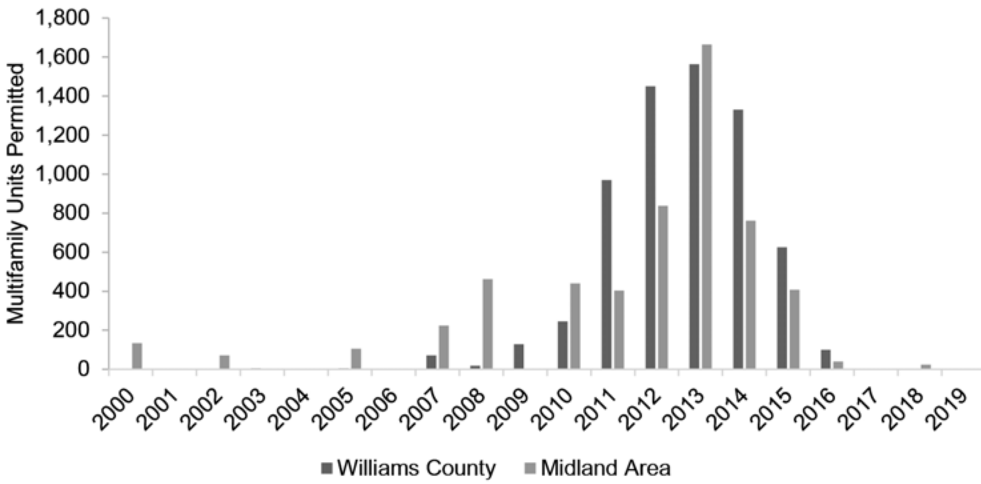
Notes: Resident employment based on 12-month averages. The Crude Oil Average Spot Price Per Barrel is based on the West Texas Intermediate (WTI) Cushing, Oklahoma price. Rig Counts are based on wells with a depth of 15,000 feet or less.

Sources: U.S. Bureau of Labor Statistics, 2020; U.S. Energy Information Administration Spot Prices for Crude Oil and Petroleum Products, 2020; Region Track Rig Count Web App, 2020

The rapid rise in employment and the surge in workers to these areas led to a sharp increase in demand for housing. Some of the demand was met by man camps and other temporary housing solutions; however, multifamily developers also rushed to fill the demand for rental housing by building new apartment properties. Both Williams County, North Dakota, and Ector and Midland Counties, Texas, (hereafter, the Midland area)—which sit atop the Bakken and Permian oil basins, respectively—underwent significant apartment development. From 2000 through 2005, virtually no new apartment units were permitted in Williams County, and an average of 50 apartments were permitted annually in the Midland area (see exhibit 7). Development activity rose sharply to an average of 1,125 apartments permitted annually in Williams County from 2010 through 2014 and an average of 820 apartments permitted annually in the Midland area. Some developers sought FHA mortgage insurance for their multifamily financing.

Exhibit 7

Multifamily Permits Issued in Williams County, North Dakota and the Midland,Texas, Area



Source: U.S. Department of Housing and Urban Development and U.S. Census Bureau, Building Permits Survey, 2000–2019 final data

Despite the increase in multifamily production in those two areas, FHA's role was limited. The transient nature of upstream oil sector jobs created additional risk when providing nonrecourse mortgage insurance. Consequently, none of the 5,575 apartments permitted in Williams County from 2010 through 2014 were supported by FHA mortgage insurance. During the period, apartment vacancy rates in the area were less than 2 percent, and average rents were more than $2,500 monthly. Following the decline in oil prices beginning in 2015, however, apartment vacancy rates surged to more than 20 percent, and average rents fell to less than $1,500 monthly. In the Midland area, FHA insured three market-rate apartment properties and one Low-Income Housing Tax Credit proposal during the period, with a total of 850 units (HUD, 2020b). The apartment vacancy rate in the Midland area averaged 4.3 percent from 2010 through 2014 before rising sharply to an average of 9.5 percent in 2015 and 2016 (Reis, Inc., 2020). Average asking rents rose from $660 during 2010 to $1,139 in 2014 before falling to $908 in 2016. Since 2016, apartment market conditions in the Midland area have become balanced, with a vacancy rate of 5.5 percent and average asking rents of $1,381. The developments insured by FHA in the Midland area have reached stabilized occupancy, and none are in troubled status (HUD, 2020b). By comparison, apartment market conditions in Williams County are still soft, with a vacancy rate of 8 percent and average asking rents of $1,450 (Greystar Worldwide, LLC, 2019). The limited exposure of the FHA mortgage insurance fund to volatile market conditions in energy-affected areas such as Williams County, North Dakota, and the Midland area of Texas constrained risk and preserved liquidity.

