Cityscape

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THE FAIR HOUSING ACT AT 50
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Guest Editors' Introduction

The Fair Housing Act at 50

Vincent J. Reina
University of Pennsylvania

Susan M. Wachter
The Wharton School, University of Pennsylvania

In 1968, Congress passed the Fair Housing Act (FHA), a law prohibiting discrimination in the housing market. This piece of Federal legislation represented a significant reversal from Federal and local policies of the past, which promoted segregation. In 2015, the U.S. Supreme Court ruled that the FHA also applies to policies that have a disparate impact on members of protected classes. Although discrimination is illegal, it and segregation still exist, along with the long-term economic realities associated with both. This special issue, gathered through a call for papers, features five articles that went through peer-review process[1] and focus on fair housing and the FHA itself. Cumulatively, these articles show the importance of the FHA and the many challenges that remain to truly achieve its original mandate.

The issue begins with an article by Arthur Acolin, Desen Lin, and Susan Wachter, which looks at homeownership rates by race since 1970. This article quantifies the persistent gap in homeownership between Blacks and Whites and finds that homeownership rates for Blacks and Hispanics in 2018 are similar to what they were in 1970. As the article demonstrates, homeownership has important implications for wealth creation, which makes this gap even more concerning.

John Landis, in the second article, uses several methods to look at segregation over time. Although he finds a slight reduction in Black-White segregation, which he measures with a dissimilarity index, he also finds that segregation remains high. These realities raise the question then: what can we do?

Katherine O'Regan and Ken Zimmerman provide an overview of the U.S. Department of Housing and Urban Development's Affirmatively Furthering Fair Housing rule and its importance and limitations. This article underscores the complexity of policies aimed at addressing discrimination and segregation.

Next, an article by Edward Goetz, Anthony Damiano, and Rashad Williams examines racially concentrated poverty and racially concentrated affluence in the largest 50 metropolitan areas

1 All papers, including those of the editors, went through a double-blind peer review process.

in the United States. This article makes the argument that many of our policies have targeted deconcentrating the poor and desegregating people of color, and few emphasize the converse—reducing racially concentrated areas of affluence that are based on separatism and exclusion. This article helps further the debate about the underlying assumptions in many of our existing policies aimed at addressing fair housing.

This issue ends with an article by Vincent J. Reina, Jake Wegmann, and Erick Guerra that looks at potential tensions between location affordability and fair housing. They ask whether incorporating transportation costs in the siting of new subsidized housing could actually further racial and economic segregation. The authors offer recommendations for how location affordability can be used as one of several factors considered in the siting of affordable housing.

Combined, the articles in this issue show that many of the challenges our society faced when the Fair Housing Act passed 50 years ago are unfortunately still present. Thoughtful policies that pay attention to the importance of history, local context and market dynamics, and institutional barriers when these policies are implemented will be essential to addressing our fair housing goals going forward to ensure that the intent of the Fair Housing Act is realized.

Endowments and Minority Homeownership

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University of Washington

Desen Lin
University of Pennsylvania

Susan M. Wachter
The Wharton School, University of Pennsylvania

Abstract

Fifty years after the adoption of the 1968 Fair Housing Act that prohibits discrimination in the housing market, homeownership rates have not increased for Black or Hispanic households. The current homeownership rate for Black households is 42 percent, identical to the 1970 census reported level, and 48 percent for Hispanic households, lower than that in 1970. Using data from the 1989, 2005, and 2013 American Housing Surveys, we identify the extent to which group differences in household endowments account for persistently low minority homeownership levels.

1 Introduction

The Fair Housing Act, formally Title VIII of the Civil Rights Act of 1968, aims to remove barriers to access to opportunity to individuals regardless of their race or ethnicity.[1] Following the FHA, Congress passed the 1974 Equal Credit and Opportunity Act (ECOA), to prohibit discrimination in mortgage lending; the 1975 Home Mortgage Disclosure Act (HMDA), to monitor mortgage lending activity; the 1977 Community Reinvestment Act (CRA), to encourage financial institutions to meet the credit needs of all communities in their service; and the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, to make HMDA data and CRA ratings publicly available. In 1992, Congress enacted the Government Sponsored Enterprise Act of 1992 to set annual targets

1 The law prohibits discrimination in renting or purchasing a dwelling based on an individual belonging to defined classes, including initially race, color, religion, gender, familial status or national origin. The Fair Housing Act included enforcement mechanisms to address discriminatory behaviors and affirmatively further fair housing with unequal efforts put into implementing these provisions (Bostic and Acolin, 2017).

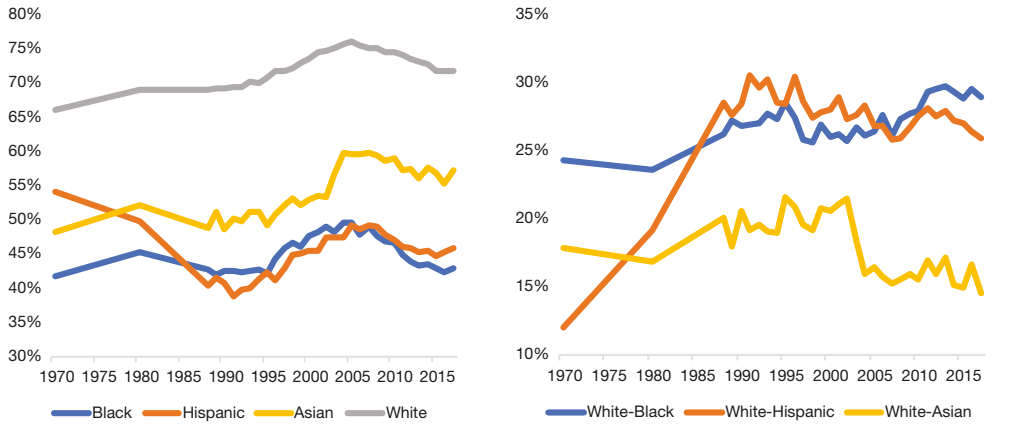
for affordable mortgage purchases for Fannie Mae and Freddie Mac (Bostic and Surette, 2001; Gabriel and Rosenthal, 2008).

In 1970, 2 years after the adoption of the Fair Housing Act, 66 percent of non-Hispanic White households owned their homes,[2] whereas 42 percent of Black households, 54 percent of Hispanic households, and 48 percent of Asian households were homeowners (based on census data; IPUMS, 2017). These disparities reflect less favorable socioeconomic conditions for minority households and decades of individual and structural barriers that prevented minority access to homeownership. Barriers included discriminatory actions government entities took, such as the Federal Housing Administration limiting minority access to mortgages for financing home purchases by redlining minority neighborhoods; the Fair Housing Act and other legislation address these actions (Schill and Wachter, 1995; Wachter and Acolin, 2015; Rothstein, 2017).[3]

Despite legislative initiatives, homeownership rates for Black and Hispanic households did not increase until the second half of the 1990s (exhibits 1 and 2). The Black homeownership rate rose from 42 percent in 1990 to 49 percent in 2000 and continued to rise to 50 percent in 2004.

Exhibit 1

U.S. Homeownership Rate by Race and Homeownership Gap Relative to White Households, 1970–2017



(a) Homeownership rate

(b) Homeownership gap

Note: White is non-Hispanic White; Asian is Asian, Hawaiian, or Pacific Islander.

Sources: Decennials: 1970 and 1980 U.S. Census, CPS March ASEC supplement: 1988–2017. IPUMS 2018.

2 Throughout the paper, White households refer to non-Hispanic White households unless otherwise indicated.

3 The ECOA prohibits mortgage lending discrimination based on defined classes, as noted in footnote 1. Redlining or neighborhood lending discrimination is determined based on neighborhood characteristic (Guttentag and Wachter, 1980).

Exhibit 2.1

Homeownership Rates: 1989, 2005, and 2013

Data	Year	Black	Hispanic	Asian	White
AHS	1989	46.4%	43.1%	49.6%	70.5%
	2005	49.5%	50.7%	60.1%	76.1%
	2013	43.8%	43.8%	54.6%	72.7%
CPS	1989	42.1%	41.6%	51.2%	69.3%
	2005	49.7%	49.3%	59.7%	76.1%
	2013	42.9%	45.9%	56.0%	73.3%

Notes: CPS data is from Housing Vacancies and Homeownership (CPS/HVS). 1989 data comes from CPS March Supplement. White refers to non-Hispanic White households. AHS data is from American Housing Survey from Census Bureau.

Exhibit 2.2

Homeownership Rate Gaps: 1989, 2005, and 2013

Data	Year	White-Black	White-Hispanic	White-Asian
AHS	1989	24.1%	27.4%	20.9%
	2005	26.6%	25.4%	16.0%
	2013	28.9%	28.9%	18.1%
CPS	1989	27.2%	27.7%	18.1%
	2005	26.4%	26.8%	16.4%
	2013	30.4%	27.4%	17.3%

The Hispanic homeownership rate rose from 41 percent in 1990 to 46 percent in 2000 and to 50 percent in 2005. Homeownership rates did increase slightly for Asian households from 1970 to 1990, from 48 percent to 49 percent, and then increased to 53 percent in 2000 and 60 percent in 2004. Homeownership rates for White households increased from 66 percent in 1970 to 69 percent in 1990, to 74 percent in 2000, and peaked at 76 percent in 2004. Homeownership rates increased from the mid-1990s to 2004–2005 for all groups, and disparities in homeownership decreased.[4]

Decreases in homeownership gaps and increases in the homeownership rates for all groups are consistent with a heightened impact of the CRA due to increased bank merger activity (Bostic and Surette, 2001) and public access to data on CRA ratings, along with more emphasis on government sponsored enterprise (GSE) affordable housing goals (Gabriel and Rosenthal, 2008). The increases in minority homeownership rates reversed in the aftermath of the financial crisis.

As of the second quarter of 2018, the homeownership rate is 42 percent for Black households and 47 percent for Hispanic households, at or beneath their 1970 levels, whereas the homeownership rate is 73 percent for non-Hispanic White households and 58 percent for Asian households, both higher than in 1970 (U.S. Census, 2018).[5] With demographic shifts toward a "minority-majority" nation, the aggregate homeownership rate for the U.S. in coming decades is projected to decline if

4 The minority-White homeownership gap decreased between 1990 and 2004–2005 by 2 percentage points for Black households, 3 points for Hispanic households, and 5 points for Asian households.

5 These percentages are based on the Current Population Survey (CPS), a nationally representative survey that includes information about race, ethnicity, and tenure.

the homeownership attainments of minority groups remain at these levels (Acolin, Goodman, and Wachter, 2016).

The ability to become a homeowner affects access to opportunity. Homeownership provides a hedge against future housing cost increases and encourages wealth accumulation through saving mechanisms embedded in amortizing mortgages. Homeownership also allows households to continue to live in neighborhoods with improving public amenities and services, including the quality of local public schools (Dietz and Haurin, 2003). The benefits accompanying homeownership can enable intergenerational economic mobility (Acolin and Wachter, 2017); hence, the public has an interest in homeownership outcomes.

Historically, government policies have favored homeownership in the United States, including through the mortgage interest rate deduction.[6] Several policy actions directly aim to increase access to homeownership by expanding mortgage credit availability. These include the Federal Housing Agency and U.S. Department of Veterans Affairs (VA) low and no down payment mortgages, respectively, with Ginnie Mae government backing; the government regulated GSE mortgages (through Fannie Mae and Freddie Mac); and the CRA and the GSEs' affordable housing goals (Bostic and Surette, 2001; Wachter and Acolin, 2015).

The CRA is currently under revision (U.S. Department of the Treasury, 2018). The GSEs' affordable housing goals are also under consideration to limit their scale (Parrott and Zandi, 2018). Uncertainty around the reform of the GSEs persists but their future structure will have major implications for the availability and pricing of credit to support minority access to homeownership (Acolin, Goodman, and Wachter, 2018; Parrott and Zandi, 2018).

In this article, we describe the rise and fall in homeownership rates for minority households since 1989. Using data from the 1989, 2005, and 2013 American Housing Surveys (AHS), we decompose disparities in homeownership rates into the share accounted for by endowments—most importantly, permanent income—and a residual share. We find permanent income declines are associated with decreases in minority homeownership rates, but we also find an unexplained increase in residual gaps.

Section 2, which follows, reviews the literature examining differences in homeownership rates across racial and ethnic groups. Section 3 describes the data we use to account for homeownership gaps. Section 4 presents the method used to decompose the homeownership gap into the share explained by endowment and unexplained residuals and presents results. Section 5 discusses implications and concludes.

6 The mortgage interest deduction (MID), prior to the recent changes, provided a substantial tax benefit to homeowners with most of the benefits flowing to borrowers with larger mortgages (Poterba and Sinai, 2008). The 2017 Tax Cuts and Jobs Act substantially limited the benefit from the MID (ABA, 2017), although this might only have a marginal impact on homeownership decisions (Poterba and Sinai, 2008).

2 Literature Review

An extensive literature examines disparities in homeownership rates across racial and ethnic groups.[7] This literature identifies factors that contribute to lower homeownership rates among minority groups. These include income and wealth disparities, which contribute to an "endowment effect." Standard tenure choice models attribute homeownership gaps to the estimated effects of endowments, and, to a residual, which may be linked to individual and structural discrimination as well as to other unobserved factors.

Standard tenure choice determinants include household permanent and transitory income, the price of owning relative to renting, and household life cycle characteristics as endowment factors (Wachter and Megbolugbe, 1992). Differences in income across demographic groups play an important role in explaining differences in homeownership given differences in household characteristics, such as marital status and number of children (Wachter and Megbolugbe, 1992; Gabriel and Rosenthal, 2005; Seah, Fesselmeyer, and Le, 2017; Newman, Holupka, and Ross, 2018).

Differences in location, with minorities more concentrated in central cities where housing prices tend to be higher, and the substantial level of segregation experienced by minorities also help to explain lower minority homeownership rates (Gyourko, Linneman, and Wachter, 1999; Deng, Ross, and Wachter, 2003; Carrillo and Yezer, 2009). For minority households, the impact of lending practices, such as the use of redlining the Federal Housing Administration (FHA) implemented that considered minority neighborhoods too risky to lend into, contributed to depressing homeownership outcomes (Rothstein, 2017).

Long after the end of institutional barriers that restricted minority access to mortgages, particularly through FHA redlining, these practices continue to have a negative impact on homeownership in minority areas, in part due to the lack of opportunity to share in wealth building through homeownership in these neighborhoods (Appel and Nickerson, 2016; Krimmel, 2018; Rothstein, 2017). Hence, endowment effects, particularly through intergenerational wealth transfers, can have a persistent impact on homeownership outcomes (Bricker et al., 2017).

Such endowment effects may operate through borrowing constraints that limit access to mortgages based on down payment requirements.[8] The empirical literature shows the impact of a lesser ability to receive family support for a down payment through intergenerational wealth transfers (Hilber and Liu, 2008; Gyourko, Linneman, and Wachter, 1999) and the positive impact on homeownership of receiving family transfers and having parents who are homeowners (Lee et al., 2018).[9]

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7 See among others, Bayer, Ferreira, and Ross, 2016; Calem, Hershaff, and Wachter, 2004; Kain and Quigley, 1972; Wachter and Megbolugbe, 1992; Coulson, 1999; Gyourko, Linneman, and Wachter, 1999; Painter, Gabriel, and Myers, 2001; Deng, Ross, and Wachter, 2003; Gabriel and Rosenthal, 2005; Hilber and Liu, 2008; DeSilva and Elmelech, 2012; Seah, Fesselmeyer, and Le, 2017; and McCabe, 2018.

8 The literature provides empirical evidence on the significance of credit related factors to homeownership outcomes (Linneman and Wachter, 1989; Haurin, Hendershott, and Wachter, 1997).

9 For minority groups in which a substantial share is foreign-born, factors specific to immigration such as lack of language ability, limited credit history, and temporary migratory projects, contribute to different homeownership outcomes (Coulson, 1999; Painter, Gabriel, and Myers, 2001; Painter, Yang, and Yu, 2004; DeSilva and Elmelech, 2012).

The empirical evidence suggests that the impact of credit barriers on gaps declined over the 1983–2001 period and, more generally, that the unexplained portion of estimated White-minority gaps, along with the actual gaps, decreased over that period (Gabriel and Rosenthal, 2005).[10] The empirical evidence also suggests that, in the aftermath of the Great Recession, tightened credit particularly impacted minority homeownership.[11] A decomposition study for the years 2005 to 2011 shows that much of the increase in the minority homeownership gap is due to income disparities, and most of the unexplained increase is found for Black households on the margin of homeownership (Seah, Fesselmeyer, and Le, 2017). This is consistent with research showing the decline in first-time homebuyers following the crisis (Acolin et al., 2018).[12]

Here, we employ a cross-sectional modeling technique for the years 1989, 2005, and 2013 to examine decreases from 1989 to 2005 and then increases from 2005 to 2013 in homeownership disparities. Data limitations and possible estimation strategies do not allow us to provide causal estimates due to the potential for omitted variable bias and selection effects.[13] Despite these limitations, we identify the extent to which observed household and market endowments account for gaps. Particularly we draw implications from the changing role of permanent and transitory income over time by demographic group. We also consider the implications of income-related and residual homeownership gaps for the future evolution of aggregate homeownership rates.

As Acolin, Goodman, and Wachter (2016) showed, with anticipated demographic changes, the United States will become a "minority-majority" country, (with White representing less than 50 percent of the overall population), and persistent low homeownership rates among minorities may result in substantially lower aggregate homeownership rates. In contrast, continued increases in human capital through increased educational outcomes for minority households could contribute to increasing homeownership rates and smaller homeownership gaps (Painter et al., 2018).

3 Data and Summary Statistics

We utilize the Public Use File (PUF) of the 2013 American Housing Survey (AHS) to examine minority/majority homeownership gaps.[14] The AHS includes detailed information on households and housing characteristics that allow for hedonic price estimation with a nationally representative

10 The impact of credit scores, which intergenerational transfers may also affect, increased in this period, relative to down payment and debt to income credit constraints (Barakova et al., 2003).

11 See Goodman and Mayer (2018) for evidence of tightened credit constraints in the aftermath of the financial crisis. Banks tightened credit through so-called "credit overlays" after insurers imposed penalties for representation and warranty failures in mortgage loan origination (McCoy and Wachter, 2017).

12 Acolin et al. (2016) show that the aggregate homeownership rate decline from 69.0 percent in 2004 to 63.7 percent in 2015 can be attributed to tighter credit.

13 For instance, some evidence shows that higher headship rates among some groups (Black and White) can result in lower measured homeownership rates than in others (Asian and Hispanic), and these differences in propensity to form households have been shown to change over time (Yu and Haan, 2012; Lee and Painter, 2013). Higher mobility rates among some minority groups (Kan, 1999; Painter et al., 2001) and their concentration in neighborhoods with lower levels of amenities (Gabriel and Painter, 2008) could contribute to lowering the demand for homeownership for a given level of endowment. However, there is no evidence that these differences in mobility and neighborhood characteristics have changed differentially across groups over time.

14 Housing price and market value data are not available in the most recent Public Use File of the 2015 AHS. We thus use the 2013 AHS.

sample. One limitation is the lack of information about household wealth, credit, and employment history that affect the household's ability to access credit.

In terms of racial and ethnic composition, 67 percent out of the AHS 2013 sample are non-Hispanic White households. Black, Hispanic, and Asian households account for 15 percent, 14 percent, and 5 percent, respectively, of the sample. AHS PUFs provide identifiers for 15 consolidated metropolitan statistical areas (CMSA), with each further divided into two submarkets by center city status.[15]

As exhibit 2 shows, the homeownership rate pattern over time in the AHS is broadly consistent with that of the CPS. Exhibit 3 reports summary statistics across years for the four demographic groups examined: non-Hispanic White (the reference group referred to as White), Black, Hispanic, and Asian. We include t-statistics of the mean differences indicating whether the mean of a variable is statistically different across the White and the minority group.

Exhibit 3.1a

Sample Statistics by Group: White and Black, 2013

	White_mean	sd	Black_mean	sd	mean_diff_tstat
Household income	76,127.83	80,915.47	42875.12	47666.27	25.28
Permanent income	66,708.51	34,433.85	38699.68	24910.78	49.17
Transitory income	9,419.32	70,417.65	4175.44	40239.84	4.59
Price-rent ratio	144.20	29.49	139.11	31.10	9.89
Value-rent ratio	157.26	60.41	131.69	56.39	24.06
Age	54.08	17.45	50.33	16.46	12.57
Family size	2.33	1.34	2.41	1.53	– 3.44
Married	0.52	0.50	0.29	0.45	27.41
Gender (male)	0.54	0.50	0.37	0.48	19.45

15 The 1980 design consolidated MSA code is used in AHS 1989, 2005, and 2013 samples. Due to confidentiality restrictions, only 14 CMSA codes are allowed on the public use file (Boston-Lawrence-Salem, MA-NH; Buffalo-Niagara Falls, NY; Dallas-Fort Worth, TX; Denver-Boulder, CO; Hartford-New Britain-Middletown, CT; Kansas City, MO-Kansas City, KS; Los Angeles-Anaheim-Riverside, CA; Miami-Fort Lauderdale, FL; New York-Northern New Jersey-Long Island, NY-NJ-CT; Pittsburgh-Beaver Valley, PA; Portland-Vancouver, OR-WA; Providence-Pawtucket-Fall River, RI-MA; Saint Louis-East Saint Louis-Alton, MO-IL; Seattle-Tacoma, WA). We group households not in those CMSAs for which we do not have information about location into a separate market. The AHS is a random national survey with a stratified sample design in which units in each large county and units in a randomly selected small county stratified by geography and characteristics are sampled.

Exhibit 3.1b

Sample Statistics by Group: White and Hispanic, 2013

	White_mean	sd	Hispanic_mean	sd	mean_diff_tstat
Household income	76,127.83	80,915.47	50,946.54	53,631.79	18.27
Permanent income	66,708.51	34,433.85	46,314.90	26,003.44	34.37
Transitory income	9,419.32	70,417.65	4,645.24	47,785.42	3.97
Price-rent ratio	144.20	29.49	152.24	41.30	– 14.17
Value-rent ratio	157.26	60.41	153.46	60.44	3.45
Age	54.08	17.45	46.13	15.61	25.92
Family size	2.33	1.34	3.19	1.74	– 34.21
Married	0.52	0.50	0.51	0.50	0.41
Gender (male)	0.54	0.50	0.52	0.50	2.24

Exhibit 3.1c

Sample Statistics by Group: White and Asian, 2013

	White_mean	sd	Asian_mean	sd	mean_diff_tstat
Household income	76,127.83	80,915.47	83,195.17	83,494.80	– 4.89
Permanent income	66,708.51	34,433.85	74,207.44	34,517.75	– 10.84
Transitory income	9,419.32	70,417.65	8,987.73	74,457.58	– 0.19
Price-rent ratio	144.20	29.49	161.54	44.58	– 17.47
Value-rent ratio	157.26	60.41	175.61	68.15	– 10.61
Age	54.08	17.45	47.23	15.84	11.53
Family size	2.33	1.34	2.95	1.53	– 11.71
Married	0.52	0.50	0.64	0.48	– 8.51
Gender (male)	0.54	0.50	0.59	0.49	– 4.10

Exhibit 3.1d

Sample Statistics by Group: White and Black, 2005

	White_mean	sd	Black_mean	sd	mean_diff_tstat
Household income	64,765.17	70,494.15	39,500.25	43,208.38	24.25
Permanent income	55,875.18	28,312.26	34,070.62	21,941.27	51.27
Transitory income	8,889.99	62,647.59	5,429.62	36,185.99	3.75
Price-rent ratio	179.78	41.38	176.55	41.87	5.05
Value-rent ratio	197.98	80.35	164.42	73.07	26.48
Age	51.66	17.52	47.44	16.53	15.73
Family size	2.39	1.33	2.54	1.56	– 7.00
Married	0.55	0.50	0.32	0.47	30.43
Gender (male)	0.58	0.49	0.41	0.49	22.32

Exhibit 3.1e

Sample Statistic by Group: White and Hispanic, 2005

	White_mean	sd	Hispanic_mean	sd	mean_diff_tstat
Household income	64,765.17	70,494.15	47,932.18	52,705.10	15.77
Permanent income	55,875.18	28,312.26	42,273.61	23,323.33	31.47
Transitory income	8,889.99	62,647.59	5,658.57	47,957.46	3.40
Price-rent ratio	179.78	41.38	203.20	75.13	– 31.77
Value-rent ratio	197.98	80.35	210.84	94.96	– 9.77
Age	51.66	17.52	42.99	15.11	32.26
Family size	2.39	1.33	3.31	1.76	– 41.86
Married	0.55	0.50	0.56	0.50	– 1.37
Gender (male)	0.58	0.49	0.56	0.50	2.21

Exhibit 3.1f

Sample Statistics by Group: White and Asian, 2005

	White_mean	sd	Asian_mean	sd	mean_diff_tstat
Household income	64,765.17	70,494.15	72,643.44	67,919.74	– 5.31
Permanent income	55,875.18	28,312.26	62,580.04	28,247.73	– 10.90
Transitory income	8,889.99	62,647.59	10,063.39	60,877.43	– 0.97
Price-rent ratio	179.78	41.38	210.03	77.93	– 20.33
Value-rent ratio	197.98	80.35	240.41	103.52	– 17.37
Age	51.66	17.52	45.22	14.84	11.40
Family size	2.39	1.33	3.07	1.58	– 14.43
Married	0.55	0.50	0.67	0.47	– 8.79
Gender (male)	0.58	0.49	0.64	0.48	– 4.42

Exhibit 3.1g

Sample Statistics by Group: White and Black, 1989

	White_mean	sd	Black_mean	sd	mean_diff_tstat
Household income	36,981.96	30,505.32	23,738.09	22,018.11	29.17
Permanent income	33,345.19	15,789.34	21,215.67	13,187.66	51.06
Transitory income	36,36.77	25,569.78	2,522.42	17,409.85	2.94
Price-rent ratio	120.91	32.04	122.29	28.90	– 2.86
Value-rent ratio	163.81	57.95	145.02	55.61	20.69
Age	49.54	17.64	47.06	16.74	9.23
Family size	2.53	1.38	2.77	1.65	– 11.12
Married	0.71	0.45	0.51	0.50	29.11
Gender (male)	0.70	0.46	0.49	0.50	29.53

Exhibit 3.1h

Sample Statistics by Group: White and Hispanic, 1989

	White_mean	sd	Hispanic_mean	sd	mean_diff_tstat
Household income	36,981.96	30,505.32	28,100.48	24,600.51	15.24
Permanent income	33,345.19	15,789.34	25,544.39	13,837.85	25.74
Transitory income	3,636.77	25,569.78	25,56.09	20,940.26	2.21
Price-rent ratio	120.91	32.04	136.78	37.73	– 25.23
Value-rent ratio	163.81	57.95	164.30	55.93	– 0.43
Age	49.54	17.64	42.04	15.44	22.15
Family size	2.53	1.38	3.36	1.83	– 30.32
Married	0.71	0.45	0.63	0.48	9.12
Gender (male)	0.70	0.46	0.66	0.47	4.06

Exhibit 3.1i

Sample Statistics by Group: White and Asian, 1989

	White_mean	sd	Asian_mean	sd	mean_diff_tstat
Household income	36,981.96	30,505.32	42,783.48	34,233.67	– 6.37
Permanent income	33,345.19	15,789.34	37,939.29	17,421.56	– 9.73
Transitory income	3,636.77	25,569.78	4,844.19	30,255.09	– 1.55
Price-rent ratio	120.91	32.04	136.74	38.55	– 13.73
Value-rent ratio	163.81	57.95	176.73	65.81	– 6.60
Age	49.54	17.64	42.53	13.93	11.25
Family size	2.53	1.38	3.43	1.92	– 17.69
Married	0.71	0.45	0.69	0.46	1.30
Gender (male)	0.70	0.46	0.73	0.44	– 2.46

Following Wachter and Megbolugbe (1992), we estimate tenure choice logit models and include independent variables that allow us to capture the impact of key factors that affect tenure outcomes. We categorize observable factors into household and market endowments. As part of household endowment, household income is decomposed into permanent and transitory components, based on the permanent income hypothesis (Friedman, 1957). Permanent and transitory income are the fitted value and the residual of a household income estimation regression, respectively, and permanent income is expected to be a primary driver of the demand for homeownership (Goodman, 1988). We estimate permanent income based on household characteristics including education, age, gender, marital status, number of cars, family size, ethnicity/race and the location of the households as explanatory variables.[16]

In the tenure choice logit models, we use household structure variables including age, marital status, and gender of household head, and size of household as controls, with sample statistics shown in exhibit 3. Household structure variables evolve over time with household size and married status declining, and age and gender of household head shifting, consistent with population trends.[17]

16 Descriptive statistics and econometric results from the permanent income regression are available in the online appendix.

17 Age of household head increases and household head shifts from male to female.

Important missing variables to measure household endowment include household current wealth and parental wealth that impact homeownership attainments as noted earlier (Lee et al., 2018). The historically lower homeownership and wealth attainment of the parents of minority households continue to affect current homeownership attainment. Permanent income can proxy for household wealth and for the impact of credit constraints (Haurin, Hendershott, and Wachter, 1997). However, permanent income is an imprecise measure of wealth-related borrowing constraints, and, hence, this factor would also go into the unexplained portion of our estimates (Gyourko, Linneman, and Wachter, 1999).

Market endowment measures used in the literature includes costs of renting versus owning, through two housing ratios: the value-rent ratio and the price-rent price ratio, which are expected to drive the tenure choice decision in opposite directions, with a higher value-rent ratio and a lower price-rent ratio having positive impacts on the decision to own (Goodman, 1988; Wachter and Megbolugbe, 1992). The literature uses the price-rent ratio to capture the cost of renting versus the (user) cost of owning and the value-rent ratio to identify the expected price appreciation component of user costs. The value-rent ratio is constructed using property-specific data and is derived from the hedonic regressions for renters and owners. For each owner (renter), the counterfactual rent (price) is estimated from the hedonic price (rent) regression with housing characteristics of the owner's (renter's) house. The house-specific value-rent ratio is then the ratio of two fitted values from two hedonic regressions. A high value-rent ratio captures expectation of housing price appreciation and is expected to have a positive impact on homeownership. The price-rent ratio is a market level variable of the cost of owning, relative to renting, that controls for differences in quality across markets based on a national renter sample and a national owner sample. The consolidated MSA defined 30 submarkets for public use and central city status. Within each submarket, average renter and owner characteristics are used in the hedonic price regression to derive the submarket-specific price-rent ratio.[18] In areas with higher price-rent ratios, individuals are expected to have lower homeownership rates all else equal (Wachter and Megbolugbe, 1992).

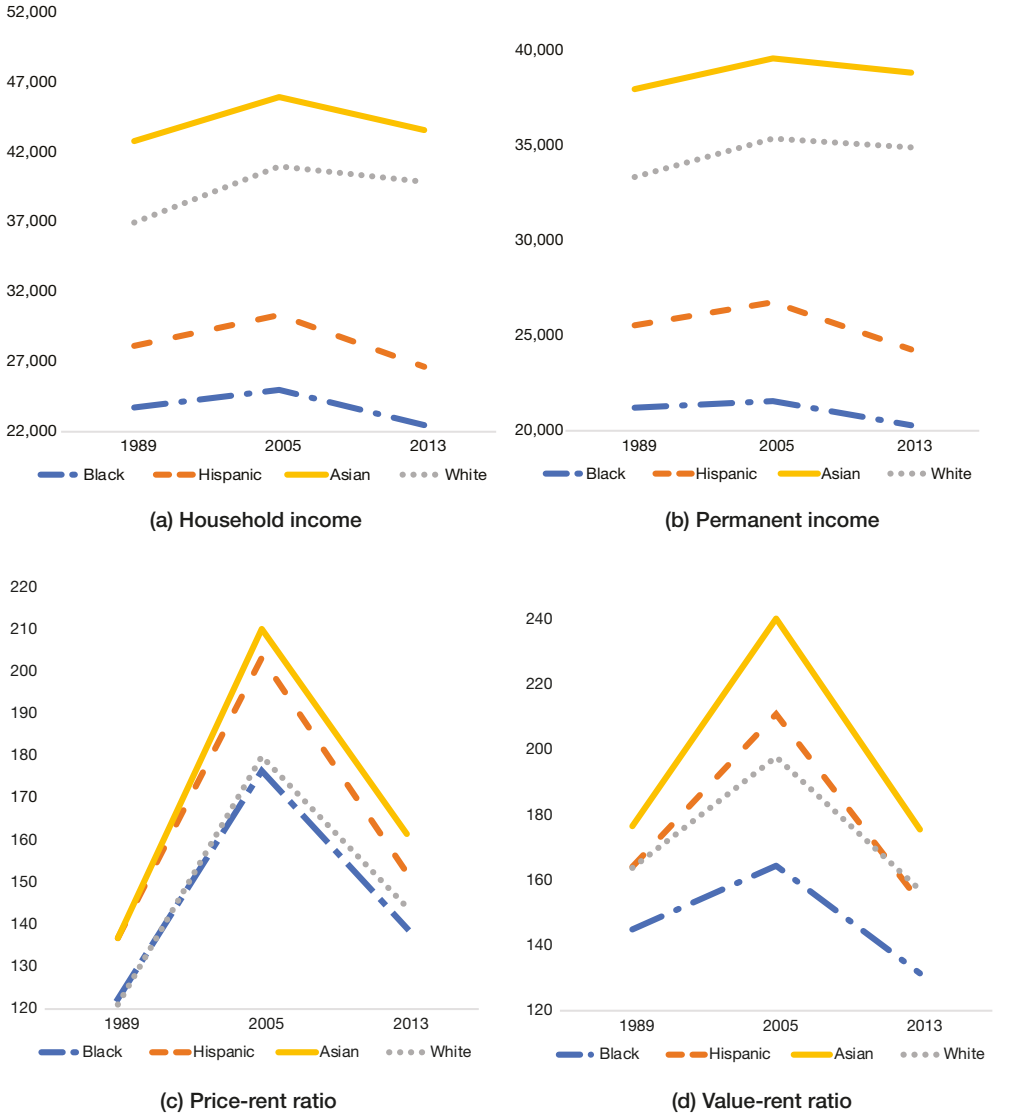
Exhibits 4 and 5 report the mean of the value-rent ratio and the price-rent ratio by group over time. The price-rent and value-rent ratios show a hump-shaped pattern over time with the ratios peaking in 2005, with countervailing implications for homeownership rate outcomes.

Exhibits 4 and 5 also show the substantial differences in actual household income and permanent income across demographic groups and their evolution over time. Most notably, the inflation adjusted actual and permanent income of Black and Hispanic households decreased over the 1989–2013 period, while for White households and Asian households, real actual and permanent income increased over time, increasing income disparities across groups.

18 The descriptive statistics and details of the hedonic regressions are available in the online appendix.

Exhibit 4

Mean Income (Dollars), Price-Rent and Value-Rent Ratios, AHS 1989, 2005, 2013



Note: Income has been inflation-adjusted to 1989 dollars.

Exhibit 5

Comparison of Income and Market Endowment: 1989 v. 2005 v. 2013

Year	Variable	Black		Hispanic		Asian		White	
		mean	sd	mean	sd	mean	sd	mean	sd
1989	Household income	23,738	22,018	28,100	24,601	42,783	34,234	36,982	30,505
	Permanent income	21,216	13,188	25,544	13,838	37,939	17,422	33,345	15,789
	Price-rent ratio	122.29	28.90	136.78	37.73	136.74	38.55	120.91	32.04
	Value-rent ratio	145.02	55.61	164.30	55.93	176.73	65.81	163.81	57.95
2005	Household income	25,000	27,347	30,337	33,358	45,977	42,987	40,991	44,617
	Permanent income	21,564	13,887	26,755	14,762	39,608	17,878	35,364	17,919
	Price-rent ratio	176.55	41.87	203.20	75.13	210.03	77.93	179.78	41.38
	Value-rent ratio	164.42	73.07	210.84	94.96	240.41	103.52	197.98	80.35
2013	Household income	22,448	24,956	26,674	28,079	43,558	43,715	39,858	42,364
	Permanent income	20,262	13,042	24,249	13,614	38,852	18,072	34,926	18,028
	Price-rent ratio	139.11	31.10	152.24	41.30	161.54	44.58	144.20	29.49
	Value-rent ratio	131.69	56.39	153.46	60.44	175.61	68.15	157.26	60.41

The real permanent income of an average Black household increased from 1989 to 2005 by 1.6 percent and then declined from 2005 to 2013 by 6 percent (decreasing from 1989 to 2013 by 4.4 percent), which *ceteris paribus* is consistent with the observed rise and then decline in homeownership rates (exhibit 5).[19] Similarly, real permanent income for Hispanic households increased by 4.7 percent and then decreased by 9.4 percent between 2005 and 2013 (decreasing 4.7 percent from 1989 to 2013). Both measures of income increased in real terms over the period 1989 and 2005 for Black and Hispanic households but the decline observed during the 2005–2013 period more than offset these gains. Unlike Black and Hispanic households, Asian and White households' real permanent income increased from 1989 to 2013 by 2.5 and 4.9 percent, respectively (it increased by 4.4 percent and 6.1 percent respectively from 1989 to 2005 then declined from 2005 to 2013).

Because of these diverging trends, the permanent income of an average Black household as a share of the permanent income of an average White household declined from 64 percent in 1989, to 61 percent in 2005, and 56 percent in 2013. For an average Hispanic household, it declined from 77 percent in 1989, 76 percent in 2005, and 69 percent in 2013. The average Asian household has higher permanent income than the average White household, The average Asian household has higher permanent income than the average White household, 14 percent higher in 1989, 12 percent higher in 2005, and 11 percent higher in 2013. In addition, income inequality within group grew as shown by increasing standard deviations. We turn to the analysis of the impact of these changes.

19 Homeownership rates were unusually low in 1989 due to high interest rates. All else equal, homeownership rates would be expected to be higher in 2013 than in 1989 due to the lower prevailing interest rates in 2013.

4 Model and Estimation Results

4.1 Model

We conduct logistic regression analyses to estimate the determinants of homeownership. Specifically, we use differences in household and market endowments to account for disparities in homeownership rates, with the model taking the following general form.

$$E(tenure_i=1 \mid X) = F(\beta_0 + inc_i \cdot \vec{\beta}_1 + hratio_i \cdot \vec{\beta}_2 + race_i \cdot \vec{\beta}_3 + D_i \cdot \vec{\beta}_4 + Z_i \cdot \vec{\beta}_5)$$

Where *tenure* = 1 indicates that a household is an owner and 0 otherwise. *F* is the cumulative distribution function of the logistic distribution. *hratio* is a vector and includes the value-rent ratio and the price-rent ratio. *inc* is a vector of household income which may include the permanent and the transitory components. *race* is a vector of ethnicity indicators, while *D* bundles the demographic information including age, family size, gender, citizenship status, and marital status that are expected to affect the demand for homeownership. *Z* is a vector of the rest of the variables including the interaction of the explanatory variables.

The next subsections present the empirical results. Exhibits 6.1 to 6.3 report results for 2013, exhibit 7.1 to 7.3 do so for 2005. Exhibit 8.1 to 8.3 report results for the analysis of the role of citizenship (for which we only have data for the years 2005 and 2013). Exhibits 9.1 to 9.3 report results for 1989. We compare 1989 to 2013 results in exhibit 10.

4.2 Logistic Results with Pooled Sample in 2013

We show 2013 results in exhibit 6.1 for tenure choice logit models for the pooled sample representative of the U.S. population.[20] Model 1 includes actual household income; model 2 includes estimated permanent and temporary income; models 3, 4, and 5 respectively add dummies for Black, Hispanic, and Asian separately; and model 6 combines all groups. Additional control variables include household structure (family size and age, gender, and marital status of household head) and price ratios along with dummies for demographic groups.

In the pooled regressions, coefficients of family structure variables, including the age and gender of the household head, family size, and marital status generally have the expected signs. A 1-year increase in household age is associated with 0.6 to 0.7-percentage points increase in homeownership probability; a male household head increases homeownership probability by 0.8 to 1.5 percentage points; and, a married household head's probability to own is 7.7 to 9.1 percentage points higher.[21]

20 The reported coefficients are the marginal probability with respect to explanatory variables, while the statistics in the parentheses are t-values. As some of the models are nested in others, the difference of the log-likelihood multiplied by (-2) are Chi-square distributed with difference of the number explanatory variables to be the degree of freedom. Likelihood ratio test results are reported which evaluate the goodness of fit in the case of incremental inclusion, as there is no direct analog of R-squares in the context of the logistic regression; in all cases they are significant.

21 The coefficient on family size is generally not significant. We perform pooled sample regressions to provide an overview of the impact of the determinants of homeownership for a nationally representative sample. We report results with citizenship status in the online appendix.

The coefficient on the dummy for Black households implies that Black households are 8 percentage points less likely to own a house relative to the average U.S. household, with Hispanic and Asian households 5 percentage points less likely to do so, in the pooled regressions, where coefficients on control variables are constrained to be the same across groups. Model 6 shows similar effects. As expected, coefficients on income variables, household income, and its permanent and transitory components are positive and significant, and coefficients on permanent income are lower in size with household characteristics included.