Case Study 2: Section 220 Development in St. Louis

The attractive finance terms of FHA loans can be the catalyst for ongoing investment in an area. For instance, limited development activity in some urban areas can keep an area from growing.

Many developers do not want to be "first money in" and risk building in an untested market. HUD offers Section 220 mortgage insurance, which is designed "for housing in urban renewal areas, areas in which concentrated revitalization or code enforcement activities have been undertaken by local government, or to alter, repair, or improve housing in those areas" (HUD, 2018a).

In the city of St. Louis, the population has been declining overall since 1950. Growth has occurred in the Central City area since 2010,[4] however, because of redevelopment that has drawn young professionals to this concentrated area (HUD, 2018b). Exhibit 8 presents a map that shows the defining borders of the city of St. Louis and the Central City area. HUD's Economic and Market Analysis Division (EMAD) estimated that from 2010 to July 1, 2018, the population of the city of St. Louis decreased by an average of 1,575 people, or 0.5 percent, annually, to 306,300. During the same period, the population of the Central City area increased by an average of 820 people, or 1.8 percent, annually, to 50,225, as of July 1, 2018. As a result of growth in the Central City area, the population loss in the city of St. Louis overall slowed from higher levels during the previous decade, which had averaged 2,900 people, or 0.9 percent, a year from 2000 to 2010.

Exhibit 8

City of St. Louis and Surrounding Area

Source: HUD, Economic Market Analysis Division

[4] The Central City area includes 12 census tracts: 1162.00, 1171.00, 1174.00, 1193.00, 1255.00, 1256.00, 1257.00, 1266.00, 1273.00, 1274.00, 1275.00, and 1276.00.

Assisting state and local government efforts, HUD has contributed to redevelopment in the city of St. Louis by insuring mortgages for market-rate apartments under Sections 220 and 221(d)(4) in and around the Central City area. Exhibit 9 lists FHA-insured apartment properties in and near Central City, St. Louis, and exhibit 10 is a map of those properties. The largest and most prominent development, One Cardinal Way, was insured under Section 220. The 29-story, 297-unit high-rise apartment building overlooks Busch Stadium, home of the St. Louis Cardinals (HUD, 2018b). One Cardinal Way was one of the first properties to test the Central City market., HUD approved the application for One Cardinal Way in 2017, construction began in 2018, and the development was completed in August 2020 (Fannie Mae, 2020a). Similarly, the substantial rehabilitation of 168 units at the Monogram apartments occurred in 2017, when the development received FHA insurance, and was completed in 2018 (HUD, 2020b). Both the Monogram and the 70-unit apartments at 1815 Locust Street, currently in planning, are within approximately 1 mile of the stadium and One Cardinal Way. Development has spread throughout the Central City area, including the planned addition of 131 units at Preservation Square Apartments, located approximately 2 miles from One Cardinal Way (HUD, 2020a). Other apartment construction in St. Louis City, outside the Central City area, includes three additional properties located 5 to 7 miles from One Cardinal Way, with a combined total of approximately 500 units.

Exhibit 9

FHA-Insured Apartments In and Near Central City, St. Louis

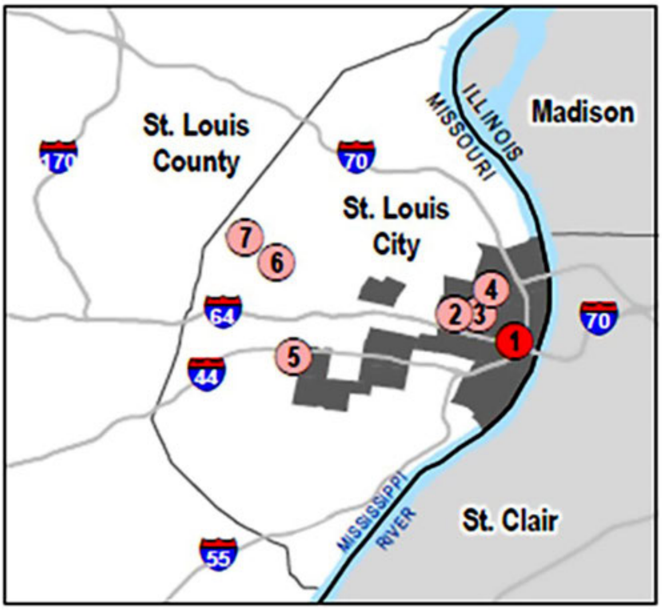
Apartment Property	Location	Total Units	Status (September 2020)	Distance (miles) to One Cardinal Way
One Cardinal Way	Central City	297	Complete	–
The Monogram	Central City	168	Complete	1.3
1815 Locust Street	Central City	70	Planning	1.3
Preservation Square Apts.	Central City	131	Planning	1.9
The Hill Apartments	St. Louis City	225	Planning	5.1
Delmar DivINe	St. Louis City	150	Planning	6.7
West End Apartments	St. Louis City	114	Under Construction	7.3

Note: Central City includes 12 census tracts in the city of St. Louis: 1162.00, 1171.00, 1174.00, 1193.00, 1255.00, 1256.00, 1257.00, 1266.00, 1273.00, 1274.00, 1275.00, and 1276.00.

Sources: Development Application Processing (DAP) System (HUD, 2020a); HUD (2020b)

Exhibit 10

FHA-Insured Developments In and Near the City of St. Louis



ID	NAME
1	One Cardinal Way
2	Monogram
3	1815 Locust
4	Preservation Square Apartments
5	The Hill Apartments
6	Delmar DivINe
7	West End Apartments

Source: Development Application Processing (DAP) System (HUD, 2020a)

Looking Forward

The Mortgage Bankers Association estimates that commercial and multifamily loans backed by income-producing properties are expected to total $683 billion during 2020—up 9 percent from the $628 billion closed during 2019 (Mortgage Bankers Association, 2020). "Total multifamily lending alone, which includes some loans made by small and midsize banks not captured in the overall total, is forecast to rise 9 percent to $395 billion in 2020, surpassing last year's expected record total of $364 billion" (Mortgage Bankers Association, 2020).

Approximately 1.6 million households were formed in the United States during each of the past 2 years. Single-family home permitting averaged 858,100 annually during 2018 and 2019, compared with an average of 1,418,900 annually from 2000 through 2006. By comparison, multifamily home permitting averaged 498,700 units annually during 2018 and 2019—the highest annual number since at least 2000 (HUD and U.S. Census Bureau, Building Permits Survey, 2020). The recent COVID-19 pandemic may temporarily depress household formation, but overall housing production has lagged behind household growth nationally since the Great Recession. This disparity will continue to encourage further housing production, including multifamily construction.

Class C multifamily units "rank as the tightest asset class on a national scale" (Axiometrics, a RealPage Company, 2020). Vacancy rates for Class C units averaged 4.0 percent in April 2020, compared with 5.3 and 4.6 percent, respectively, for Class A and Class B units nationally. From

December 2017 to April 2020, asking rents for Class C units increased 14.4 percent, to $1,149, compared with growth of 9.1 and 11.2 percent for Class A and Class B units, to $1,883 and $1,397, respectively (Axiometrics, a RealPage Company, 2020). Those market dynamics may encourage construction for more affordable Class C developments nationally.