Exhibit 6.1

Logit Models of Tenure Choice: Pooled Sample, 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Household income	1.2e-06***					
	(21.033)					
Permanent income		2.9e-06***	2.5e-06***	2.3e-06***	2.8e-06***	2.0e-06***
		(32.778)	(22.222)	(20.432)	(25.466)	(16.724)
Transitory income		4.8e-07***	8.1e-07***	7.8e-07***	8.1e-07***	7.4e-07***
		(8.557)	(14.404)	(13.811)	(14.388)	(13.438)
Price-rent ratio	– .0048***	– .0045***	– .0039***	– .0037***	– .0038***	– .0037***
	(– 53.458)	(– 50.398)	(– 45.482)	(– 43.646)	(– 43.752)	(– 42.841)
Value-rent ratio	.004***	.0036***	.0029***	.0029***	.0029***	.0029***
	(80.940)	(68.810)	(52.433)	(53.215)	(52.529)	(53.489)
Age			.0067***	.0065***	.0067***	.0063***
			(49.910)	(48.168)	(49.860)	(46.218)
Family size			– .0098***	– .0061**	– .01***	– .003
			(– 5.058)	(– 3.090)	(– 5.207)	(– 1.544)
Married			.077***	.087***	.077***	.091***
			(11.665)	(13.044)	(11.634)	(13.692)
Gender			.0082	.015**	.011*	.012*
			(1.639)	(2.963)	(2.269)	(2.463)
Black			– .072***			– .099***
			(– 10.935)			(– 15.054)
Hispanic				– .094***		– .12***
				(– 13.622)		(– 17.617)
Asian					– .11***	– .14***
					(– 9.615)	(– 12.456)
-2Log L	27,363	26,794	23,941	23,877	23,968	23,535
chi2	7,123	7,690	10,543	10,607	10,516	10,949
N	26,370	26,370	26,370	26,370	26,370	26,370

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.*

4.3 Homeownership Outcomes by Demographic Group in 2013

Exhibit 6.2 reports results for regressions by demographic groups, allowing coefficients to vary across groups. Models 1-4 are for White-only, Black-only, Hispanic-only, and Asian-only households, respectively. Model 5 uses the pooled sample (White and all minorities) as a reference. In appendix exhibit A3.1, we report White-minority pooled regression results when including a dummy for minority status. These results show that, *ceteris paribus*, a Black household is 10 percentage points less likely to own a house and a Hispanic household is 13 percentage points less likely to own a house than is a White household with a 13-percentage points difference for Asian households, controlling for varying household characteristics.[22]

Coefficients on variables vary by demographic group. Compared with the coefficients in Model 1 for White households, the coefficients on permanent income are statistically larger for Black and Hispanic households.[23] The marginal contribution of permanent income to the homeownership propensity of Black households is 3.8 times higher than that of White households and 2.5 times higher for Hispanic households.

Exhibit 6.2

Logit Models by Group, 2013

	Model 1	Model 2	Model 3	Model 4	Model 5
Permanent income	1.2e-06***	4.9e-06***	3.7e-06***	2.3e-06***	2.8e-06***
	(9.123)	(13.118)	(10.482)	(5.016)	(24.845)
Transitory income	6.1e-07***	1.1e-06***	1.2e-06***	5.7e-07**	8.2e-07***
	(9.894)	(6.018)	(6.516)	(3.200)	(14.460)
Price-rent ratio	– .0032***	– .0051***	– .004***	– .0044***	– .0038***
	(– 29.756)	(– 20.707)	(– 19.195)	(– 13.991)	(– 44.857)
Value-rent ratio	.0026***	.0035***	.0029***	.0041***	.0029***
	(40.714)	(25.150)	(18.441)	(18.647)	(52.478)
Age	.0056***	.0082***	.0077***	.0054***	.0068***
	(35.973)	(22.125)	(17.710)	(7.428)	(50.400)
Family size	– .0043	– .0039	.002	– .0043	– .011***
	(– 1.645)	(– 0.832)	(0.439)	(– 0.496)	(– 5.436)
Married	.12***	– .035	.051**	.0032	.077***
	(15.727)	(– 1.789)	(2.809)	(0.103)	(11.600)
Gender	.011	.013	.026	.015	.011*
	(1.829)	(0.929)	(1.815)	(0.634)	(2.202)
-2Log L	15,141	3,534	3,680	1,145	24,059
chi2	5,857	1,722	1,257	559	10,425
N	17,869	3,833	3,601	1,239	26,370

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Model 1: non-Hispanic-White-only sample. Model 2: Black-only sample. Model 3: Hispanic-only sample. Model 4: Asian-only sample. Model 5: pooled sample.*

22 In appendix exhibit A3.1, we additionally report the White-minority pooled regression results with fully interactive terms with the minority dummy, allowing varying marginal effects across demographic groups. The likelihood ratio tests show that the interactive terms with minority dummies are statistically different from zero. The regression coefficients of minority and White households in exhibit 6.2 are thus statistically different.

23 We find the marginal effects of income are not statistically different between White and Asian households.

4.4 Endowment Effects in 2013

Exhibit 6.3 decomposes the extent to which lower homeownership rates for minorities are attributed to measured endowment effects relative to White households. We use the separately estimated tenure choice logit models for each demographic group and create a counterfactual to quantify endowment by group. For example, we hypothesize a White household with average traits and ask what the propensity for homeownership would be if the average White household were counterfactually treated as a Black one, that is, if the White household had the Black household's endowments.

As shown in exhibits 6.3 and 11, the actual difference in the sample between Black and White homeownership rates is 28.9 percentage points (the difference between 43.8 percent and 72.7 percent). We use the fitted difference in homeownership rates, which is 39.4 percentage points (the difference between 42.0 percent and 81.4 percent for Black and White households respectively) and find, for the average White household, homeownership propensity would decrease from 81.4 percent to 61 percent (using White coefficients but Black average endowments). The difference of these two rates, 20.4 percentage points, is the endowment effect. The residual effect, which is the unexplained portion of the gap of the estimated White-Black homeownership rates, is 19 percentage points.

The actual difference in the sample between Hispanic and White homeownership rates is 28.9 percentage points (the difference between 43.8 percent and 72.7 percent). The fitted difference is 38.6 percentage points (the difference between 42.8 percent and 81.4 percent); for the average White household, homeownership propensity would decrease from 81.4 percent to 65.7 percent (using White coefficients but Hispanic average endowments). The difference, 15.7 percentage points, is the endowment effect. The residual effect is 22.9 percentage points.

The actual difference in the sample between Asian and White homeownership rates is 18.1 percentage points (the difference between 54.6 percent and 72.7 percent). The fitted difference is 20.6 percentage points (the difference between 60.8 percent and 81.4 percent) and, for the average White household, homeownership propensity would decrease from 81.4 percent to 78.7 percent. The difference of these two rates, 2.7 percentage points, is the endowment effect. The residual effect is 18.0 percentage points.

Exhibit 6.3

Probability of Homeownership, 2013

	White	diff	Black	White	diff	Hispanic	White	diff	Asian
Actual Difference	0.727	0.289	0.438	0.727	0.288	0.438	0.727	0.181	0.546
Estimated Difference	0.814	0.394	0.420	0.814	0.387	0.428	0.814	0.207	0.608
Endowment		0.204			0.157			0.027	
Residual		0.190			0.229			0.180	

4.5 Racial/Ethnic Disparities in Homeownership Rates: 2005–2013

The U.S. aggregate homeownership rate reached a peak of 69 percent in the first quarter of 2004 (U.S. Census, 2018). This rate represents a substantial increase from prevailing levels of the post-World War II period. Homeownership rates also increased substantially for minority groups from the early 1990s low-40 percent range to peaks of approximately 50 percent for Black and Hispanic households and from about 50 percent to 60 percent for Asian households. By 2013, the aggregate homeownership rate declined to 65 percent. Homeownership rates fell disproportionately for minority households.

We examine the declines in homeownership rates by group from 2005 to 2013 using AHS data, which allows us to consider the role of endowment effects. Exhibit 7.1 reports results for 2005, which we compare to the 2013 results, for the pooled sample. The demographic effect, controlling for income and other independent factors on the probability of homeownership for Black households is -4.9 percentage points in 2005 versus -7.2 percentage points in 2013. For Hispanic households, it is -9.8 percentage points in 2005 versus -9.4 percentage points in 2013, and it is -13 percentage points in 2005 versus -11 percentage points in 2013 for Asian households.[24]

Exhibit 7.2 reports results for 2005 by demographic group, as before.[25] In the estimated homeownership probabilities for 2005, a Black household and a Hispanic household are 7.4 percentage points and 12 percentage points less likely to own a house than a White household, respectively, and these differences are significantly smaller than in 2013 (10 percentage points for Black households and 13 percentage points for Hispanic households). This is consistent with the observed gap increases between 2005 and 2013.[26] We also find a higher response of homeownership propensity to the permanent income of Black and Hispanic households relative to White households in 2013 compared to 2005.[27]

We estimate endowment and residual gaps for 2005 and report the results in exhibits 7.3 and 11. Estimated gaps increase for Black households and for Hispanic households, as do actual gaps, from 2005 to 2013. For Black households, the actual gap is 26.6 percentage points (compared with 28.9 percent in 2013). We use the fitted difference, 34.6 percentage points, and find that the homeownership propensity for the average White household would decrease from 86.6 percent to 66 percent using White coefficients but Black average endowments). The difference, 20.6 percentage points, is the endowment effect, which is similar to the 2013 20.4-percentage points difference in

24 The marginal contribution of controls in the national pooled sample regression are qualitatively similar in 2005 and 2013.

25 We report White-minority pooled regression results for group specific homeownership rates in appendix exhibit A3.2. We find qualitatively similar coefficients on control variables for 2005 and 2013 in these results, as well.

26 We pool the 2005 and 2013 AHS samples and run a linear probability model of tenure choice on the year dummy, the binary indicator of minority groups (Black, Hispanic, or Asian) and their interactive terms. Results reported in appendix exhibit A4.1 show that homeownership rate differences are significant over time and that the residual differences are significant over time for Blacks and Hispanics. All else being equal, the homeownership probability is 15 percentage points lower for Asian than White households in 2005, but that effect decreases to 13 percentage points in 2013, the reverse of the outcomes for Black and Hispanic households relative to White households (appendix exhibit A3.1-A3.8).

27 We present the statistical evidence of higher response to the permanent income of minorities and persistency in appendix exhibit A3.1 and A3.2 (with logit models) and in Exhibit A4.2 (with linear probability models) respectively.

estimated homeownership rates. The residual effect is 14 percentage points, which is smaller than the 19-percentage points rate of 2013, and which accounts for essentially the entire difference over these two periods in estimated homeownership rates for Black and White households.

The actual difference in the sample between Hispanic and White homeownership rates is 25.4 percentage points. We use the fitted difference, 33 percentage points, and find that of this, 11.8 percentage points is the endowment effect (compared with 15.7 percent in 2013) and 21.2 percentage points (compared with 22.9 percent) is the residual effect. Both are smaller than in 2013, although the endowment effect is mostly responsible for the increasing homeownership gap in 2013.

Exhibit 7.1

Logit Models of Tenure Choice: Pooled Sample, 2005 (1 of 2)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Household income	1.7e-06***					
	(28.358)					
Permanent income		3.2e-06***	2.3e-06***	2.1e-06***	2.6e-06***	1.8e-06***
		(37.698)	(21.514)	(18.997)	(23.831)	(16.479)
Transitory income		9.2e-07***	1.4e-06***	1.4e-06***	1.4e-06***	1.3e-06***
		(15.060)	(22.805)	(21.867)	(22.869)	(21.612)
Price-rent ratio	– .0036***	– .0034***	– .0029***	– .0028***	– .0029***	– .0027***
	(– 76.054)	(– 71.363)	(– 62.752)	(– 60.161)	(– 61.427)	(– 58.543)
Value-rent ratio	.0031***	.0028***	.0023***	.0024***	.0024***	.0024***
	(98.618)	(86.745)	(70.730)	(72.469)	(71.683)	(72.346)
Age			.0052***	.005***	.0052***	.0048***
			(49.962)	(47.660)	(49.883)	(46.077)
Family size			– .011***	– .0082***	– .012***	– .0054***
			(-7.367)	(-5.241)	(– 7.802)	(– 3.427)
Married			.1***	.11***	.1***	.11***
			(19.018)	(20.555)	(19.151)	(20.871)
Gender			.018***	.022***	.019***	.022***
			(4.610)	(5.779)	(5.001)	(5.636)
Black			– .049***			– .071***
			(– 9.142)			(– 13.309)
Hispanic				– .098***		– .12***
				(– 17.496)		(– 20.849)
Asian					– .13***	– .15***
					(– 13.011)	(– 15.603)
-2Log L	36,970	36,404	33,048	32,832	32,967	32,452
chi2	11,885	12,451	15,808	16,023	15,888	16,403
N	39,884	39,884	39,884	39,884	39,884	39,884

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.*

We find that the estimated gap between Asian and White households also increases from 2005 to 2013 from 16 percentage points to 18.1 percentage points. The endowment effect in 2005

is slightly negative, unlike the positive 2013 endowment effect, and the residual effect actually decreases slightly; hence, the increase in the gap in 2013 is due to an increase in the endowment effect, similar to the result for Hispanic households.

The results indicate that we can attribute the increase in the gap in homeownership for Hispanic and Asian households to changes associated with endowments, relative to White households, in income declines, as discussed further later. The increase in the Black-White gap is not explained and may be due to deterioration in unobserved variables, associated with access to credit, relative to White households, which we are not able to identify here.

Exhibit 7.2

Logit Models by Group, 2005

	Model 1	Model 2	Model 3	Model 4	Model 5
Permanent income	1.1e-06***	4.7e-06***	3.9e-06***	2.7e-06***	2.5e-06***
	(9.304)	(10.980)	(10.714)	(5.354)	(23.282)
Transitory income	1.1e-06***	2.0e-06***	2.2e-06***	1.6e-06***	1.5e-06***
	(15.982)	(8.670)	(10.212)	(6.415)	(22.866)
Price-rent ratio	– .0026***	– .004***	– .0029***	– .0027***	– .0029***
	(– 43.936)	(– 22.429)	(– 27.274)	(– 15.351)	(– 62.610)
Value-rent ratio	.0022***	.0031***	.0026***	.0027***	.0024***
	(58.029)	(29.027)	(27.724)	(19.105)	(71.328)
Age	.0042***	.0076***	.0063***	.0027***	.0053***
	(36.956)	(22.513)	(16.030)	(3.636)	(50.346)
Family size	– .0059**	– .0034	– .007	.0029	– .012***
	(– 2.910)	(– 0.811)	(– 1.795)	(0.354)	(– 8.041)
Married	.13***	.011	.097***	.059*	.1***
	(21.044)	(0.598)	(6.110)	(1.960)	(19.093)
Gender	.025***	.027*	– .0013	.0083	.019***
	(5.891)	(2.104)	(– 0.106)	(0.354)	(4.901)
-2Log L	22,632	4,223	4,395	1,168	33,130
chi2	9,993	2,052	1,880	608	15,725
N	29,673	4,527	4,527	1,319	39,884

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Model 1: non-Hispanic-White-only sample. Model 2: Black-only sample. Model 3: Hispanic-only sample. Model 4: Asian-only sample. Model 5: pooled sample.*

Exhibit 7.3

Probability of Homeownership, 2005

	White	diff	Black	White	diff	Hispanic	White	diff	Asian
Actual	0.761		0.495	0.761		0.507	0.761		0.601
Difference		0.266			0.254			0.160	
Estimated	0.866		0.520	0.866		0.536	0.866		0.685
Difference		0.346			0.330			0.181	
Endowment		0.206			0.118			– 0.006	
Residual		0.140			0.212			0.187	

4.6 Citizenship and Homeownership

The literature (Myers and Lee, 1998; Coulson, 1999; Painter, Gabriel, and Myers, 2001; Cortes et al., 2007) has established a correlation of citizenship with household tenure outcomes. For 2005 and 2013, we have included citizenship and foreign-born status in the homeownership probability regressions. The AHS for 2005 and 2013 include citizenship and foreign-born status while the 1989 AHS does not, hence, we cannot include these variables in the 1989 analysis. To examine the impact of these variables, we run the previous regressions with citizenship and foreign-born status.[28]

For perspective on the importance of citizenship and foreign-born status, exhibit 8.1 reports the share of citizens and foreign-born by demographic group in 2005 and 2013. Citizenship status is divided into native, foreign-born with citizenship (*naturalized*), and foreign-born without citizenship (*non-citizen*). For non-Hispanic White and Black in 2013, 94 and 91 percent, respectively, are U.S. native (a household head is either born in the United States or born abroad with U.S. parents). More than 50 percent of Hispanic households surveyed are foreign-born, with 20.6 percent naturalized and 32 percent in non-citizen status. About 80 percent of the Asian households surveyed are foreign-born, with 50 percent naturalized and 30 percent in non-citizen status. The shares of citizenship in 2005 are similar.[29]

Exhibit 8.1

Citizenship Across Groups, 2005 and 2013

Year	Race	Native	Foreign, Naturalization	Foreign, Not Citizen
2005	White	95.77%	2.61%	1.63%
	Asian	23.80%	46.08%	30.12%
	Black	92.47%	3.81%	3.72%
	Hispanic	51.86%	16.32%	31.82%
	Total	88.22%	5.68%	6.11%
2013	White	94.00%	3.90%	2.10%
	Asian	20.30%	49.40%	30.30%
	Black	90.70%	5.70%	3.60%
	Hispanic	47.50%	20.50%	32.00%
	Total	84.00%	8.40%	7.60%

We compare citizenship's correlation with homeownership across demographic groups in exhibits 8.2 and 8.3, for 2013 and 2005, respectively. In the regressions that we rerun, we use a binary indicator to differentiate households that are not U.S.-native. We find weak or no statistical association between non-native status and homeownership for Hispanic and Asian households.[30] Because households in the foreign category are heterogeneous, we examine the foreign-born with the finer categories with the available data in 2005 and 2013. The insignificant foreign-born association of Hispanic households comes from the heterogeneous impact of naturalization and

28 Complete regression results controlling for citizenship for 2005 and 2013 are reported in the online appendix.

29 Citizenship not only captures the legal migration status of households, whether they are first-generation immigrants and extended length of residence in the United States but is also correlated with risk preference and social norms (Dalton, 2008; Bonin et al., 2009).

30 For Black households, native born increases the propensity of owning a house by 7.4 percentage points in 2013.

non-citizenship that exerts significant but opposite effects. A naturalized Hispanic household is 5.6 percentage points more likely to own a house, whereas a Hispanic household without U.S. citizenship is 5.8 percentage points less likely to own a house.[31] These results are consistent with findings from Coulson (1999), Gabriel, Myers, and Painter (2001), Shierholz (2010), Sumption and Flamm (2012), and DeSilva and Elmelech (2012). Citizenship status is positively correlated with homeownership. Broadly similar results are found for 2005 and 2013, so this does not explain shifts over time in homeownership gaps.

Exhibit 8.2

Homeownership and Citizenship, 2013

	Black	Hispanic	Asian	Black	Hispanic	Asian
Foreign-born	– .074***	– .0076	– .0049			
	(3.364)	(0.525)	(0.167)			
Naturalized				– .045	.056**	.057
				(– 1.704)	(3.006)	(1.818)
Non-citizen				– .12***	– .058***	– .1**
				(– 3.688)	(– 3.418)	(– 3.042)
-2Log L	3,523	3,680	1,145	3,519	3,648	1,110
chi2	1,733	1,257	559	1,736	1,290	595
N	3,833	3,601	1,239	3,833	3,601	1,239

Notes: Naturalized = 1 means a household head is foreign-born but naturalized, whereas Non-Citizen = 1 means a household head is foreign-born and is not a U.S. citizen. Unreported variables controlling endowment: Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, and Gender.

Exhibit 8.3

Homeownership and Citizenship, 2005

	Black	Hispanic	Asian	Black	Hispanic	Asian
Foreign-born	– .094***	– .034**	– .018			
	(– 4.179)	(– 2.728)	(– 0.723)			
Naturalized				– .059*	.049**	.056*
				(– 1.972)	(2.747)	(2.050)
Non-citizen				– .13***	– .084***	– .12***
				(– 4.280)	(– 5.746)	(– 4.156)
-2Log L	4,206	4,387	1,168	4,203	4,338	1,120
chi2	2,070	1,888	609	2,073	1,937	657
N	4,527	4,527	1,319	4,527	4,527	1,319

4.7 Disparities over 24 Years

Using 1989 results, we can examine changes in homeownership patterns over the past several decades.[32] We perform regressions for the year 1989 and find the coefficients on Black and

31 For Asian households, no statistical evidence of difference in homeownership between U.S. native and naturalized Asian households exists; however, a foreign-born Asian household without citizenship is 10 percentage points less likely to own a house, compared with their U.S. native counterparts, who are twice as likely to have a college degree or higher.

32 Income in 2013 is adjusted to 1989 dollars. To the extent possible, we use similar variables and estimation strategies in survey years for consistency. AHS 1989 and 2013 do not share all variables. We attempt to use variables with similar description if the same variables are not found.

Hispanic dummies in White-minority pooled samples increase in absolute value, implying widening homeownership disparities over the three periods.

We run pooled sample regressions (exhibit 9.1) and regressions by demographic group (exhibit 9.2) and construct counterfactual outcomes for 1989 to decompose the homeownership gap as reported in exhibit 11. The demographic effect (exhibit 9.1), controlling for income and other independent factors on the probability of homeownership is less than in 2005 and 2013 for Black and Hispanic households whereas it is the same in 1989 and 2005 (and lower than 2013) for Asian households. Similar results are found using group regressions.[33]

Exhibit 9.1

Logit Models of Tenure Choice Group: Pooled Sample, 1989

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Household income	2.3e-06***					
	(26.199)					
Permanent income		4.0e-06***	3.8e-06***	3.7e-06***	4.1e-06***	3.5e-06***
		(28.550)	(23.027)	(22.632)	(25.264)	(20.746)
Transitory income		1.5e-06***	2.3e-06***	2.2e-06***	2.3e-06***	2.2e-06***
		(15.305)	(23.490)	(23.059)	(23.669)	(22.771)
Price-rent ratio	– .0059***	– .0057***	– .0046***	– .0046***	– .0046***	– .0044***
	(– 90.550)	(– 87.970)	(– 71.955)	(– 69.970)	(– 71.363)	(– 68.311)
Value-rent ratio	.0047***	.0045***	.0034***	.0034***	.0034***	.0034***
	(131.391)	(120.853)	(82.291)	(82.606)	(82.403)	(81.942)
Age			.0051***	.005***	.0051***	.005***
			(44.955)	(43.841)	(44.846)	(43.651)
Family size			.0014	.0025	.001	.0055***
			(0.988)	(1.779)	(0.746)	(3.864)
Married			.088***	.09***	.089***	.086***
			(20.827)	(21.299)	(21.151)	(20.466)
Gender			.036***	.039***	.036***	.037***
			(8.201)	(8.884)	(8.212)	(8.620)
Black			– .043***			– .055***
			(– 7.650)			(– 9.860)
Hispanic				– .082***		– .094***
				(– 11.831)		(– 13.462)
Asian					– .13***	– .15***
					(– 10.760)	(– 11.762)
-2Log L	40,265	40,023	36,024	35,943	35,967	35,721
chi2	14,777	15,019	19,018	19,099	19,074	19,320
N	42,975	42,975	42,975	42,975	42,975	42,975

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.*

33 White-minority pooled regression results are reported in appendix exhibits A3.1-A3.3. The dummies for Black and Hispanics went from -6 percentage points and -10 percentage points in 1989 to -7.4 percentage points and -12 percentage points in 2005 and to -10 percentage points and -13 percentage points in 2013, respectively. The dummy for Asian went from -15 percentage points in 1989 and 2005 to -13 percentage points in 2013.

We identify explained and residual portions of gaps over time, as reported in exhibit 9.3. Using AHS data, we find increasing White-Black homeownership estimated and actual gaps from 1989 to 2005, but not for other minorities.[34] The White-Hispanic and White-Asian homeownership gaps decrease from 1989 to 2005 (and increase from 2005 to 2013, as noted earlier).[35] These declines are consistent with a heightened enforcement of anti-discrimination mortgage legislation, for Hispanic and Asian groups, but the increase in the Black homeownership rate in this period, in the AHS data, is proportionately similar to that of White households.

Exhibit 9.2

Logit Models by Group (No Citizenship), 1989

	Model 1	Model 2	Model 3	Model 4	Model 5
Permanent income	2.5e-06***	7.9e-06***	7.0e-06***	7.0e-06***	4.0e-06***
	(14.049)	(12.780)	(10.314)	(8.728)	(24.762)
Transitory income	1.9e-06***	2.7e-06***	3.6e-06***	3.1e-06***	2.3e-06***
	(18.697)	(7.413)	(8.554)	(6.534)	(23.652)
Price-rent ratio	– .0042***	– .0065***	– .005***	– .004***	– .0047***
	(– 57.941)	(– 26.717)	(– 20.788)	(– 11.374)	(– 72.252)
Value-rent ratio	.0034***	.0038***	.0033***	.0034***	.0035***
	(72.780)	(27.815)	(18.761)	(15.536)	(82.626)
Age	.0046***	.0076***	.0071***	.0042***	.0052***
	(36.153)	(20.025)	(15.289)	(5.030)	(44.924)
Family size	.0083***	.0062	– .0032	– .0045	.00014
	(4.716)	(1.675)	(– 0.707)	(– 0.662)	(0.099)
Married	.093***	.034**	.071***	.029	.09***
	(19.989)	(2.622)	(3.980)	(0.983)	(21.329)
Gender	.043***	.00066	.023	– .029	.036***
	(9.031)	(0.049)	(1.212)	(– 0.976)	(8.351)
-2Log L	28,425	4,000	2,502	675	36,082
chi2	13,741	2,313	1,257	568	18,960
N	34,863	4,566	2,744	897	42,975

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Model 1: non-Hispanic-White-only sample. Model 2: Black-only sample. Model 3: Hispanic-only sample. Model 4: Asian-only sample. Model 5: pooled sample.*

Exhibit 9.3

Probability of Homeownership, 1989

	White	diff	Black	White	diff	Hispanic	White	diff	Asian
Actual Difference	0.705	0.240	0.464	0.705	0.273	0.431	0.705	0.208	0.496
Estimated Difference	0.801	0.338	0.464	0.801	0.384	0.417	0.801	0.276	0.525
Endowment		0.220			0.189			0.042	
Residual		0.117			0.195			0.234	

34 The slight decrease in the Black-White gap in the Census data may reflect differences in geographical distribution of households in the AHS and Census data.

35 The statistical tests for time-varying homeownership gaps are reported in appendix exhibits A5.1-A5.2.

Exhibit 10

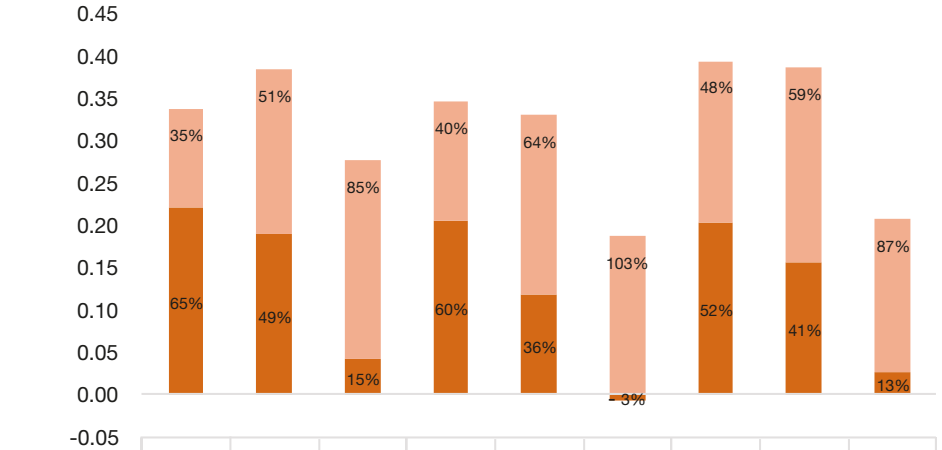
Coefficient on Permanent Income, 1989 v. 2005 v. 2013

	White	Black	Hispanic	Asian
Permanent income	1.4e-06***	7.3e-06***	6.6e-06***	7.2e-06***
	(8.872)	(12.225)	(9.460)	(7.715)
ahs05*permanent	– 7.4e-07**	– 1.6e-06	– 1.8e-06*	– 3.1e-06*
income	(– 3.108)	(– 1.810)	(– 1.988)	(– 2.476)
ahs13*permanent	– 8.5e-08	1.2e-06	5.7e-08	– 3.1e-06*
income	(– 0.308)	(1.284)	(0.059)	(– 2.508)
R^2	0.304	0.374	0.332	0.393
N	82,405	12,926	10,872	3,455

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. The dependent variable in the linear probability model is household's tenure choice (owning = 1). ahs05 and ahs13 are indicators of AHS 2005 and 2013 respectively. Unreported variables controlling endowment: Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, and Gender. Time-varying marginal effect of endowment is allowed. Income is adjusted to 1989 dollars.*

Exhibit 11

Decomposition of Ethnic Homeownership Gap with Respect to White Households



	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian
	1989			2005			2013		
Residual	0.117	0.195	0.234	0.140	0.212	0.187	0.190	0.229	0.180
Endowment	0.220	0.189	0.042	0.206	0.118	-0.006	0.204	0.157	0.027

Notes: The data used for comparison are AHS 1989, 2005, and 2013. Controls include Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, and Gender.

The actual difference in the Black-White homeownership rates in 1989 is 24 percentage points (70.5 percent versus 46 percent), whereas the estimated difference is 33.8 percentage points (80.1 percent versus 46.4 percent). In the actual and estimated results, Black-White homeownership gaps increase during the three periods. This increase is attributed almost entirely to an increase in the residual gaps, which in 1989 is 11.7 percentage points, and increases in 2005 and 2013, as opposed to the portion explained by endowments. We find that the marginal contribution of

endowment factors for Hispanic households relative to White households increases from 1989 to 2005 (and from 2005 to 2013). For Asian households, the marginal contribution of endowment factors relative to White households decreases over time.[36] The decline in gaps from 1989 to 2005, as reported in the Census data, is not.

Among the endowment factors, we examine further the impact of permanent income. To incorporate both the changes in coefficients on permanent income and the changing values of permanent income, we calculate the pattern of semi-elasticity of homeownership probability to this endowment factor.[37] We define semi-elasticity as the change of homeownership probability in response to a 1-percent change of permanent income and summarize the results in exhibit 12. The semi-elasticities with respect to permanent income of Black, Hispanic, and Asian households are more than two times higher than that of White households in 1989. A 1-percent negative shock on permanent income reduces homeownership probability by 18 percent for Black and Hispanic households, by 26 percent for Asian households, and by 8 percent for White households. The semi-elasticities decrease from 1989 to 2005 for all demographic groups, to 13 percent for Black, 15 percent for Hispanic, 16 percent for Asian, and 3 percent for White households. This is consistent with non-endowment factors having a greater impact on homeownership outcomes in this period, as shown in Gabriel and Rosenthal (2008), as discussed earlier. Although 2013 semi-elasticities for Black, Hispanic, and Asian households are persistently high, they decline as income increases for White households. In 2013, a 1-percent negative shock on permanent income reduces homeownership probability by 18 percent, 19 percent, and 17 percent for Black, Hispanic, and Asian households respectively, compared to a 6-percent reduction in probability for White households.[38] The rise and decline in observed homeownership is consistent with these changes.[39]

Exhibit 12

Semi-elasticity of Homeownership Probability, 1989 v. 2005 v. 2013

	Black			Hispanic		
	1989	**2005**	**2013**	**1989**	**2005**	**2013**
Permanent Income	.18***	.13***	.18***	.18***	.15***	.19***
	(14.33)	(10.55)	(13.04)	(10.40)	(10.39)	(11.36)
	Black			**Hispanic**		
	1989	**2005**	**2013**	**1989**	**2005**	**2013**
Permanent Income	.26***	.16***	.17***	.076***	.034***	.062***
	(8.83)	(6.01)	(5.95)	(14.76)	(6.30)	(8.36)

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001. Semi-elasticity is defined as the change of homeownership probability in response to 1-percentage change of a variable. Income is adjusted to 1989 dollars.*

36 The inference is based on appendix exhibits A3.1-A3.3. In exhibit 10, we conduct statistical tests to examine how the marginal contribution of permanent income varied from 1989 to 2013. We find evidence of a decrease in marginal effect of permanent income for Hispanic, Asian, and White households from 1989 to 2005. The marginal effects of permanent income in 2013 are not statistically different from 1989 for Black, Hispanic, and White households, but are smaller for Asian households.

37 Because other variables do not change as much in size or in influence we confine our analysis here to income.

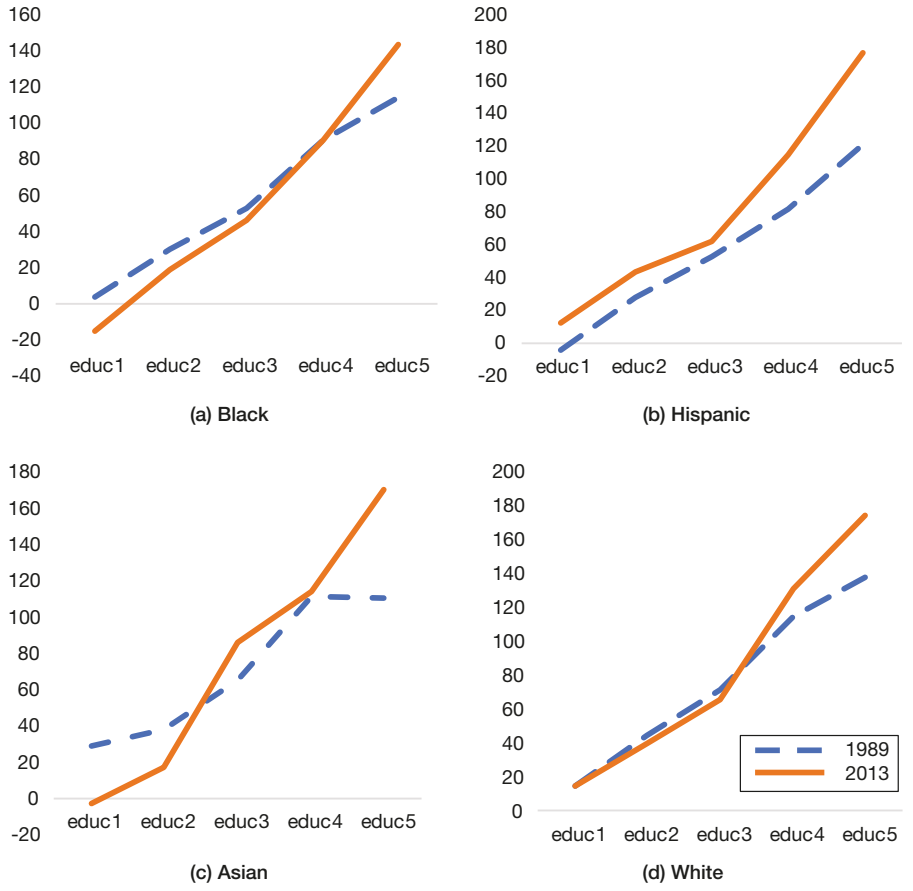
38 The semi-elasticities of homeownership probability with respect to housing ratios show similar but weaker and countervailing effects of higher semi-elasticities among minority groups.

39 The semi-elasticities reported in exhibit 12 are point estimates capturing first order effects, over-estimating the response of homeownership propensities. The over-estimation may be due to higher-order nonlinear effects.

Because education is an important factor driving the long-term trends in permanent income across demographic groups, as shown in the permanent income regressions, in the online appendix, we further consider the trend in return on education in exhibit 13.[40] There we show an increase in returns at higher levels of education (college graduate, graduate) for all groups. However, Black and Hispanic households still show far lower levels of college graduation and lower returns to a given education level. In 2013, Black households witnessed a decrease in returns in the lower end of the curve where the distribution of education was concentrated (exhibit 14).[41]

Exhibit 13

Return on Education by Races and Survey Years



Notes: Coefficients on education dummies in permanent income regressions in AHS 1989 and 2013 are reported. The base level is no high school. educ1 = some high school. educ2 = high school graduate. educ3 = some college. educ4 = college graduate. educ5 = graduate education. Income has been inflation-adjusted to 1989 dollars. The dependent variable of the regressions is the Box-Cox transformation value (lambda = 0.5) of the household income.

40 The F-tests to examine education dummies jointly in permanent income regressions in 1989 and 2013 show that they are statistically different from zeros at 1-percent confidence level.

41 These findings in AHS data are consistent with the literature on education returns and income inequality. For a historical overview of the literature see Lemieux (2008) and Wachter and Ding (2016). For additional sources on education and inequality in the United States, income and otherwise, see Hout (2012).

Exhibit 14

Distribution of Education Profile, 1989 v. 2013

	AHS	educ0	educ1	educ2	educ3	educ4	educ5	Total
Black	1989	19.40	13.68	35.77	17.76	7.94	5.44	100
Hispanic		33.76	10.06	29.49	14.80	6.68	5.21	100
Asian		10.50	3.61	24.84	13.89	27.13	20.02	100
White		11.23	7.76	36.22	19.17	14.39	11.21	100
Total		13.50	8.46	35.52	18.64	13.48	10.40	100
		educ0	**educ1**	**educ2**	**educ3**	**educ4**	**educ5**	**Total**
Black	2013	3.97	12.01	30.01	32.95	13.82	7.25	100
Hispanic		24.71	11.53	26.17	23.28	9.93	4.38	100
Asian		6.12	3.80	16.89	16.19	32.61	24.40	100
White		3.36	5.35	25.20	29.12	22.46	14.52	100
Total		6.32	7.01	25.61	28.3	20.1	12.65	100

Notes: educ0 = no high school. educ1 = some high school. educ2 = high school graduate. educ3 = some college. educ4 = college graduate. educ5 = graduate education.

5 Conclusion

Homeownership rates for Blacks and Hispanics as of 2018 are similar to or lower than 1970 levels, 2 years after the passage of the Fair Housing Act. From the mid-1990s to their peaks in 2004–2005, after several decades of no increases, homeownership rates increased from low-40 percent levels to about 50 percent, for Black and Hispanic households, and for Asian households, from low-50 percent levels to 60 percent. In the aftermath of the crisis, homeownership rates declined, to low-40 percent, mid-40 percent, and mid-50 percent levels, for Black, Hispanic, and Asian households, respectively, and majority-minority homeownership disparities increased.

In this article, we decompose the attribution of minority-majority homeownership gaps, using AHS data, to differences in household endowments, particularly permanent income, and to unobserved residual factors. We find that the pattern of changing homeownership rates is consistent with estimated changes in the impact of permanent income by group. The findings on the changes in the levels and impacts of permanent income on homeownership suggest a weaker ability of minorities to achieve consumption smoothing through self and social insurance than their White counterparts, particularly, in 2013 when gaps widened significantly.

Permanent income differences are found to be associated with homeownership outcomes, in 1989, 2005, and 2013, and may affect access to homeownership through income, asset and credit effects. We also find an increasing gap in homeownership from 2005 to 2013 for Black households which is unexplained, and which may be consistent with an increased impact of tightened credit, relative to White households, in this period, as well as due to other institutional factors which we cannot observe. For Hispanic and Asian households, we find that citizenship is an important contributor to White-minority homeownership gaps for the years for which we have data (2005 and 2013), consistent with the literature.

Permanent income and unmeasured wealth differences and their impact on the ability to access homeownership especially through intergenerational down payment assistance, may be continuing effects of discrimination.[42] Differences in wealth and credit quality may also result from the effects of historical inequalities in the ability of minority families to access and build wealth through homeownership.

Persistently lower homeownership outcomes contribute to limiting households' ability to withstand negative shocks in times of economic crisis. In addition, differential access to homeownership is both influenced by and has long-lasting impacts on intergenerational wealth building. Policies that impact access to homeownership are currently under reconsideration. The CRA is currently undergoing revision and GSE reform is also under consideration, both with important implications for homeownership outcomes. As the United States becomes a minority-majority nation, within the next three decades, policies that effectively address homeownership gaps will be important to lessen longstanding wealth disparities that limit homeownership opportunity.

42 Limited attention is paid to the credit and wealth of Asian groups. Bricker et al. (2017) conducted a comprehensive survey on family finance of different races and ethnicities using Survey of Consumer Finance. Asian households are pooled with other and multiple race groups, accounting for 30 percent of the other races other than Black and Hispanic.