The continued demand for multifamily housing and the record-setting lending environment should support the role of FHA multifamily mortgage insurance in the near future. To ensure that FHA is both meeting the needs of the market and acting responsibly as a public entity, FHA has instituted risk mitigation measures to hedge risk resulting from the uncertainty surrounding the COVID-19 outbreak in the United States. In addition, FHA continues to offer green mortgage insurance premium (MIP) reductions; low, fixed interest rates; and fully amortizing loans. Those incentives will likely ensure that FHA multifamily finance remains a key component of the multifamily financial market.

The countercyclical nature of FHA multifamily finance may become evident again in the near future in response to the economic impact of the COVID-19 pandemic. Whether the pandemic and the resulting economic slowdown have seriously affected trends in conventional financing is not yet clear; however, early indications seem to confirm that developers are now initiating a large number of developments using FHA multifamily financing. During the first quarter of 2020, multifamily residential mortgages fell to $98.3 billion from $102.7 billion during the first quarter of 2019 (Board of Governors of the Federal Reserve System [U.S.], 2020a, F.219). Initial endorsements for new FHA multifamily construction also declined during the period, from $906.4 million to $846.8 million, but rose to $1.21 billion during the second quarter of 2020 from $1.18 billion a year earlier (HUD, 2020c). Future research will confirm whether those data are the beginning of another countercyclical trend in FHA multifamily finance.

Data Limitations

The analysis in this paper presents a comparison of the net change in levels of mortgage debt outstanding for all sectors and the unpaid principal balance for the FHA multifamily portfolio. As such, the FHA data include new products and refinanced mortgages, including those that may not have previously been in the FHA portfolio.

The data presented on multifamily construction are the total number of multifamily units permitted and include apartments, condominiums, and townhomes. At the national level, the vast majority of those units are apartments; however, significant variations exist in the tenure makeup of multifamily units permitted by geography.

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Evaluation Tradecraft

Evaluation Tradecraft presents short articles about the art of evaluation in housing and urban research. Through this department of Cityscape, the Office of Policy Development and Research presents developments in the art of evaluation that might not be described in detail in published evaluations. Researchers often describe what they did and what their results were, but they might not give readers a step-by-step guide for implementing their methods. This department pulls back the curtain and shows readers exactly how program evaluation is done. If you have an idea for an article of about 3,000 words on a particular evaluation method or an interesting development in the art of evaluation, please send a one-paragraph abstract to marina.l.myhre@hud.gov.

Participant Engagement Strategies in a Housing First Randomized Trial

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Abstract

Conducting longitudinal Housing First research requires effective recruitment and engagement strategies to enroll individuals with prolonged homelessness histories who also have physical health and mental health vulnerabilities. In this article, we share our experiences working with participants in an attempt to conduct a randomized trial of single-site and scattered-site Housing First units in Seattle, Washington. We highlight considerations for the informed consent process, fostering participant agency, outreach strategies, issues with administration of measures, setting of boundaries, and ensuring participant safety. Our successes with participant engagement underscore the importance of a trauma-informed research philosophy, promoting a sense of choice for participants over the research process, and a perception of trustworthiness of the research team.

Introduction

Housing First is a model of permanent supportive housing in which individuals experiencing prolonged homelessness receive a rent subsidy and wraparound support services to promote their ability to attain and maintain housing (Tsemberis, 2011). Housing First programs operate by principles of providing housing without preconditions for compliance with treatment of psychiatric or substance use disorders or abstinence from substance use; however, variations on the structure of the housing exist. Most notably, Housing First may be configured as single-site housing (that is, buildings composed of all Housing First apartments with services provided onsite) or scattered-site housing (that is, Housing First apartments located in buildings throughout the community with services provided in the community). We embarked on an effort to conduct a randomized trial of single-site and scattered-site Housing First interventions for individuals experiencing chronic homelessness. Although the study terminated prior to completion due to pervasive barriers to implementation (Brown et al., 2020), we learned several lessons for effective engagement of participants in Housing First research.