Appendix

Exhibit A1.1

Logit Models of Tenure Choice: Pooled Sample (with Citizenship), 2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Household income	1.6e-06***					
	(27.617)					
Permanent income		3.1e-06***	2.0e-06***	2.0e-06***	2.2e-06***	1.7e-06***
		(37.204)	(18.394)	(18.355)	(20.936)	(15.777)
Transitory income		8.6e-07***	1.3e-06***	1.3e-06***	1.3e-06***	1.3e-06***
		(14.381)	(21.381)	(21.101)	(21.604)	(20.971)
Price-rent ratio	– .0034***	– .0032***	– .0027***	– .0027***	– .0027***	– .0027***
	(– 69.829)	(– 65.559)	(– 57.499)	(– 56.926)	(– 57.354)	(– 56.558)
Value-rent ratio	.003***	.0028***	.0023***	.0024***	.0023***	.0023***
	(97.730)	(86.360)	(70.359)	(71.610)	(71.179)	(71.335)
Naturalized	– .047***	– .052***	– .071***	– .052***	– .05***	– .021*
	(– 5.150)	(– 5.682)	(– 8.227)	(– 6.047)	(– 5.658)	(– 2.336)
Non-citizen	– .24***	– .24***	– .19***	– .16***	– .18***	– .13***
	(– 27.421)	(– 27.347)	(– 22.691)	(– 17.834)	(– 20.184)	(– 14.484)
Age			.0049***	.0049***	.005***	.0047***
			(47.331)	(46.546)	(47.601)	(45.058)
Family size			– .0053***	– .0053***	– .0071***	– .0032*
			(– 3.396)	(– 3.343)	(– 4.519)	(– 2.036)
Married			.11***	.11***	.11***	.11***
			(20.693)	(21.297)	(20.636)	(21.415)
Gender			.023***	.025***	.024***	.024***
			(5.873)	(6.529)	(6.147)	(6.198)
Black			– .057***			– .07***
			(– 10.850)			(– 13.118)
Hispanic				– .055***		– .082***
				(– 9.064)		(– 12.981)
Asian					– .073***	– .11***
					(– 6.794)	(– 10.089)
-2Log L	36,152	35,584	32,431	32,466	32,501	32,215
chi2	12,703	13,272	16,424	16,389	16,354	16,640
N	39,884	39,884	39,884	39,884	39,884	39,884

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Naturalized = 1 means a household head is foreign-born but naturalized, while Non-Citizen = 1 means a household head is foreign-born and is not a U.S. citizen.*

Exhibit A1.2

Logit Models of Tenure Choice: Pooled Sample (with Citizenship), 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Household income	1.1e-06***					
	(20.163)					
Permanent income		2.9e-06***	2.1e-06***	2.3e-06***	2.5e-06***	1.9e-06***
		(32.429)	(18.927)	(19.880)	(22.352)	(16.067)
Transitory income		4.2e-07***	7.2e-07***	7.2e-07***	7.4e-07***	7.1e-07***
		(7.618)	(13.083)	(13.021)	(13.292)	(12.892)
Price-rent ratio	– .0045***	– .0042***	– .0036***	– .0036***	– .0036***	– .0036***
	(– 49.620)	(– 46.644)	(– 42.085)	(– 41.286)	(– 41.308)	(– 41.552)
Value-rent ratio	.004***	.0036***	.0028***	.0028***	.0028***	.0028***
	(79.833)	(68.053)	(51.952)	(52.387)	(52.012)	(52.615)
Naturalized	– .057***	– .063***	– .078***	– .06***	– .061***	– .034***
	(– 5.990)	(– 6.713)	(– 8.910)	(– 6.663)	(– 6.613)	(– 3.567)
Non-citizen	– .23***	– .23***	– .18***	– .15***	– .16***	– .13***
	(– 23.110)	(– 23.266)	(– 18.952)	(– 14.727)	(– 16.553)	(– 12.132)
Age			.0064***	.0064***	.0065***	.0062***
			(47.714)	(47.271)	(48.170)	(45.551)
Family size			– .0031	– .0029	– .0047*	– .00072
			(– 1.603)	(– 1.489)	(– 2.382)	(– 0.366)
Married			.091***	.094***	.09***	.095***
			(13.786)	(14.081)	(13.457)	(14.436)
Gender			.013**	.018***	.016***	.014**
			(2.720)	(3.587)	(3.292)	(2.948)
Black			– .083***			– .098***
			(– 12.892)			(– 14.962)
Hispanic				– .051***		– .084***
				(– 6.885)		(– 10.913)
Asian					– .046***	– .087***
					(– 3.846)	(– 7.120)
-2Log L	26,798	26,216	23,513	23,629	23,661	23,377
chi2	7,688	8,268	10,971	10,855	10,823	11,107
N	26,370	26,370	26,370	26,370	26,370	26,370

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Naturalized = 1 means a household head is foreign-born but naturalized, while Non-Citizen = 1 means a household head is foreign-born and is not a U.S. citizen.*

Exhibit A2.1

Logit Models by Group (with Citizenship), 2005

	Model 1	Model 2	Model 3	Model 4	Model 5
Permanent income	1.2e-06***	4.8e-06***	3.3e-06***	2.6e-06***	2.2e-06***
	(9.839)	(11.147)	(9.079)	(5.247)	(20.492)
Transitory income	1.1e-06***	2.0e-06***	2.0e-06***	1.5e-06***	1.3e-06***
	(15.827)	(8.526)	(9.560)	(6.014)	(21.492)
Price-rent ratio	– .0025***	– .0039***	– .0029***	– .0026***	-.0027***
	(– 42.144)	(– 21.755)	(– 26.452)	(– 14.671)	(-57.465)
Value-rent ratio	.0022***	.0031***	.0025***	.0025***	.0023***
	(57.745)	(28.895)	(26.968)	(17.511)	(71.051)
Naturalized	– .082***	– .059*	.049**	.056*	-.068***
	(-5.617)	(– 1.972)	(2.747)	(2.050)	(-7.979)
Non-citizen	– .18***	– .13***	– .084***	– .12***	-.19***
	(– 10.001)	(– 4.280)	(– 5.746)	(– 4.156)	(-22.075)
Age	.0042***	.0075***	.0057***	.0016*	.005***
	(36.919)	(21.999)	(14.381)	(2.109)	(47.835)
Family size	– .0055**	– .0024	– .0028	.0032	-.0068***
	(– 2.706)	(– 0.568)	(– 0.700)	(0.402)	(-4.335)
Married	.13***	.012	.11***	.078**	.11***
	(21.011)	(0.651)	(6.759)	(2.630)	(20.734)
Gender	.025***	.032*	.0068	.0018	.024***
	(5.765)	(2.473)	(0.531)	(0.078)	(6.201)
-2Log L	22,483	4,203	4,338	1,120	32,547
chi2	10,142	2,073	1,937	657	16,308
N	29,673	4,527	4,527	1,319	39,884

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Model 1: non-Hispanic-White-only sample. Model 2: Black-only sample. Model 3: Hispanic-only sample. Model 4: Asian-only sample. Model 5: pooled sample.*

Exhibit A2.2

Logit Models by Group (with Citizenship), 2013

	Model 1	Model 2	Model 3	Model 4	Model 5
Permanent income	1.2e-06***	4.9e-06***	3.4e-06***	2.5e-06***	2.4e-06***
	(9.390)	(13.037)	(9.485)	(5.457)	(22.065)
Transitory income	5.8e-07***	1.1e-06***	1.1e-06***	5.7e-07***	7.3e-07***
	(9.477)	(5.924)	(6.204)	(3.324)	(13.214)
Price-rent ratio	– .0031***	– .0049***	– .0039***	– .0042***	– .0036***
	(– 28.226)	(– 20.070)	(– 18.872)	(– 13.250)	(– 41.489)
Value-rent ratio	.0026***	.0035***	.0028***	.0038***	.0028***
	(40.508)	(25.248)	(17.811)	(16.738)	(52.015)
Naturalized	– .11***	– .045	.056**	.057	– .073***
	(– 7.158)	(– 1.704)	(3.006)	(1.818)	(– 8.351)
Non-citizen	– .19***	– .12***	– .058***	– .1**	– .17***
	(– 9.013)	(– 3.688)	(– 3.418)	(– 3.042)	(– 17.918)
Age	.0056***	.0081***	.0073***	.0043***	.0065***
	(36.108)	(21.693)	(16.632)	(5.821)	(48.365)
Family size	– .0033	– .0029	.006	– .0034	– .0045*
	(– 1.268)	(– 0.603)	(1.289)	(– 0.399)	(-2.286)
Married	.13***	– .029	.056**	.0073	.09***
	(15.988)	(– 1.504)	(3.099)	(0.235)	(13.591)
Gender	.011	.014	.034*	.012	.016***
	(1.868)	(1.001)	(2.333)	(0.507)	(3.329)
-2Log L	14,999	3,519	3,648	1,110	23,676
chi2	6,000	1,736	1,290	595	10,808
N	17,869	3,833	3,601	1,239	26,370

*Notes: t-statistics in parentheses * p< 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability. Model 1: non-Hispanic-White-only sample. Model 2: Black-only sample. Model 3: Hispanic-only sample. Model 4: Asian-only sample. Model 5: pooled sample.*

Exhibit A3.1

Group Effect on Tenure Choice (no Citizenship), 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Permanent income	1.7e-06***	1.2e-06***	1.6e-06***	1.3e-06***	1.3e-06***	1.2e-06***
	(13.254)	(9.112)	(12.902)	(9.112)	(10.135)	(9.119)
Transitory income	6.9e-07***	6.3e-07***	7.1e-07***	6.4e-07***	6.2e-07***	6.2e-07***
	(11.368)	(9.880)	(11.761)	(9.880)	(10.517)	(9.889)
Price-rent ratio	– .0036***	– .0033***	– .0034***	– .0034***	– .0033***	– .0033***
	(– 35.791)	(– 29.306)	(-36.014)	(– 29.306)	(-32.345)	(– 29.590)
Value-rent ratio	.0028***	.0027***	.0027***	.0028***	.0028***	.0027***
	(47.308)	(39.595)	(44.816)	(39.595)	(44.135)	(40.297)
Age	.0061***	.0057***	.006***	.0058***	.0056***	.0057***
	(42.034)	(35.119)	(40.661)	(35.115)	(36.735)	(35.655)
Family size	– .0039	– .0044	– .0031	– .0045	– .0039	– .0043
	(– 1.705)	(– 1.645)	(-1.386)	(– 1.645)	(– 1.566)	(– 1.645)
Married	.1***	.13***	.11***	.13***	.11***	.12***
	(13.901)	(15.653)	(15.297)	(15.652)	(15.036)	(15.700)
Gender	.011*	.011	.013*	.011	.01	.011
	(1.968)	(1.828)	(2.437)	(1.828)	(1.833)	(1.829)
Race	– .1***	– .17***	– .13***	– .18***	– .13***	– .14*
	(– 15.857)	(– 3.922)	(– 18.836)	(– 4.519)	(– 12.968)	(– 2.209)
Perm. inc. *Race		3.3e-06***		1.9e-06***		8.3e-07
		(8.374)		(5.436)		(1.871)
Temp. inc. *Race		3.8e-07*		3.8e-07*		– 1.0e-07
		(2.088)		(2.188)		(-0.587)
Price-rent ratio *Race		– .0014***		.000021		– .00074*
		(– 4.737)		(0.090)		(– 1.973)
Value-rent ratio *Race		.00057**		– .00037*		.0011***
		(3.164)		(– 2.204)		(3.672)
Age *Race		.0019***		.00059		– .00079
		(4.209)		(1.295)		(– 1.093)
Fam. size *Race		.00073		.0061		.0004
		(0.143)		(1.311)		(0.047)
Married *Race		– .16***		– .086***		– .12***
		(– 8.047)		(– 4.977)		(– 4.130)
Gender *Race		.0011		.011		.0031
		(0.078)		(0.814)		(0.139)
-2Log L	18,801	18,675	18,866	18,822	16,329	16,286
chi2	8,571	8,697	8,133	8,178	6,533	6,576
N	21,702	21,702	21,470	21,470	19,108	19,108

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.* Race *is an indicator of races (Black, Hispanic or Asian). Model 1-2: White-black pooled sample. Model 3-4: White-Hispanic sample. Model 5-6: White-Asian pooled sample.*

Exhibit A3.2

Group Effect on Tenure Choice (no Citizenship), 2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Permanent income	1.5e-06***	1.2e-06***	1.5e-06***	1.2e-06***	1.2e-06***	1.1e-06***
	(12.472)	(9.299)	(13.065)	(9.299)	(10.379)	(9.302)
Transitory income	1.2e-06***	1.1e-06***	1.2e-06***	1.1e-06***	1.1e-06***	1.1e-06***
	(18.038)	(15.953)	(18.805)	(15.952)	(17.223)	(15.973)
Price-rent ratio	– .0028***	– .0027***	– .0026***	– .0027***	– .0026***	– .0026***
	(– 49.276)	(– 43.215)	(– 52.235)	(– 43.198)	(– 46.264)	(– 43.703)
Value-rent ratio	.0023***	.0023***	.0023***	.0023***	.0022***	.0022***
	(64.703)	(56.415)	(64.231)	(56.376)	(60.768)	(57.500)
Age	.0047***	.0044***	.0045***	.0044***	.0042***	.0043***
	(42.751)	(36.482)	(40.867)	(36.470)	(37.213)	(36.803)
Family size	– .005**	– .0061**	– .0064***	– .0061**	– .0052**	– .0059**
	(– 2.794)	(– 2.910)	(– 3.692)	(– 2.910)	(– 2.667)	(– 2.910)
Married	.11***	.13***	.12***	.13***	.12***	.13***
	(20.061)	(20.957)	(21.834)	(20.955)	(20.785)	(21.016)
Gender	.025***	.026***	.021***	.026***	.024***	.025***
	(6.219)	(5.890)	(5.246)	(5.890)	(5.727)	(5.891)
Race	– .074***	– .17***	– .12***	– .2***	– .15***	– .18***
	(– 14.241)	(– 5.093)	(– 21.620)	(– 7.239)	(– 15.999)	(– 3.652)
Perm. inc. *Race		2.7e-06***		1.9e-06***		1.2e-06*
		(6.960)		(5.834)		(2.544)
Temp. inc. *Race		5.1e-07*		5.9e-07**		2.6e-07
		(2.482)		(3.139)		(1.120)
Price-rent ratio *Race		– .00057**		.0004**		.00033
		(– 3.088)		(3.123)		(1.635)
Value-rent ratio *Race		.00029*		– .00028**		.000088
		(2.365)		(– 2.710)		(0.497)
Age *Race		.0019***		.00054		– .002**
		(5.308)		(1.488)		(– 3.046)
Fam. size *Race		.0033		.00058		.0084
		(0.805)		(0.154)		(1.168)
Married *Race		– .12***		– .054***		– .077**
		(– 7.458)		(– 3.812)		(– 2.932)
Gender *Race		– .004		– .027*		– .018
		(– 0.352)		(– 2.480)		(– 0.906)
-2Log L	26,959	26,855	27,083	27,027	23,843	23,800
chi2	13,208	13,311	12,983	13,040	10,719	10,763
N	34,200	34,200	34,200	34,200	30,992	30,992

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.* Race *is an indicator of races (Black, Hispanic or Asian). Model 1-2: White-Black pooled sample. Model 3-4: White-Hispanic sample. Model 5-6: White-Asian pooled sample.*

Exhibit A3.3

Group Effect on Tenure Choice (no Citizenship), 1989

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Permanent income	3.0e-06***	2.6e-06***	2.9e-06***	2.6e-06***	2.7e-06***	2.5e-06***
	(17.298)	(14.036)	(16.689)	(14.041)	(15.369)	(14.047)
Transitory income	2.0e-06***	1.9e-06***	2.0e-06***	1.9e-06***	2.0e-06***	1.9e-06***
	(20.248)	(18.663)	(20.397)	(18.675)	(19.730)	(18.690)
Price-rent ratio	– .0044***	– .0042***	– .0043***	– .0042***	– .0042***	– .0042***
	(– 63.716)	(– 56.860)	(– 62.237)	(– 57.231)	(– 59.105)	(– 57.724)
Value-rent ratio	.0034***	.0034***	.0034***	.0034***	.0034***	.0033***
	(78.043)	(70.674)	(75.561)	(71.388)	(74.395)	(72.351)
Age	.0049***	.0046***	.0047***	.0046***	.0046***	.0046***
	(40.585)	(35.872)	(39.039)	(35.970)	(36.674)	(36.098)
Family size	.0078***	.0084***	.006***	.0084***	.0073***	.0083***
	(4.980)	(4.716)	(3.757)	(4.716)	(4.293)	(4.716)
Married	.088***	.094***	.092***	.094***	.092***	.093***
	(20.083)	(19.934)	(20.515)	(19.953)	(20.003)	(19.978)
Gender	.04***	.043***	.042***	.043***	.041***	.043***
	(8.852)	(9.027)	(9.034)	(9.028)	(8.679)	(9.030)
Race	– .06***	– .018	– .1***	– .099*	– .15***	– .24**
	(– 10.708)	(– 0.511)	(– 14.555)	(– 2.553)	(– 12.275)	(– 3.220)
Perm. inc. *Race		4.8e-06***		3.7e-06***		5.1e-06***
		(7.557)		(5.513)		(5.057)
Temp. inc. *Race		5.4e-07		1.2e-06**		1.5e-06**
		(1.511)		(3.058)		(2.606)
Price-rent ratio *Race		– .0018***		– .00025		– .00018
		(– 6.153)		(– 0.915)		(– 0.385)
Value-rent ratio *Race		.00012		– .00041*		.00037
		(0.712)		(– 2.086)		(1.094)
Age *Race		.0024***		.0017***		.000063
		(5.689)		(3.511)		(0.065)
Fam. size *Race		– .0026		– .011*		– .013
		(– 0.677)		(– 2.573)		(– 1.726)
Married *Race		– .062***		– .031		– .061
		(– 4.748)		(– 1.828)		(– 1.874)
Gender *Race		– .043**		– .023		– .075*
		(– 3.190)		(– 1.348)		(– 2.262)
-2Log L	32,551	32,425	30,991	30,927	29,146	29,100
chi2	16,904	17,029	15,736	15,800	14,427	14,473
N	39,429	39,429	37,607	37,607	35,760	35,760

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.* Race *is an indicator of races (Black, Hispanic or Asian). Model 1-2: White-Black pooled sample. Model 3-4: White-Hispanic sample. Model 5-6: White-Asian pooled sample.*

Exhibit A3.4

Group Effect on Tenure Choice (with Citizenship), 2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Permanent income	1.5e-06***	1.2e-06***	1.4e-06***	1.2e-06***	1.3e-06***	1.2e-06***
	(13.001)	(9.790)	(12.268)	(9.607)	(10.884)	(9.795)
Transitory income	1.2e-06***	1.1e-06***	1.2e-06***	1.1e-06***	1.1e-06***	1.1e-06***
	(17.830)	(15.803)	(18.267)	(15.852)	(17.002)	(15.847)
Price-rent ratio	– .0027***	– .0026***	– .0025***	– .0027***	– .0025***	– .0025***
	(– 47.342)	(– 41.626)	(– 50.408)	(– 42.150)	(– 44.573)	(– 42.141)
Value-rent ratio	.0023***	.0023***	.0022***	.0023***	.0022***	.0022***
	(64.384)	(56.160)	(63.531)	(56.106)	(60.028)	(57.173)
Age	.0047***	.0044***	.0045***	.0044***	.0042***	.0042***
	(42.528)	(36.467)	(40.207)	(36.284)	(36.870)	(36.617)
Family size	– .0044*	– .0057**	– .004*	– .0059**	– .0047*	– .0056**
	(– 2.469)	(– 2.724)	(– 2.291)	(– 2.806)	(– 2.405)	(– 2.736)
Married	.11***	.13***	.12***	.13***	.12***	.13***
	(20.081)	(20.927)	(22.234)	(20.927)	(20.917)	(20.975)
Gender	.026***	.026***	.023***	.026***	.023***	.025***
	(6.313)	(5.775)	(5.764)	(5.832)	(5.565)	(5.787)
Race	– .069***	– .17***	– .085***	– .16***	– .08***	– .099*
	(– 13.157)	(– 5.046)	(– 13.533)	(– 5.849)	(– 7.089)	(– 1.980)
Perm. inc. *Race		2.7e-06***		1.3e-06***		1.2e-06*
		(7.094)		(3.921)		(2.515)
Temp. inc. *Race		5.0e-07*		4.7e-07*		2.0e-07
		(2.435)		(2.517)		(0.849)
Price-rent ratio *Race		– .00056**		.0004**		.00035
		(– 3.037)		(3.131)		(1.712)
Value-rent ratio *Race		.0003*		– .00029**		6.0e-06
		(2.421)		(– 2.805)		(0.033)
Age *Race		.0017***		.00027		– .0024***
		(4.958)		(0.733)		(– 3.678)
Fam. size *Race		.0041		.0064		.011
		(1.007)		(1.700)		(1.538)
Married *Race		– .12***		– .036*		– .052
		(– 7.368)		(– 2.477)		(– 1.933)
Gender *Race		.0019		– .016		– .025
		(0.167)		(– 1.400)		(– 1.218)
-2Log L	26,788	26,690	26,906	26,877	23,666	23,624
chi2	13,379	13,477	13,161	13,190	10,897	10,939
N	34,200	34,200	34,200	34,200	30,992	30,992

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.* Race *is an indicator of races (Black, Hispanic or Asian). Model 1-2: White-Black pooled sample. Model 3-4: White-Hispanic sample. Model 5-6: White-Asian pooled sample. Unreported control variables: Naturalized, Non-Citizen.*

Exhibit A3.5

Group Effect on Tenure Choice (with Citizenship), 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Permanent income	1.7e-06***	1.3e-06***	1.5e-06***	1.3e-06***	1.3e-06***	1.2e-06***
	(13.386)	(9.346)	(12.187)	(9.233)	(10.449)	(9.343)
Transitory income	6.6e-07***	6.0e-07***	6.7e-07***	6.2e-07***	5.8e-07***	5.9e-07***
	(10.955)	(9.513)	(11.283)	(9.682)	(10.050)	(9.546)
Price-rent ratio	– .0034***	– .0032***	– .0033***	– .0033***	– .0032***	– .0031***
	(– 34.054)	(– 27.988)	(– 34.831)	(– 28.513)	(– 31.057)	(– 28.302)
Value-rent ratio	.0028***	.0027***	.0026***	.0027***	.0027***	.0026***
	(47.265)	(39.397)	(44.184)	(39.415)	(43.474)	(40.071)
Age	.0061***	.0057***	.006***	.0058***	.0056***	.0056***
	(41.900)	(35.216)	(40.380)	(35.021)	(36.485)	(35.617)
Family size	– .0028	– .0035	– .00052	– .004	– .0029	– .0035
	(– 1.230)	(– 1.317)	(– 0.235)	(– 1.490)	(– 1.173)	(– 1.341)
Married	.1***	.13***	.11***	.13***	.12***	.13***
	(14.338)	(15.887)	(15.896)	(15.795)	(15.420)	(15.939)
Gender	.011*	.011	.016**	.011	.011	.011
	(2.078)	(1.867)	(2.921)	(1.864)	(1.891)	(1.891)
Race	– .096***	– .17***	– .093***	– .14***	– .05***	– .029
	(– 14.911)	(– 3.888)	(– 11.860)	(– 3.589)	(– 3.893)	(– 0.458)
Perm. inc. *Race		3.2e-06***		1.4e-06***		9.2e-07*
		(8.264)		(4.045)		(2.030)
Temp. inc. *Race		3.9e-07*		2.9e-07		– 1.5e-07
		(2.144)		(1.704)		(-0.845)
Price-rent ratio *Race		– .0014***		.000044		– .00078*
		(– 4.698)		(0.186)		(-2.079)
Value-rent ratio *Race		.00062***		– .00044**		.00092**
		(3.470)		(– 2.599)		(3.152)
Age *Race		.0017***		.00053		– .0012
		(3.889)		(1.164)		(– 1.594)
Fam. size *Race		.0015		.012*		.0029
		(0.289)		(2.563)		(0.342)
Married *Race		– .15***		– .069***		– .11***
		(– 7.718)		(– 3.941)		(– 3.546)
Gender *Race		.0027		.021		.000093
		(0.191)		(1.563)		(0.004)
-2Log L	18,645	18,525	18,753	18,718	16,167	16,134
chi2	8,727	8,847	8,247	8,281	6,696	6,729
N	21,702	21,702	21,470	21,470	19,108	19,108

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. Dependent variable is the binary indicator of homeownership. Reported coefficients are marginal probability.* Race *is an indicator of races (Black, Hispanic or Asian). Model 1-2: White-Black pooled sample. Model 3-4: White-Hispanic sample. Model 5-6: White-Asian pooled sample. Unreported control variables: Naturalized, Non-Citizen.*

Exhibit A3.6

Probability of Homeownership (with Citizenship), 2005

	White	diff	Black	White	diff	Hispanic	White	diff	Asian
Actual	0.761		0.495	0.761		0.507	0.761		0.601
Difference		0.266			0.254			0.160	
Estimated	0.867		0.520	0.867		0.535	0.867		0.689
Difference		0.348			0.332			0.177	
Endowment		0.218			0.215			0.081	
Residual		0.130			0.117			0.096	

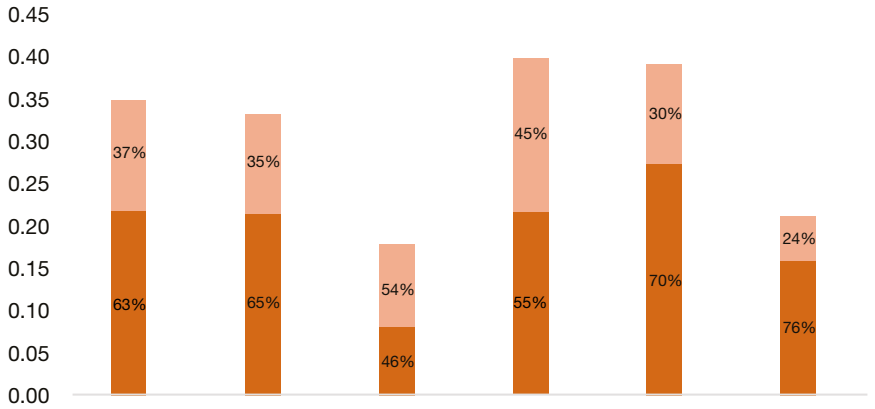
Exhibit A3.7

Probability of Homeownership (with Citizenship), 2013

	White	diff	Black	White	diff	Hispanic	White	diff	Asian
Actual	0.727		0.438	0.727		0.438	0.727		0.546
Difference		0.289			0.288			0.181	
Estimated	0.816		0.419	0.816		0.426	0.816		0.606
Difference		0.398			0.391			0.210	
Endowment		0.218			0.274			0.160	
Residual		0.180			0.117			0.050	

Exhibit A3.8

Decomposition of Ethnic Homeownership Gap with Respect to White Households (with Citizenship)



	Black	Hispanic	Asian	Black	Hispanic	Asian
	2005			2013		
Residual	0.13	0.117	0.096	0.18	0.117	0.05
Endowment	0.218	0.215	0.081	0.218	0.274	0.16

Notes: The data used for comparison are AHS 2005 and 2013. Endowment controlled includes Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, Gender, citizenship status.

Exhibit A4.1

Disparity in Homeownership: 2005 v. 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ahs13	– .036***	– .036***	– .036***	– .045***	– .045***	– .042***
	(– 8.452)	(– 8.457)	(– 8.587)	(– 11.644)	(– 11.773)	(– 10.935)
Race	– .27***	– .25***	– .16***	– .11***	– .11***	– .078***
	(– 37.521)	(– 35.950)	(– 13.186)	(– 17.284)	(– 15.736)	(– 6.640)
ahs13 *Race	– .021*	– .032**	– .012	– .044***	– .035***	.0078
	(– 1.991)	(– 3.016)	(– 0.682)	(– 4.929)	(– 3.843)	(0.518)
R^2	0.049	0.046	0.009	0.321	0.316	0.289
N	55,902	55,670	50,100	55,902	55,670	50,100

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable in the linear probability model is household's tenure choice (owning = 1).* Ahs13 *is a binary indicator of AHS 2013. Model 1-3 (or 4-6) are White-Black, White-Hispanic, and White-Asian pooled samples, respectively.* Race *= Black (Model 1 and 4).* Race *= span (Model 2 and 5).* Race *= Asian (Model 3 and 6). Unreported variables controlling endowment in Model 4-6: Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, Gender. Income is adjusted to 2005 dollars.*

Exhibit A4.2

Coefficient on Permanent Income: 2005 v. 2013

	White	Black	Hispanic	Asian
ahs13	– .13***	– .053	– .092	– .097
	(– 5.339)	(– 0.959)	(– 1.840)	(– 1.085)
Permanent Income	7.9e-07***	5.9e-06***	4.1e-06***	3.9e-06***
	(4.595)	(9.252)	(7.409)	(4.674)
ahs13* Permanent Income	6.0e-07*	2.6e-06**	2.0e-06*	3.8e-07
	(2.163)	(2.745)	(2.265)	(0.316)
R^2	0.283	0.362	0.328	0.381
N	47,542	8,360	8,128	2,558

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable in the linear probability model is household's tenure choice (owning = 1).* ahs05 *and* ahs13 *are indicators of AHS 2005 and 2013 respectively. Unreported variables controlling endowment: Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, Gender. Time-varying marginal effect of endowment is allowed. Income in 2013 have been adjusted to 1989 dollars.*

Exhibit A5.1

Disparity in Homeownership: 1989 v. 2005 v. 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ahs05	.056***	.056***	.056***	.17***	.16***	.16***
	(16.036)	(16.084)	(16.243)	(45.743)	(45.327)	(44.021)
ahs13	.022***	.022***	.022***	.12***	.11***	.11***
	(5.506)	(5.522)	(5.577)	(30.986)	(30.374)	(30.670)
Race	– .24***	– .27***	-.21***	– .11***	– .16***	– .17***
	(– 34.751)	(– 31.380)	(– 14.137)	(– 18.492)	(– 20.672)	(– 13.077)
ahs05 *Race	– .025**	.02	.049*	.01	.0062	– .0018
	(– 2.585)	(1.753)	(2.542)	(1.222)	(0.647)	(– 0.112)
ahs13 *Race	– .048***	– .015	.027	– .037***	– .032**	.0055
	(– 4.638)	(– 1.268)	(1.391)	(– 4.103)	(– 3.111)	(0.325)
R^2	0.041	0.038	0.009	0.326	0.319	0.300
N	99,781	97,401	89,699	95,331	93,277	85,860

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable in the linear probability model is household's tenure choice (owning = 1).* ahs05 *and* ahs13 *are indicators of AHS 2005 and 2013 respectively. Model 1-3 (or 4-6) are White-Black, White-Hispanic, and White-Asian pooled samples, respectively.* Race *= Black (Model 1 and 4).* Race *= Span (Model 2 and 5).* Race *= Asian (Model 3 and 6). Unreported variables controlling endowment in Model 4-6: Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, Married, Gender. Income in 2013 have been adjusted to 1989 dollars.*

Exhibit A5.2

Disparity in Homeownership: 1989 v. 2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ahs13	.019***	.019***	.019***	.14***	.13***	.14***
	(4.392)	(4.407)	(4.437)	(34.211)	(33.636)	(33.714)
Race	– .24***	– .27***	– .21***	– .098***	– .14***	– .16***
	(– 32.813)	(– 29.930)	(– 13.452)	(– 15.960)	(– 18.717)	(– 12.757)
ahs13 *Race	– .05***	– .016	.032	– .037***	– .034***	.0049
	(– 4.605)	(– 1.291)	(1.581)	(– 4.149)	(– 3.345)	(0.289)
R^2	0.036	0.034	0.007	0.340	0.332	0.316
N	61,131	59,077	54,868	61,131	59,077	54,868

*Notes: t-statistics in parentheses * p < 0.05, ** p < 0.01, *** p<0.001. The dependent variable in the linear probability model is household's tenure choice (owning = 1). Ahs13 is an indicator of AHS 2013. Model 1-3 (or 4-6) are White-Black, White-Hispanic, and White-Asian pooled samples, respectively. Race = Black (Model 1 and 4). Race = span (Model 2 and 5). Race = Asian (Model 3 and 6). Unreported variables controlling endowment in Model 4-6: Permanent Income, Transitory Income, Price-Rent Ratio, Value-Rent Ratio, Age, Family Size, married, Gender. Income in 2013 have been adjusted to 1989 dollars.*

Exhibit A6.1

Descriptive Statistics for Hedonic Regressions, 2013

	Owners		Renters			Owners		Renters	
	mean	sd	mean	sd		mean	sd	mean	sd
btyear	49.081	25.680	53.275	25.218	**west**	0.158	0.365	0.206	0.405
cellar	0.302	0.459	0.086	0.280	**ccity**	0.247	0.431	0.480	0.500
garage	0.796	0.403	0.354	0.478	**boston_lawrence_ salem**	0.010	0.098	0.013	0.114
rooms	6.504	1.676	4.456	1.395	**buffalo_niagara_falls**	0.003	0.052	0.003	0.056
bedrms	3.133	0.891	2.013	0.961	**dallas_fort_worth**	0.009	0.096	0.015	0.120
baths	1.761	0.752	1.233	0.476	**denver_boulder**	0.006	0.074	0.009	0.092
airsys	0.717	0.450	0.484	0.500	**hartford_new_ britain_middletown**	0.002	0.043	0.003	0.050
cracks	0.037	0.189	0.064	0.245	**kansas**	0.004	0.060	0.005	0.069
bigp	0.014	0.119	0.028	0.164	**los_angeles_ anaheim_riverside**	0.031	0.172	0.057	0.231
ifblow	0.074	0.261	0.075	0.263	**miami_fort_lauderdale**	0.008	0.090	0.012	0.107
ifsew	0.012	0.109	0.016	0.126	**ny_nj_long_island**	0.052	0.222	0.128	0.334
ifdry	0.019	0.135	0.036	0.185	**pittsburgh_beaver_ valley**	0.006	0.075	0.004	0.067
howh	8.521	1.508	7.722	1.849	**portland_vancouver**	0.004	0.062	0.005	0.073
hown	8.257	1.728	7.668	2.033	**providence_ pawtucket_fall_river**	0.003	0.055	0.004	0.066
northeast	0.271	0.444	0.302	0.459	**saint_louis_alton**	0.005	0.073	0.005	0.073
midwest	0.299	0.458	0.253	0.435	**seattle_tacoma**	0.006	0.080	0.009	0.095
south	0.272	0.445	0.239	0.427	**bc_value**	122.331	37.169	94.286	42.080

Notes: For owners, bc_value = Box-Cox transformation value (lambda = 0.3) of the property value. For renters, bc_value = Box Cox transformation value (lambda = 0.6) of the gross rent.

Exhibit A6.2

Descriptive Statistics for Hedonic Regressions, 2005

	Owners mean	sd	Renters mean	sd		Owners mean	sd	Renters mean	sd
btyear	41.528	25.185	46.764	25.086	**west**	0.203	0.402	0.255	0.436
cellar	0.268	0.443	0.057	0.231	**ccity**	0.229	0.420	0.459	0.498
garage	0.772	0.420	0.311	0.463	**boston_lawrence_salem**	0.011	0.103	0.016	0.125
rooms	6.546	2.071	4.343	1.530	**buffalo_niagara_falls**	0.003	0.054	0.004	0.060
bedrms	3.098	0.884	1.945	0.928	**dallas_fort_worth**	0.010	0.100	0.018	0.134
baths	1.741	0.737	1.203	0.462	**denver_boulder**	0.006	0.076	0.008	0.089
airsys	0.687	0.464	0.474	0.499	**hartford_new_britain_middletown**	0.003	0.052	0.004	0.060
cracks	0.037	0.188	0.071	0.256	**kansas**	0.001	0.023	0.000	0.022
bigp	0.014	0.117	0.034	0.181	**los_angeles_anaheim_riverside**	0.033	0.179	0.066	0.248
ifblow	0.090	0.286	0.094	0.291	**miami_fort_lauderdale**	0.010	0.100	0.013	0.113
ifsew	0.010	0.099	0.017	0.131	**ny_nj_long_island**	0.044	0.205	0.096	0.295
ifdry	0.026	0.158	0.046	0.210	**pittsburgh_beaver_valley**	0.006	0.078	0.007	0.081
howh	8.495	1.458	7.633	1.883	**portland_vancouver**	0.004	0.065	0.006	0.078
hown	8.273	1.646	7.619	2.039	**providence_pawtucket_fall_river**	0.003	0.056	0.006	0.078
northeast	0.186	0.389	0.219	0.413	**saint_louis_alton**	0.006	0.078	0.007	0.081
midwest	0.249	0.432	0.201	0.401	**seattle_tacoma**	0.007	0.083	0.012	0.107
south	0.362	0.481	0.325	0.468	**bc_value**	121.891	37.744	81.109	31.724

Notes: For owners, bc_value = Box-Cox transformation value (lambda = 0.3) of the property value. For renters, bc_value = Box Cox transformation value (lambda = 0.6) of the gross rent.

Exhibit A6.3

Descriptive Statistics for Hedonic Regressions, 1989

	Owners mean	sd	Renters mean	sd		Owners mean	sd	Renters mean	sd
btyear	32.372	21.305	34.362	23.110	**west**	0.193	0.395	0.244	0.430
cellar	0.318	0.466	0.070	0.256	**ccity**	0.271	0.444	0.491	0.500
garage	0.734	0.442	0.288	0.453	**boston_lawrence_salem**	0.014	0.118	0.022	0.146
rooms	5.552	3.499	3.563	3.303	**buffalo_niagara_falls**	0.004	0.061	0.005	0.071
bedrms	2.411	2.582	1.294	2.624	**dallas_fort_worth**	0.010	0.101	0.017	0.129
baths	1.040	2.237	0.579	2.327	**denver_boulder**	0.007	0.084	0.009	0.092
airsys	0.438	0.496	0.304	0.460	**hartford_new_britain_middletown**	0.003	0.056	0.004	0.063
cracks	0.033	0.179	0.087	0.282	**kansas**	0.000	0.000	0.000	0.000
bigp	0.030	0.170	0.070	0.255	**los_angeles_anaheim_riverside**	0.042	0.201	0.071	0.257
ifblow	0.164	0.409	0.161	0.429	**miami_fort_lauderdale**	0.012	0.109	0.014	0.117
ifsew	0.019	0.137	0.025	0.158	**ny_nj_long_island**	0.061	0.240	0.108	0.311
ifdry	0.037	0.190	0.059	0.235	**pittsburgh_beaver_valley**	0.008	0.091	0.007	0.082
howh	8.621	1.568	7.565	2.050	**portland_vancouver**	0.005	0.073	0.008	0.087
hown	8.365	1.855	7.427	2.404	**providence_pawtucket_fall_river**	0.004	0.064	0.007	0.082
northeast	0.212	0.409	0.243	0.429	**saint_louis_alton**	0.008	0.086	0.008	0.090
midwest	0.256	0.436	0.217	0.413	**seattle_tacoma**	0.009	0.095	0.013	0.111
south	0.339	0.473	0.296	0.456	**bc_value**	94.725	25.405	56.416	19.251

Notes: For owners, bc_value = Box-Cox transformation value (lambda = 0.3) of the property value. For renters, bc_value = Box Cox transformation value (lambda = 0.6) of the gross rent.

Exhibit A7.1

Hedonic Price Regressions for Renters and Owners, 2013

	(1) Owners		(2) Renters	
btyear	0.0752***	(7.391)	– 0.00387	(– 0.213)
cellar	2.970***	(5.610)	– 0.512	(– 0.353)
garage	8.518***	(14.360)	6.167***	(6.513)
rooms	4.981***	(22.263)	3.333***	(5.519)
bedrms	– 0.442	(– 1.110)	– 1.666	(– 1.946)
baths	12.24***	(31.487)	16.86***	(16.393)
airsys	6.766***	(11.833)	7.650***	(7.927)
cracks	– 5.379***	(– 4.440)	– 1.835	(– 1.098)
bigp	– 3.207	(– 1.656)	– 3.791	(– 1.549)
ifblow	1.530	(1.804)	2.575	(1.718)
ifsew	– 5.749**	(– 2.835)	– 8.500**	(– 2.800)
ifdry	– 2.118	(– 1.298)	3.311	(1.578)
howh	1.293***	(7.057)	– 1.086***	(– 4.040)
hown	1.911***	(12.026)	2.062***	(8.593)
ccity	0.698	(1.279)	2.737**	(3.263)
Northeast	21.03***	(28.472)	19.98***	(13.718)
Midwest	– 1.078	(– 1.657)	7.514***	(6.203)
West	21.50***	(26.362)	20.78***	(14.465)
Boston-Lawrence-Salem, MA-NH	25.88***	(10.605)	3.643	(0.956)
Buffalo-Niagara Falls, NY	– 25.28***	(– 5.559)	– 24.32**	(– 3.268)
Dallas-Fort Worth, TX	– 3.075	(– 1.288)	1.050	(0.321)
Denver-Boulder, CO	– 2.223	(– 0.741)	– 2.206	(– 0.512)
Hartford_New Britain-Middletown, CT	– 8.128	(– 1.452)	– 6.007	(– 0.731)
Kansas City, MO-KS	– 1.851	(– 0.496)	– 4.435	(– 0.786)
Los Angeles-Anaheim-Riverside, CA	22.84***	(15.925)	12.08***	(6.229)
Miami-Fort Lauderdale, FL	9.813***	(3.986)	22.11***	(6.138)
New York-Northern New Jersey-Long Island, NY-NJ-CT	24.72***	(21.461)	21.13***	(13.173)
Pittsburgh-Beaver Valley, PA	– 24.81***	(– 8.134)	– 22.02***	(– 3.760)
Portland-Vancouver, OR-WA	3.678	(1.030)	– 0.329	(– 0.061)
Providence-Pawtucket-Fall River, RI-MA	1.610	(0.358)	– 10.02	(– 1.709)
Saint Louis-East Saint Louis-Alton, MO-IL	0.116	(0.037)	4.506	(0.846)
Seattle-Tacoma, WA	14.61***	(5.186)	6.829	(1.622)
Constant	16.30***	(9.248)	32.50***	(11.633)
Adjusted R^2	0.3908		0.1650	
N	17,084		97,46	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. For owner's equation, the dependent variable is Box-Cox transformation value (lambda = 0.3) of the property value. For renter's equation, the dependent variable is Box Cox transformation value (lambda = 0.6) of the gross rent.*