Many ethical considerations are important when conducting research with individuals experiencing chronic homelessness (Runnels et al., 2009). Individuals in our sample experienced mental illness, substance use disorders, physical illness and disability, and cognitive difficulties, thus requiring engagement strategies that were sensitive to their needs and abilities. Furthermore, people who are homeless experience marginalization and often have negative or traumatic histories with homeless services and other institutions, so fostering trust among our participants was critical (Jost, Levitt, and Porcu, 2010; Kryda and Compton, 2009). This article highlights our approach to participant engagement in our research endeavor and the challenges we confronted therein.

Study Overview

Our study sought to examine person-environment fit in single-site and scattered-site Housing First models. That is, we aimed to identify characteristics and preferences of tenants that predicted positive housing and quality of life outcomes in each of the two housing models. The study was conducted in collaboration with Downtown Emergency Service Center (DESC), a large homeless service provider located in Seattle, Washington. Participants were randomly assigned to either single-site Housing First or scattered-site Housing First. The intended study enrollment was 450 participants. Participants were 18 years of age and older, spoke English or Spanish, and were currently experiencing homelessness—most of whom met U.S. Department of Housing and Urban Development (HUD, 2015) criteria for chronic homelessness. Vacancies in the Housing First programs drove the flow of participant recruitment; as DESC units became vacant, individuals who were next in line for housing were recruited and randomly assigned. The communitywide queue of Coordinated Entry for All (CEA) in King Country and the DESC internal housing referral channel provided referrals for the study. Both referral sources assessed, prioritized, and referred individuals to DESC-operated housing. Participants were administered measures[1] at the prehousing baseline and 6-month, 12-month, and 18-month followup interviews.

[1] Alcohol Use Disorders Identification Test (Saunders et al., 1993), a background history interview developed for the study, Citizenship Outcome Measure (Rowe et al., 2012), Colorado Symptom Index (Boothroyd and Chen, 2008), Community Integration Scale (Aubry and Myner, 1996), Drug Abuse Screening Test-10 (Skinner, 1982), Housing Environment Survey (Kloos and Shah, 2009), Quality of Life Interview (Lehman, 1988), Residential Time-Line Follow-Back Inventory (Tsemberis et al., 2007), The Substance Abuse and Mental Health Administration (SAMHSA) Housing Satisfaction Scale (Tsemberis et al., 2003), SF-12 (Ware, Kosinski, and Keller, 1996), and a social network interview developed for the study.

Participant Recruitment and Followup

Anh-Dao Tran served as the study Research Coordinator (RC) and received the referrals to the study. The RC was a DePaul University employee who conducted her work out of DESC offices. On receipt of a referral, the RC conducted outreach to meet with potential participants for recruitment and consent to the study. Recruitment and consent meetings typically consisted of five parts: (1) reviewing information about the study and its relationship with DESC housing, (2) reviewing the consent form and obtaining informed consent, (3) completing a measure about the ideal housing preferences for the participant, (4) notifying the participants of their housing randomization, and (5) discussing the next steps for housing application and study participation.

Out of the 72 referrals we received between February 2018 and April 2018, nine potential participants declined participation. Declinations occurred for the following reasons: (1) individuals or their case managers had a strong preference for single- or scattered-site housing and so did not want to risk random assignment, (2) individuals did not want DESC housing, and (3) the time commitment of the study was too great. In addition, two potential participants could not be enrolled in the study because they were unable to provide informed consent due to disabilities. Demonstrating the complexity of the recruitment process, 10 referrals that CEA provided were returned to the community queue before recruitment could take place. In these instances, individuals could not be recruited because: (1) they did not meet low income or other requirements for DESC housing, (2) language barriers prohibited participation, (3) the RC was unable to contact the individual, or (4) the individual was incarcerated.