Exhibit A7.2

Hedonic Price Regressions for Renters and Owners, 2005

	(1) Owners		(2) Renters	
btyear	0.0251**	(3.027)	– 0.0803***	(– 6.456)
cellar	4.822***	(11.029)	– 2.308*	(– 2.036)
garage	11.07***	(24.574)	6.683***	(10.772)
rooms	2.639***	(23.459)	1.479***	(5.434)
bedrms	2.815***	(10.518)	0.781	(1.684)
baths	12.79***	(41.547)	12.97***	(19.664)
airsys	6.287***	(13.969)	8.237***	(12.880)
cracks	– 4.683***	(– 4.883)	– 2.612*	(– 2.521)
bigp	1.265	(0.828)	0.373	(0.257)
ifblow	2.009**	(3.288)	1.842*	(2.098)
ifsew	– 1.644	(– 0.942)	– 3.872*	(– 2.014)
ifdry	– 2.796*	(– 2.531)	1.818	(1.509)
howh	1.700***	(11.385)	– 0.218	(– 1.263)
hown	1.151***	(8.848)	1.268***	(8.086)
ccity	2.176***	(5.015)	3.171***	(5.912)
Northeast	12.84***	(19.390)	15.62***	(15.128)
Midwest	0.840	(1.666)	5.644***	(7.231)
West	26.96***	(48.033)	19.22***	(22.898)
Boston-Lawrence-Salem, MA-NH	31.95***	(17.901)	19.32***	(8.503)
Buffalo-Niagara Falls, NY	– 21.67***	(– 6.584)	– 13.68**	(– 3.171)
Dallas-Fort Worth, TX	– 3.077	(– 1.713)	3.240	(1.603)
Denver-Boulder, CO	– 5.325*	(– 2.376)	– 6.818*	(– 2.414)
Hartford_New Britain-Middletown, CT	6.850*	(2.032)	3.340	(0.800)
Kansas City, MO-KS	– 12.39	(– 1.691)	-11.46	(– 1.080)
Los Angeles-Anaheim-Riverside, CA	29.99***	(27.639)	9.478***	(8.016)
Miami-Fort Lauderdale, FL	26.97***	(15.274)	16.78***	(7.689)
New York-Northern New Jersey-Long Island, NY-NJ-CT	28.93***	(28.939)	20.86***	(17.153)
Pittsburgh-Beaver Valley, PA	– 21.43***	(– 8.990)	– 10.56***	(– 3.341)
Portland-Vancouver, OR-WA	– 7.429**	(– 2.788)	– 2.700	(– 0.797)
Providence-Pawtucket-Fall River, RI-MA	17.11***	(5.589)	– 1.751	(– 0.529)
Saint Louis-East Saint Louis-Alton, MO-IL	0.0268	(0.012)	– 1.460	(– 0.483)
Seattle-Tacoma, WA	8.656***	(4.005)	6.513**	(2.621)
Constant	23.43***	(16.768)	33.71***	(19.394)
Adjusted R^2	0.3993		0.2179	
N	28,232		12,383	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. For owner's equation, the dependent variable is Box-Cox transformation value (lambda = 0.3) of the property value. For renter's equation, the dependent variable is Box Cox transformation value (lambda = 0.6) of the gross rent.*

Exhibit A7.3

Hedonic Price Regressions for Renters and Owners, 1989

	(1) Owners		(2) Renters	
btyear	– 0.0316***	(– 5.136)	– 0.0956***	(– 13.474)
cellar	4.811***	(17.738)	– 0.227	(– 0.425)
garage	8.983***	(33.255)	4.790***	(14.663)
rooms	3.337***	(30.894)	2.130***	(11.187)
bedrms	0.324	(1.665)	– 0.733**	(– 2.579)
baths	6.952***	(32.274)	7.463***	(20.155)
airsys	4.195***	(15.778)	7.029***	(19.890)
cracks	– 1.682*	(– 2.521)	– 1.766***	(– 3.408)
bigp	– 0.769	(– 1.097)	– 1.357*	(– 2.382)
ifblow	0.593*	(2.153)	0.952**	(2.958)
ifsew	– 1.274	(– 1.561)	– 1.075	(– 1.283)
ifdry	– 0.763	(– 1.296)	0.764	(1.359)
howh	1.257***	(15.199)	– 0.355***	(– 4.652)
hown	0.750***	(11.068)	0.379***	(6.072)
ccity	1.275***	(4.936)	0.506	(1.846)
Northeast	12.20***	(29.245)	13.64***	(25.937)
Midwest	– 2.479***	(– 7.692)	4.310***	(10.720)
West	13.54***	(35.570)	12.83***	(28.222)
Boston-Lawrence-Salem, MA-NH	21.82***	(22.024)	13.70***	(13.514)
Buffalo-Niagara Falls, NY	– 7.937***	(– 4.388)	– 10.64***	(– 5.786)
Dallas-Fort Worth, TX	2.691*	(2.401)	3.699***	(3.511)
Denver-Boulder, CO	– 8.602***	(– 6.349)	– 5.535***	(– 3.799)
Hartford_New Britain-Middletown, CT	17.07***	(8.838)	7.787***	(3.662)
Los Angeles-Anaheim-Riverside, CA	19.04***	(30.301)	12.17***	(19.953)
Miami-Fort Lauderdale, FL	11.28***	(11.058)	12.81***	(11.583)
New York-Northern New Jersey-Long Island, NY-NJ-CT	21.76***	(38.910)	10.58***	(17.625)
Pittsburgh-Beaver Valley, PA	– 14.14***	(– 11.255)	– 6.104***	(– 3.660)
Portland-Vancouver, OR-WA	– 12.86***	(– 8.318)	– 0.875	(– 0.572)
Providence-Pawtucket-Fall River, RI-MA	11.35***	(6.434)	– 0.488	(– 0.304)
Saint Louis-East Saint Louis-Alton, MO-IL	2.329	(1.798)	– 2.361	(– 1.635)
Seattle-Tacoma, WA	– 1.709	(– 1.450)	2.866*	(2.354)
Constant	29.31***	(34.759)	30.06***	(34.123)
Adjusted R^2	0.4536		0.3103	
N	28,505		14,699	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. For owner's equation, the dependent variable is Box-Cox transformation value (lambda = 0.3) of the property value. For renter's equation, the dependent variable is Box Cox transformation value (lambda = 0.6) of the gross rent.*

Exhibit A8.1

Descriptive Statistics for Permanent Income Models, 2013

	Pooled		Renters		Owners	
	mean	sd	mean	sd	mean	sd
bc_zinc2	470.5985	235.4490	378.5215	188.1332	521.8439	243.4096
educ1	0.0703	0.2557	0.0973	0.2963	0.0550	0.2280
educ2	0.2564	0.4366	0.2660	0.4419	0.2509	0.4336
educ3	0.2850	0.4514	0.2976	0.4572	0.2778	0.4479
educ4	0.2000	0.4000	0.1700	0.3756	0.2170	0.4122
educ5	0.1252	0.3310	0.0823	0.2748	0.1496	0.3567
age1424	0.0353	0.1845	0.0843	0.2778	0.0075	0.0861
age2529	0.0668	0.2496	0.1305	0.3369	0.0305	0.1720
age3034	0.0832	0.2762	0.1267	0.3327	0.0585	0.2347
age3544	0.1752	0.3801	0.2088	0.4065	0.1561	0.3630
age4554	0.1960	0.3969	0.1747	0.3798	0.2080	0.4059
age5564	0.1956	0.3967	0.1308	0.3372	0.2325	0.4224
age6574	0.1318	0.3383	0.0742	0.2621	0.1646	0.3708
hhgender	0.5121	0.4999	0.4492	0.4974	0.5478	0.4977
hhmar	0.4884	0.4999	0.2946	0.4559	0.5985	0.4902
cars	1.2549	0.9316	0.9178	0.8112	1.4464	0.9412
Black	0.1434	0.3504	0.2223	0.4158	0.0985	0.2980
Hispanic	0.1322	0.3387	0.2049	0.4037	0.0909	0.2874
Asian	0.0463	0.2102	0.0581	0.2340	0.0396	0.1951
othrace	0.2121	0.4088	0.3138	0.4641	0.1543	0.3613
west	0.1677	0.3736	0.2062	0.4046	0.1583	0.3651
south	0.2744	0.4462	0.2393	0.4267	0.2718	0.4449
midwest	0.2829	0.4504	0.2530	0.4347	0.2990	0.4578
frstho					0.5540	0.4971
downpay					0.8969	0.3041

Exhibit A8.2

Descriptive Statistics for Permanent Income Models, 2005

	Pooled		Renters		Owners	
	mean	sd	mean	sd	mean	sd
bc_zinc2	436.4449	219.8511	333.8073	169.3104	481.6365	224.3100
educ1	0.0870	0.2819	0.1170	0.3214	0.0738	0.2615
educ2	0.2715	0.4447	0.2770	0.4476	0.2691	0.4435
educ3	0.2816	0.4498	0.2844	0.4512	0.2803	0.4492
educ4	0.1830	0.3867	0.1505	0.3575	0.1973	0.3980
educ5	0.1020	0.3026	0.0631	0.2432	0.1191	0.3239
age1424	0.0528	0.2236	0.1338	0.3405	0.0171	0.1297
age2529	0.0721	0.2587	0.1400	0.3470	0.0422	0.2011
age3034	0.0860	0.2803	0.1196	0.3245	0.0712	0.2571
age3544	0.2043	0.4032	0.2105	0.4077	0.2015	0.4012
age4554	0.2114	0.4083	0.1574	0.3642	0.2351	0.4241
age5564	0.1603	0.3669	0.0959	0.2945	0.1886	0.3912
age6574	0.1051	0.3067	0.0592	0.2359	0.1254	0.3312
hhgender	0.5587	0.4965	0.4600	0.4984	0.6022	0.4895
hhmar	0.5310	0.4990	0.2908	0.4541	0.6368	0.4809
cars	1.2004	0.9121	0.8915	0.7889	1.3364	0.9294
Black	0.1137	0.3175	0.1879	0.3906	0.0810	0.2729
Hispanic	0.1110	0.3142	0.1791	0.3835	0.0810	0.2729
Asian	0.0330	0.1787	0.0431	0.2031	0.0286	0.1666
othrace	0.1687	0.3745	0.2658	0.4418	0.1259	0.3318
west	0.2031	0.4023	0.2553	0.4360	0.2030	0.4023
south	0.3798	0.4853	0.3250	0.4684	0.3623	0.4807
midwest	0.2291	0.4203	0.2010	0.4008	0.2486	0.4322
frstho					0.5801	0.4935
downpay					1.5797	1.9293

Exhibit A8.3

Descriptive Statistics for Permanent Income Models, 1989

	Pooled		Renters		Owners	
	mean	sd	mean	sd	mean	sd
bc_zinc2	341.8561	148.7028	283.7751	123.4257	372.3175	151.7351
educ1	0.0849	0.2787	0.1016	0.3021	0.0761	0.2652
educ2	0.3549	0.4785	0.3581	0.4795	0.3532	0.4780
educ3	0.1864	0.3894	0.1954	0.3966	0.1816	0.3855
educ4	0.1345	0.3411	0.1249	0.3306	0.1395	0.3465
educ5	0.1042	0.3055	0.0781	0.2684	0.1178	0.3224
age1424	0.0496	0.2172	0.1228	0.3282	0.0113	0.1056
age2529	0.0946	0.2926	0.1735	0.3787	0.0532	0.2245
age3034	0.1157	0.3198	0.1608	0.3673	0.0920	0.2891
age3544	0.2187	0.4134	0.2139	0.4100	0.2213	0.4151
age4554	0.1570	0.3638	0.1103	0.3133	0.1815	0.3855
age5564	0.1386	0.3456	0.0736	0.2612	0.1727	0.3780
age6574	0.1328	0.3393	0.0725	0.2593	0.1644	0.3706
hhgender	0.6723	0.4694	0.5487	0.4976	0.7370	0.4403
hhmar	0.6864	0.4640	0.4475	0.4973	0.8116	0.3910
cars	-0.7427	4.2039	0.2544	2.7316	0.9617	2.4533
Black	0.1077	0.3100	0.1678	0.3737	0.0762	0.2653
Hispanic	0.0642	0.2452	0.1062	0.3082	0.0422	0.2011
Asian	0.0209	0.1432	0.0307	0.1724	0.0158	0.1249
othrace	0.1382	0.3451	0.2167	0.4120	0.0970	0.2959
west	0.2055	0.4040	0.2443	0.4297	0.1931	0.3947
south	0.3376	0.4729	0.2956	0.4563	0.3390	0.4734
midwest	0.2361	0.4246	0.2174	0.4125	0.2561	0.4365
frstho					0.3490	0.4767
downpay					0.9256	0.2625

Exhibit A9.1

Permanent Income Regressions, 2013

	(1) Pooled		(2) Renters		(3) Owners	
educ1	10.78	(1.708)	0.359	(0.047)	10.18	(0.979)
educ2	50.45***	(9.672)	42.39***	(6.480)	39.92***	(4.736)
educ3	86.79***	(16.565)	69.61***	(10.518)	74.59***	(8.853)
educ4	171.9***	(31.264)	147.1***	(20.514)	155.6***	(17.887)
educ5	235.6***	(40.300)	195.2***	(23.568)	224.1***	(24.869)
age1424	14.55*	(2.057)	32.95***	(3.878)	64.05**	(2.986)
age2529	55.57***	(9.932)	76.07***	(9.809)	107.2***	(10.190)
age3034	85.07***	(16.259)	99.66***	(12.843)	128.3***	(15.486)
age3544	105.0***	(23.946)	88.79***	(12.327)	153.9***	(24.417)
age4554	109.1***	(25.507)	76.34***	(10.408)	149.9***	(25.336)
age5564	85.02***	(20.021)	47.10***	(6.217)	112.8***	(19.727)
age6574	25.49***	(5.604)	18.12*	(2.151)	31.72***	(5.248)
hhgender	31.97***	(13.635)	37.78***	(11.398)	26.30***	(7.737)
hhmar	110.5***	(44.176)	58.76***	(15.692)	110.0***	(29.907)
west	– 22.23***	(-6.346)	– 21.10***	(– 4.465)	-20.67***	(– 3.945)
south	– 37.89***	(– 12.197)	– 33.46***	(– 7.441)	– 52.17***	(– 11.381)
midwest	– 34.92***	(– 11.450)	– 41.41***	(– 9.272)	– 44.21***	(– 9.976)
cars	49.40***	(37.856)	45.03***	(21.314)	38.68***	(21.284)
Black	– 13.61	(– 1.660)	– 16.55	(– 1.729)	6.850	(0.488)
Hispanic	– 35.37***	(– 9.670)	– 12.22**	(– 2.728)	– 29.82***	(– 4.976)
Asian	10.14	(1.091)	1.371	(0.122)	23.36	(1.534)
othrace	– 38.67***	(– 5.027)	– 17.73*	(– 1.963)	– 35.68**	(– 2.755)
frstho					49.96***	(14.166)
downpay					31.88***	(5.859)
_cons	201.6***	(33.830)	198.7***	(23.824)	175.0***	(16.594)
adj. R^2	0.3669		0.2797		0.3561	
N	24,632		9,905		14,727	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable is the Box-Cox transformation value (lambda = 0.5) of the household income.*

Exhibit A9.2

Permanent Income Regressions, 2005

	(1) Pooled		(2) Renters		(3) Owners	
educ1	14.32***	(3.301)	2.361	(0.431)	17.93**	(2.898)
educ2	54.18***	(14.675)	42.42***	(8.886)	48.13***	(9.254)
educ3	89.65***	(24.057)	64.59***	(13.324)	81.96***	(15.617)
educ4	170.4***	(42.950)	129.6***	(23.949)	160.8***	(29.258)
educ5	220.4***	(50.678)	156.6***	(23.613)	213.7***	(36.599)
age1424	13.08**	(2.836)	16.67**	(2.886)	88.38***	(8.991)
age2529	68.51***	(16.288)	63.99***	(11.159)	128.1***	(19.751)
age3034	95.78***	(23.830)	76.80***	(12.971)	141.4***	(26.067)
age3544	120.3***	(36.016)	77.27***	(14.389)	160.1***	(37.905)
age4554	120.6***	(36.377)	64.50***	(11.602)	153.9***	(37.592)
age5564	84.36***	(24.456)	41.29***	(6.804)	104.6***	(24.914)
age6574	22.37***	(5.998)	– 7.063	(– 1.037)	33.25***	(7.411)
hhgender	28.16***	(15.376)	40.82***	(15.641)	20.97***	(8.684)
hhmar	106.8***	(55.806)	61.69***	(20.945)	95.55***	(37.208)
west	– 0.00381	(– 0.001)	0.198	(0.052)	– 7.081	(– 1.952)
south	– 24.38***	(– 10.038)	– 26.18***	(– 7.418)	– 38.44***	(– 11.954)
midwest	– 21.68***	(– 8.243)	– 29.84***	(– 7.534)	– 35.07***	(– 10.319)
cars	39.40***	(39.735)	42.92***	(25.405)	29.56***	(24.028)
Black	– 18.13**	(– 2.853)	– 11.76	(– 1.573)	– 14.79	(– 1.538)
Hispanic	– 26.74***	(– 9.028)	– 8.275*	(– 2.236)	– 19.46***	(– 4.558)
Asian	– 10.42	(– 1.389)	– 12.09	(– 1.311)	– 8.982	(– 0.821)
othrace	– 26.19***	(– 4.464)	– 16.49*	(– 2.370)	– 4.993	(– 0.567)
frstho					40.04***	(16.618)
downpay					– 4.126***	(– 7.136)
_cons	165.6***	(37.906)	171.9***	(28.010)	179.0***	(29.036)
adj. R^2	0.3569		0.2782		0.3350	
N	40,771		13,029		27,742	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable is the Box-Cox transformation value (lambda = 0.5) of the household income.*

Exhibit A9.3

Permanent Income Regressions, 1989

	(1) Pooled		(2) Renters		(3) Owners	
educ1	10.23***	(4.269)	3.505	(1.019)	11.94**	(3.242)
educ2	40.05***	(21.804)	33.77***	(12.298)	39.05***	(14.043)
educ3	65.42***	(31.540)	46.13***	(14.899)	67.58***	(21.336)
educ4	108.9***	(48.568)	87.77***	(25.585)	108.5***	(31.233)
educ5	131.9***	(55.415)	99.94***	(25.833)	133.5***	(36.840)
age1424	21.89***	(6.863)	17.73***	(4.216)	56.61***	(7.593)
age2529	60.06***	(22.423)	51.88***	(13.049)	87.20***	(19.828)
age3034	81.82***	(32.020)	61.38***	(15.372)	105.4***	(26.720)
age3544	94.92***	(41.036)	66.77***	(17.383)	106.0***	(30.102)
age4554	105.3***	(43.665)	65.46***	(15.688)	119.2***	(33.121)
age5564	73.96***	(30.996)	43.80***	(9.941)	80.50***	(22.953)
age6574	15.71***	(6.726)	6.105	(1.415)	20.68***	(6.031)
hhgender	41.99***	(33.046)	35.50***	(19.989)	38.87***	(18.977)
hhmar	46.08***	(34.533)	26.22***	(14.261)	34.68***	(15.491)
west	– 14.04***	(– 8.451)	– 15.12***	(– 6.354)	– 16.91***	(– 6.188)
south	– 28.72***	(– 19.236)	– 31.54***	(– 13.917)	– 34.97***	(– 14.919)
midwest	– 29.55***	(– 18.667)	– 37.26***	(– 15.373)	– 34.07***	(– 13.962)
cars	42.90***	(64.672)	42.52***	(37.928)	34.70***	(34.449)
Black	11.96*	(2.044)	0.464	(0.071)	28.64**	(2.661)
Hispanic	– 15.82***	(– 6.847)	– 11.22***	(– 3.904)	– 5.379	(– 1.347)
Asian	24.81***	(3.686)	– 6.961	(– 0.897)	56.64***	(4.656)
othrace	– 40.71***	(– 7.244)	– 22.86***	(– 3.676)	– 45.61***	(– 4.375)
frstho					14.90***	(8.173)
downpay					23.73***	(8.792)
_cons	128.2***	(50.322)	151.2***	(38.624)	123.3***	(25.815)
adj. R^2	0.4150		0.3318		0.3872	
N	34,308		15,414		18,894	

*Notes: t-statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001. The dependent variable is the Box-Cox transformation value (lambda = 0.5) of the household income.*

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Black-White and Hispanic Segregation Magnitudes and Trends from the 2016 American Community Survey

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Abstract

This article takes a fresh look at the incidence of Black-White and Hispanic-Non-Hispanic segregation across metropolitan America using 5-year estimates from the 2016 American Community Survey (ACS). Until recently, researchers had to wait for the publication of the Decennial Census for this type of data, but in 2015, the Census Bureau added census tract-level tabulations of demographic and economic data to the ACS, making it possible to track neighborhood and metropolitan-level changes at more frequent intervals. This analysis adds to the discussion about residential segregation and opportunity in five ways. First, as noted above, it is as up-to-date as the data will allow, and employs two complementary (rather than substitutable) measures of residential segregation. Second, it considers Black-White and Hispanic-non-Hispanic segregation in parallel, gaining mutual insights from each. Third and most important, it is undertaken at the metropolitan scale, the geography at which today's housing markets function. Fourth, it considers variations in segregation levels by metropolitan area size, something that has not been done before. Lastly, it looks at the associations between changes in residential segregation levels between 2000 and 2016 and various measures of metropolitan growth, demographic composition, residential mobility, and land use regulatory regimes.