Once participants were enrolled in the study, the RC and a team of volunteer research assistants (RAs) conducted the prehousing baseline and followup data collections. Data collection consisted of a series of self-reported measures and structured interviews with individuals regarding their mental health, substance use, quality of life, social networks, perceptions of their housing environment, and their housing preferences and satisfaction. Taken together, data collection meetings were intended to take approximately 90 minutes.

Engagement Strategies in Service of Participant Wellbeing: Successes and Challenges

We incorporated study procedures to promote participant wellbeing and autonomy. Treating participants with dignity was at the heart of all interactions. Furthermore, in acknowledgment of the high prevalence of trauma histories among individuals experiencing homelessness (Sundin and Baguley, 2015), we drew on principles of trauma-informed care that have been implemented in homelessness services (Hopper, Bassuk, and Olivet, 2010) to guide our participant engagement strategies. Within homelessness services, trauma-informed care involves using a set of guiding principles to inform organizational policies, practices, and interpersonal interactions among staff and clients to promote a sense of physical and emotional safety (Hopper, Bassuk, and Olivet, 2010). The principles of choice (that is, promoting a sense of control by participants) and trustworthiness (that is, demonstrating clarity, consistency, and boundaries; Fallot and Harris, 2006) primarily guided our research activities. Specifically, we offered participants the choice and control over the logistics of their participation to the extent possible, and we promoted participant trust of the research team through transparency about the research procedures and reliable follow-through with scheduled interviews.

Considerations for Informed Consent

The informed consent process was essential to promote trust among potential participants and inform them of the purpose, methods, risks, and benefits of the research; the process allowed individuals the option to participate voluntarily. The RC provided a verbal overview of the essential elements of the consent form. Next, the participant independently read (or the RC read aloud upon request) the consent form in full. Participants had opportunities to ask questions. Finally, their understanding of the risks, benefits, and procedures of the study were assessed through a series of questions. Most participants were able to answer the informed consent questions without a prompt.

Importantly, the RC made concerted efforts to communicate to prospective participants that their ability to secure housing was not contingent on study participation; individuals would still receive DESC housing if they declined the study. Because housing and research were offered at the same time, however, the relationship between housing and research participation was often an area of misunderstanding. When this occurred, further review of the research consent information was prompted, and informed consent was demonstrated only after participants were able to show an understanding of the relationship between housing and research participation. The RC presumed that a few individuals chose to participate because they believed participation would accelerate or ensure their housing placement. Although these individuals communicated their understanding of the separation between research and housing, they may not have fully trusted that housing was guaranteed. In these instances, the research protocol could have been adapted to better ensure understanding by participants. In hindsight, we could have given participants more time to consider participation before signing the consent form, or we could have involved case managers to echo the information we provided about the independence of housing and research participation.

Fostering Participant Agency

To promote a sense of choice to participants, we met their preferences for meeting locations. The RC and RAs met with participants at the following locations: DESC offices, the offices of other service providers in the local community, shelters, or public spaces (coffee shops, libraries, parks, campsites, and so on). Due to confidentiality and safety issues of certain public spaces, meetings outside of private offices were less common and typically occurred only if potential participants requested them.

Case managers served a vital role in the study and fostered our ability to engage participants overall. We often used case managers to introduce us to participants and to help us locate participants in the community. Some participants preferred that their case managers be present during the consent process. During recruitment, however, some case managers declined participation on behalf of their clients or tried to influence the housing preferences of their clients during the consent meeting. Typically, case managers showed a preference for single-site housing for their clients, citing their perception of the service needs of their clients and a general preference for housing with more supportive services. Due to these occurrences, our research team implemented changes in our recruitment process to intentionally reduce our reliance on case managers during recruitment and to contact referrals directly when possible and when acceptable to participants. Doing so protected participant confidentiality and promoted agency in personal decisionmaking. Indeed, participants demonstrated their autonomy during interactions with the RC. They described choosing to participate because they wanted to contribute to change and make a difference for the homeless population in the future. Participants often communicated the importance of autonomy and choice in housing, expressing hope for a better system.

Outreach Strategies

We used a combination of outreach strategies for recruitment and followup data collections. These strategies varied depending on the availability of contact information and participant preferences. For recruitment, contact information and contact preferences for potential participants were typically available in the Homeless Management Information System (HMIS). If direct contact information (phone number or email) for the participant was available, that was typically the first method the RC and RAs used to reach out to participants. Participant contact information collected during previous interactions was used for followup timepoints.

When direct contact information was not available, the RC and RAs reached out to the support team for the participant, including housing support staff and case managers. For many participants, contact information frequently changed. We gathered updated information from the DESC internal database, housing support team, or other service providers. Therefore, the RC and RAs used either direct contact information or contact through support teams before visiting participants at their housing. Because participants often communicated their frustration for lack of privacy at their housing, especially in single-site housing, the RC and RAs used discretion when eliciting help from housing support staff or case managers, refraining from going to participant housing unless all other methods were unsuccessful. Outreach to potential participants on the streets, campsites, or public spaces was also sometimes necessary. Street outreach often involved going along with case managers during their outreach efforts or working with case managers to learn the whereabouts of an individual.

Timing and persistence were essential for outreach. For participants who had a pattern of being difficult to contact, the research team allotted more time prior to their expected followup timepoints for outreach. For some participants, the RC was able to rely on making contact within a day or two; for others, the RC would start outreach a full month in advance of interaction. Relationships between participants and the research team were critical for tailoring outreach and engagement strategies to the circumstances of each participant. For this reason, it was also vital to have consistent study personnel to build relationships and rapport with participants and other service providers.

The study design included three intermittent followup timepoints between data collections at 3, 9, and 15 months after enrollment. These intermittent followups enabled further opportunities to check in with participants, update their contact information, and maintain rapport. Through regular contact, the RC was able to develop a better understanding of participants, their situations, routines, and preferences to improve the effectiveness of outreach strategies. Strategies for contacting participants during the intermittent followups were similar to other timepoints, although they rarely involved home visits. These followups were less time-sensitive and not crucial for data collection; therefore, they were done with more flexibility. Because they were less crucial, and incentives were not provided, participants were also less responsive to intermittent followups. Every now and then, the RC would coincidentally encounter participants in public places such as on the streets, buses, and parks. If the timing was close to their intermittent followups, the RC would use those opportunities to complete them, highlighting the importance of sustained engagement within the community.

Balancing Rapport and Boundary Setting

Among members of the research team, the RC had the most consistent contact with study participants over time, which afforded her an opportunity to develop rapport with participants. She promoted trustworthiness by being reliable and consistent in her commitments to participants. Most participants clearly understood the RC role as a researcher and would only expect contact with her every 3 months. Some participants saw the RC as a source of support during times of desperation, however. Participants who contacted the RC outside of followup timepoints often expressed frustration with their housing and expressed lack of trust for their support team. Thus, relationships developed in the context of research inadvertently caused some participants to believe that the research team could help them with their housing problems and advocate for them. In these instances, setting boundaries and redirecting participants to their support team was necessary but also difficult. The RC addressed this tension through honest and persistent communication of her role and limitations. When necessary, participant support teams were also contacted to help redirect participants and ensure they received assistance.

Ensuring Participant Safety

A unique aspect of our study management was that the oversight of research activities occurred at a distance from Chicago, with only the RC and volunteer RAs working in Seattle. RAs were most often students from local universities seeking research experience, most of whom had limited experience working directly with individuals experiencing homelessness. As such, structures were put in place to ensure the Seattle-based team was equipped with the resources necessary to support participants in crisis.

The Principal Investigator (PI; second author) and Graduate Assistant (GA; third author) provided training and oversight of the RC and RAs via video conferencing and phone. The RC and RAs engaged in a rigorous training process that included attendance at virtual presentations on the study procedures, completing assigned readings of key literature, and shadowing and engaging in role plays with experienced RAs. They were quizzed on their knowledge of procedures before being allowed to interact with research participants.

We prioritized procedures ensuring participant safety. The research team received indepth training on suicide and homicide risk assessment should participants express ideation, intent, or plans to engage in harmful behavior on the Colorado Symptom Index or at any point during a data collection interaction.

We developed a series of actions to address the risk of harm that the DePaul University Institutional Review Board (IRB) reviewed and approved. First, the study consent form informed participants that confidentiality may be broken should they pose a risk of harm to themselves or others to ensure their awareness of the implications of disclosure. Second, we provided RAs with a script for assessing risk that included a decision tree for steps to take to ensure safety among participants at varying levels of risk of harm to themselves or others. At lower levels of risk (for example, participants reporting ideation about harm to self or others without intent or a plan to engage in harmful behavior), we provided participants with a list of local and national mental health and crisis resources and encouraged them to disclose their distress to their service team. At moderate- and high-risk levels, we instructed the RC and RAs to contact the PI or GA (one of whom was on call during all scheduled data collection meetings) for guidance. To promote a sense of choice, whenever possible, the research team worked collaboratively with participants expressing moderate risk (that is, participants endorsing ideation and a plan but no intent or means to carry out the plan) to determine how their support team would be informed about their risk of harm. At-risk participants were generally amenable to seeking support from their service providers, but the IRB approved that our team could notify DESC staff if necessary. Fortunately, we did not encounter instances of imminent risk (that is, participants reporting ideation, intent, and a plan to engage in harmful behavior), but emergency services would have been contacted in these cases. Taken together, our collaborative approach with participants in distress and our partnership with DESC, which allowed for a direct linkage to support services, enhanced our promotion of participant safety.

Noteworthy Issues with Data Collection

In an effort to align our study outcomes with the existing Housing First literature, we used a battery of measures that were largely used in previous Housing First studies (for example, Goering et al., 2011). Although we acknowledged the sensitive nature of questions about mental health and wellbeing, reactions to the measures by participants were notable. Although most participants were comfortable with discussing their personal information with the research team during data collection meetings, the sensitivity of the survey questions led some participants to choose not to respond to items. In other cases, participant responses appeared inconsistent with their observable presentation (for example, they denied mental health symptoms but showed signs of responding to internal stimuli/hallucinations or displayed signs that suggested the participant was depressed or anxious), suggesting they may have refrained from responding truthfully. Although it happened infrequently, participants occasionally answered questions hesitantly regarding their own substance use, criminal record, and substance use by people in their social network. In particular, questions about friends and family often triggered emotional distress. Participants often talked about not having friends or family or that their relationships were complicated. If the RC and RAs observed signs of hesitation, they reiterated information regarding participant confidentiality and remained neutral when sensitive information was disclosed. As it was made clear that participants could skip questions they did not wish to answer, we found that a large portion of participants chose not to answer the social network survey.

Although our battery of measures was similar in length to a national Housing First demonstration trial for individuals experiencing homelessness with mental illness in Canada (Goering et al., 2011), response bias may have occurred when participants were not fully engaged during data collection due to survey fatigue. Most participants were able to complete the interview within 90 minutes, but some individuals' answers were tangential and often needed more time regardless of redirecting efforts. Understandably, the length of the interview was too long for some individuals and created frustration. In these instances, we provided those participants with breaks or invited them to terminate the session and meet again at a later date to complete the measures. A combination of emotional and physical distress from study questions, the length of data collection, individual circumstances (for example, insufficient sleep, mental health symptoms, frustration with housing, and so on) also caused survey fatigue. In addition, information about specific dates and timelines was, at times, subject to recall bias when reporting previous living situations, especially when individuals experienced a substantial amount of inconsistency in their lives. Nevertheless, participants were generally able to discuss events of their lives in detail.

Conclusion

In sum, our commitment to the population we were studying facilitated our successes. The positive and trauma-informed interactions among participants and the research team fostered effective data collection. Responsiveness to participant needs and preferences was key to building their trust. Thus, flexibility in participant engagement strategies should be incorporated into Housing First research protocols wherever possible.

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