Notwithstanding today's politically charged times, most Americans continue to believe that racial, ethnic, and gender discrimination are fundamentally wrong, and that governments at all levels have an affirmative responsibility to enforce anti-discrimination laws.[1] This responsibility is enshrined in the 14th Amendment to the U.S. Constitution, which was enacted in 1868, and the Civil Rights Act

1 The Institute of Government and Public Affairs at the University of Illinois has compiled the results of national surveys summarizing Americans' attitudes toward race from the 1940s until the present. A digest of those results is available at https://igpa.uillinois.edu/programs/racial-attitudes.

of 1964, the Voting Rights Act of 1965, the Equal Employment Opportunity Act of 1972, and the Fair Housing Acts of 1968 and 1988.

Unfortunately, when it comes to housing, this responsibility has all too frequently been ignored. Longstanding works by Logan and Schneider (1984); Jackson (1987); Massey and Denton (1993); Farley and Frey (1994); Yinger (1995); Logan, Stults, and Farley (2004); Ross and Turner (2005); and Reardon, et al. (2008); and more recent works by Glaeser and Vigdor (2012), Sugrue (2014), and Rothstein (2017) have documented how America's federal housing and mortgage programs have too often been administered in a racially discriminatory manner resulting in a substantial worsening of residential segregation. Still, as the results of a series of national fair housing audits conducted in 1977, 1989, 2000, and 2012 indicate, the incidence of all forms of housing discrimination has declined significantly during the past 40 years (Oh and Yinger, 2015).

This decline in housing discrimination has been accompanied by a slower fall-off in residential segregation (Krysan and Crowder, 2017). Nationally, the Black-White dissimilarity index, a measure of how many resident households of U.S. metropolitan areas would have to move to achieve complete Black-White integration, has declined from its all-time high of .73 in 1980 (Iceland and Weinberg, 2002), to .47 in 2016. While several U.S. cities remain "hyper-segregated" along Black-White lines—defined as a dissimilarity index value of .70 or higher—most U.S. cities and metropolitan areas have witnessed notable declines in Black-White segregation since 1990. Unfortunately, the same cannot be said for Latinos, for whom residential segregation is generally on the upswing: among the United States' more than 360 metropolitan areas, the average Hispanic dissimilarity index value[2] rose from .31 in 2000 to .35 in 2016.

The assumption when looking at these trends is that reduced residential segregation is automatically a good thing. Well before its landmark 1954 ruling in *Brown v. Board of Education*[3] in which the U.S. Supreme Court unanimously declared racially segregated schools to be inherently unequal and therefore a violation of the 14th Amendment's Equal Protection Clause, the federal courts have looked at housing discrimination as a fundamental societal ill requiring active government intervention to remedy.[4]

The key question, of course, is *how* active? For the most part, the federal courts have left this question to the states, which except for the New Jersey Supreme Court in its three Mt. Laurel decisions (Massey, et al., 2013), have largely stayed on the sidelines. This is why the Supreme Court's recent 5-4 decision in *Texas Dept. of Housing and Community Affairs v. Inclusive Communities Project, Inc.*[5] to re-enter the segregated housing field—and its finding that well-intended government housing programs which had the effect of generating a "disparate racial impact" constituted a violation of the Fair Housing Act—was such a surprise. Following up on the

2 Comparing the numbers and locations of census respondents who self-identified as "Hispanic" or "Latino" to those who did not identify as such.

3 *Brown v. Board of Education of Topeka*, 347 U.S. 483 (1954).

4 The U.S. Supreme Court ruled racially-restrictive zoning to be unconstitutional in *Buchanan v. Warley* in 1917 (*Buchanan v. Warley*, 245 U.S. 60 (1917)), and racially restrictive covenants to be unconstitutional in *Shelley v. Kraemer* in 1948 (*Shelley v. Kraemer*, 334 US 1 (1948)).

5 *Texas Dept. of Housing and Community Affairs v. Inclusive Communities Project, Inc.*, 576 US 1 (2015).

Supreme Court's decision, the Obama Administration promulgated the Affirmatively Furthering Fair Housing Rule (AFFH) requiring cities and towns receiving federal housing and community development funds to identify the extent of residential segregation in their communities, to determine whether and how local policies might be worsening residential segregation, and to create plans to affirmatively reduce fair housing barriers (HUD, 2015). HUD's original due date for these AFFH plans of January 2018 has since been extended by Trump Administration HUD Secretary Ben Carson until after 2020.[6]

At the heart of the Supreme Court's reasoning in the *Texas Dept. of Housing and Community Affairs* case is the view that racially segregated housing markets continue to constitute a threat to individual and community welfare. This was certainly the case in 1968 when The United States National Advisory Commission on Civil Disorders, (better known as the Kerner Commission) issued its warning that worsening residential discrimination and segregation were putting the United States on a path to becoming "two societies, one black, one white—separate and unequal" (Report Summary, Chapter 17, 1968). Indeed, it was the Kerner Commission's strong condemnation of residential segregation as the principal cause of the nation's urban riots, and the subsequent assassination of Dr. Martin Luther King Jr. that encouraged an otherwise indifferent Congress to enact the Fair Housing Act of 1968.

The argument that living in a segregated neighborhood adversely affects individual outcomes is mostly borne out by the available data. A series of articles by James Rosenbaum and colleagues (1995; 2002; 2005) pointed to the generally salutary effect of the Gautreaux court decree, which enabled African-American residents of segregated public housing projects in Chicago to move to integrated suburban communities. A 2005 Brookings collection by de Souza-Briggs entitled *The Geography of Opportunity: Race and Housing Choice in Metropolitan America*, reviewed the many connections between government housing policy-segregated housing markets and reduced economic and social opportunity. More recently, a series of longitudinal studies by Chetty, Hendren, and others (2014; 2016; 2018) of children growing up in low-opportunity neighborhoods have pointed to residential segregation as the principal cause of the persistent gap in economic achievement levels between comparably educated African-Americans and Whites.

This article takes a fresh look at the incidence of Black-White and Hispanic-Non-Hispanic segregation across metropolitan America using 5-year estimates from the 2016 American Community Survey (ACS).[7] Until recently, researchers had to wait for the publication of the Decennial Census for this type of data. Fortunately, in 2015, the Census Bureau added census tract-level tabulations of demographic and economic data to the ACS, making it possible to track neighborhood and metropolitan-level changes at more frequent intervals. With such data in

6 https://www.hudexchange.info/programs/affh/

7 The Census Bureau now publishes three sets of ACS estimates: (1) 1-year estimates based on sample data collected over a 1-year period and covering places larger than 65,000 residents; (2) 3-year estimates based on sample data collected over a 3-year period and covering places larger than 20,000 residents; and (3) 5-year estimates based on sample data collected over a 5-year period and covering all places, including census tracts. Going forward, the 3-year series has been discontinued. Dollar values and ranges in multi-year ACS samples are adjusted for inflation. The Census Bureau samples the population by households. The national ACS sample is based on a sample factor of 1.6 percent. State sample factors vary from a low of 1.3 percent in Florida, Georgia, Texas, and Mississippi, to a high of 2.7 percent in Minnesota, Wisconsin, and Alaska.

hand, it is now possible to look past simple averages and trends at the full range of contemporary metropolitan segregation patterns and outcomes.

This was not the case 40 years ago when minority populations were limited to central cities and when suburban municipalities routinely relied on a combination of restrictive zoning, realtor steering, and discriminatory mortgage lending to exclude Black and Hispanic residents. Such practices, although hardly unknown, are far less common today. Precisely because the incidence of discriminatory practices has been so substantially reduced—although by no means eliminated—today's Black and Hispanic households seeking to improve their housing and neighborhood conditions have many more geographic options than did their counterparts a generation ago. Whether they can take advantage of those options in a manner that reduces residential segregation or contributes to a reduction in poverty or an increase in housing affordability is the subject of this article.

This analysis adds to the discussion about residential segregation and opportunity in four ways. First, as noted earlier, it is as up-to-date as the data will allow, and employs two complementary (rather than substitutable) measures of residential segregation. Second, it considers Black-White and Hispanic-non-Hispanic segregation in parallel, gaining mutual insights from each. Third and most important, it is undertaken at the metropolitan scale, the geography at which today's housing markets function. Currently, the United States has 383 metropolitan areas. Lastly, it considers variations in segregation levels by metropolitan area size, something that has not been done before.

The great strength of this analysis, its comprehensive and comparative focus on metropolitan-level indices and outcomes, is also its Achilles' heel. Today's housing and labor markets function at a metropolitan scale, but the outcomes generated by those markets are mostly experienced at an individual, household, or neighborhood level. For the Latino high school graduate unable to find a good job within easy commuting distance, or for the poor African-American family looking for a nearby affordable rental unit, the fact that their metropolitan area is less segregated along Black-White or Hispanic lines than most is irrelevant. What matters is how the forces of discrimination and segregation affect them in their neighborhood.

The remainder of this brief article is organized into three parts. Part I looks at the current state of Black-White and Hispanic segregation among America's 383 metropolitan areas using two complementary measures of residential segregation: dissimilarity indices, and Moran's I, a measure of spatial autocorrelation. Part II uses regression analysis to explore some of the metropolitan-scale factors most associated with changes in Black-White and Hispanic segregation since the year 2000. Part III concludes with a summary of the major findings and their implications for federal, state, and local residential integration policy.

A few notes on measurement before we get to our key findings. Following the literature, the principle measure of residential segregation used in this article is the *dissimilarity index*, or DI.[8] DIs combine small area (for example, census tracts or zip code districts) differences in racial

8 The basic formula for the index of dissimilarity comparing two groups, A and B is: $\frac{1}{2} * \sum_i (| a_i/A - b_i/B |)$ where a_i is the population of group A in the *i*-th area; A is the total population of group A; b_i = the population of group B in the *i*-th area; and B is the total population of group B.

or demographic makeup to generate larger area (for example, city- or metropolitan area-level) summaries of residential segregation. DIs vary between 0 and 1: a DI value of 0 indicates complete integration whereas a value of 1 indicates complete segregation. DIs are easy to compute. Because they are linear, they are easy to interpret—a DI of .5 means one-half the population would have to move to achieve an integrated outcome; a value of .75 means that three-fourths of residents would have to move.[9]

Dissimilarity indices have limitations. They can only be used to compare segregation across two groups (for example, Blacks versus Whites or Hispanics versus non-Hispanics), and they can be less than reliable when used in highly diverse communities. To get around this problem, this article has both Black-White DIs and Hispanic-Non-Hispanic DIs.[10] This use of dichotomous groupings oversimplifies internal differences within groups. For example, although most African-Americans identify themselves as being Black or of mixed race, not all Cuban-Americans see themselves as being within the same Hispanic ethnic group as Puerto Ricans or Mexican-Americans—although the Census Bureau reports them as such. For many Hispanics, immigration status is more important than ethnicity.

Dissimilarity indices summarize segregation. They do not measure spatial concentrations. To understand the difference, consider the following example. In metropolitan area A, the White population is dispersed on the east side of town while the Black population is dispersed on the west side. In metropolitan area B, the Black population is concentrated in the central city while the White population is dispersed throughout the suburbs. Both metropolitan area A and B are highly segregated and have similar DI values, but in metropolitan area B, the Black population is also spatially clustered.

To measure spatial concentrations, or more precisely, the degree to which population characteristics are spatially auto-correlated, geographers use a statistic known as *Moran's I*.[11] Moran's I typically varies between -1 and +1: a Moran's I value of 1 indicates that a population or activity is completely concentrated at one point in space; a Moran's I value of 0 indicates that a population or activity is located randomly in space, whereas a Moran's I value of -1 indicates complete dispersal—that the population or activity is distributed along the edge of the space of interest. Moran's I values follow a statistical distribution, meaning that their statistical significance can be assessed. For most urban activities, Moran's

9 Researchers have proposed numerous segregation measures in addition to the dissimilarity index. These can be grouped into exposure measures (including the dissimilarity index, the isolation index, and the entropy index), concentration measures (including Massey and Denton's absolute concentration index), centrality measures, and clustering measures. Exposure and concentration measure values tend to have similar magnitudes, which are different from centrality and clustering values. The Census Bureau (https://www.census.gov/hhes/www/housing/resseg/pdf/app_b.pdf) identifies and compares 17 such measures.

10 Following Census Bureau practice, this article will refer to census respondents who identify themselves as either Hispanic or Latino as Hispanic.

11 Moran's I is defined as

$$I = \frac{N}{W} \frac{\Sigma_i \, E_j \, w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\Sigma_i (x_i - \bar{x})^2}$$

Where N is the number of spatial units indexed by i and j; x is the variable of interest; $\bar{x}$ is the mean of x; w_{ij} is a matrix of spatial weights with zeroes on the diagonal (i.e. $w_{ii} = 0$); and W is the sum of all w_{ij}.

I values fall between -.1 and +.3. Values greater than .5 indicate extreme spatial concentration, or, in the language of sociologists, the presence of a ghetto. Readers should exercise caution in interpreting Moran's I values: unlike dissimilarity index values, Moran's I values are not linear.

Finally, readers should remember that all measures calculated from the American Community Survey are based on counts from a sample survey, not a comprehensive census. This means that they are subject to the problem of sampling error, especially in smaller census tracts (Napierala and Denton, 2017). Measures and indices constructed from ACS data should therefore be interpreted with caution, especially when observed differences over time and space are small.

I. Current Black-White and Hispanic Segregation Levels Among U.S. Metropolitan Areas

To orient readers to the extent of segregation in America, this study starts the way many segregation studies do: with listings of the nation's most segregated metropolitan areas. Because segregation varies by metropolitan area size—larger metropolitan areas are consistently more segregated than smaller ones—the author divides the listings into three metropolitan area size categories: (1) exhibit 1 includes large metropolitan areas with more than one million residents in 2016; (2) exhibit 2 includes mid-sized metropolitan areas having a 2016 population between 250,000 and 1 million; and (3) exhibit 3 includes small metropolitan areas with fewer than 250,000 residents in 2016. Each exhibit lists the 25 most segregated metropolitan areas in each metropolitan area size category as well as the category average. Dissimilarity index values are listed for 2000 and 2016, whereas Moran's I statistics are listed just for 2016. Black-White values are listed in the top block of each exhibit; Hispanic values are listed in the bottom block.

Exhibit 1A

Top 25 Large Metro Areas Ranked by 2000 and 2016 Black-White Segregation Measures

Large Metro Areas: 2016 Population gt. 1 million	2000 Black-White Dissimilarity Index Value	Large Metro Areas: 2016 Population gt. 1 million	2016 Black-White Dissimilarity Index Value	Large Metro Areas: 2016 Population gt. 1 million	2016 Moran's I for Black Share of Tract Population
Detroit, MI	0.86	Milwaukee, WI	0.79	Detroit, MI	0.88
Milwaukee, WI	0.82	Detroit, MI	0.73	Milwaukee, WI	0.76
Chicago, IL-IN-WI	0.79	Chicago, IL-IN-WI	0.72	Jacksonville, FL	0.71
Buffalo, NY	0.79	Greater New York, NY-NJ	0.71	Washington, DC-VA-MD	0.67
Cleveland, OH	0.78	Cleveland, OH	0.71	Providence, RI-MA	0.66
Greater New York, NY-NJ	0.75	St. Louis, MO-IL	0.71	Philadelphia, PA-NJ-DE	0.66
St. Louis, MO-IL	0.74	Buffalo, NY	0.70	Baltimore, MD	0.65
Cincinnati, OH-KY-IN	0.73	Cincinnati, OH-KY-IN	0.65	Atlanta, GA	0.61
Indianapolis, IN	0.71	Pittsburgh, PA	0.65	Boston, MA-NH	0.60
Philadelphia, PA-NJ-DE	0.70	Philadelphia, PA-NJ-DE	0.65	Indianapolis, IN	0.60
Kansas City, MO-KS	0.70	Boston, MA-NH	0.63	Orlando, FL	0.57
Memphis, TN-MS-AR	0.69	Baltimore, MD	0.63	Tampa-St. Petersburg, FL	0.57
New Orleans, LA	0.69	Indianapolis, IN	0.62	Cleveland, OH	0.55
Baltimore, MD	0.69	New Orleans, LA	0.62	St. Louis, MO-IL	0.53
Pittsburgh, PA	0.68	Memphis, TN-MS-AR	0.61	Nashville, TN	0.52
Boston, MA-NH	0.67	Miami-Ft. Lauderdale, FL	0.60	Charlotte, NC-SC	0.52
Miami-Ft. Lauderdale, FL	0.66	Washington, DC-VA-MD	0.59	Pittsburgh, PA	0.51
Los Angeles-Long Beach, CA	0.64	Denver, CO	0.59	Louisville, KY-IN	0.50
Atlanta, GA	0.63	Kansas City, MO-KS	0.57	Columbus, OH	0.48
San Francisco-Oakland, CA	0.63	Columbus, OH	0.56	Raleigh, NC	0.45
Louisville, KY-IN	0.63	Atlanta, GA	0.56	San Diego, CA	0.42
Washington, DC-VA-MD	0.63	Louisville, KY-IN	0.56	Cincinnati, OH-KY-IN	0.41
Columbus, OH	0.63	Providence, RI-MA	0.55	Denver, CO	0.40
Tampa-St. Petersburg, FL	0.62	San Francisco-Oakland, CA	0.55	Chicago, IL-IN-WI	0.38
Denver, CO	0.62	Minneapolis-St. Paul, MN	0.53	Buffalo, NY	0.38
Large Metro Average (N=48)	**0.61**	**Large Metro Average (N=48)**	**0.55**	**Large Metro Average (N=48)**	**0.39**

Exhibit 1B

Top 25 Large Metro Areas Ranked by 2000 and 2016 Hispanic Segregation Measures

Large Metro Areas: 2016 Population gt. 1 million	2000 Hispanic Dissimilarity Index Value	Large Metro Areas: 2016 Population gt. 1 million	2016 Hispanic Dissimilarity Index Value	Large Metro Areas: 2016 Population gt. 1 million	2016 Moran's I for Hispanic Share of Tract Population
Providence, RI-MA	0.60	Providence, RI-MA	0.56	Miami-Ft. Lauderdale, FL	0.71
Chicago, IL-IN-WI	0.59	Milwaukee, WI	0.54	Providence, RI-MA	0.69
Boston, MA-NH	0.56	Boston, MA-NH	0.53	Milwaukee, WI	0.67
Cleveland, OH	0.56	Chicago, IL-IN-WI	0.53	Tampa-St. Petersburg, FL	0.56
Milwaukee, WI	0.56	Miami-Ft. Lauderdale, FL	0.52	San Jose, CA	0.56
Miami-Ft. Lauderdale, FL	0.56	Cleveland, OH	0.51	San Antonio, TX	0.52
Greater New York, NY-NJ	0.53	Los Angeles-Long Beach, CA	0.51	San Diego, CA	0.50
Philadelphia, PA-NJ-DE	0.52	Greater New York, NY-NJ	0.48	Philadelphia, PA-NJ-DE	0.49
Los Angeles-Long Beach, CA	0.52	Philadelphia, PA-NJ-DE	0.48	Orlando, FL	0.46
Phoenix, AZ	0.49	Detroit, MI	0.47	Oklahoma City, OK	0.46
Buffalo, NY	0.49	Oklahoma City, OK	0.46	Boston, MA-NH	0.44
San Antonio, TX	0.47	Phoenix, AZ	0.45	Detroit, MI	0.38
Dallas-Fort Worth, TX	0.47	Memphis, TN-MS-AR	0.45	Charlotte, NC-SC	0.38
Denver, CO	0.47	Denver, CO	0.45	Nashville, TN	0.36
Atlanta, GA	0.46	Buffalo, NY	0.43	Greater New York, NY-NJ	0.34
Houston, TX	0.45	Nashville, TN	0.43	Jacksonville, FL	0.32
San Jose, CA	0.45	Indianapolis, IN	0.43	Atlanta, GA	0.32
San Diego, CA	0.44	San Diego, CA	0.42	Indianapolis, IN	0.30
Detroit, MI	0.44	San Jose, CA	0.42	Austin, TX	0.28
Charlotte, NC-SC	0.42	Dallas-Fort Worth, TX	0.42	Cleveland, OH	0.27
Oklahoma City, OK	0.42	Richmond, VA	0.41	Denver, CO	0.26
Nashville, TN	0.42	Atlanta, GA	0.41	Houston, TX	0.26
Minneapolis-St. Paul, MN	0.41	Cincinnati, OH-KY-IN	0.41	Seattle, WA	0.25
Washington, DC-VA-MD	0.41	Houston, TX	0.40	Las Vegas, NV	0.25
Austin, TX	0.41	San Antonio, TX	0.40	Dallas-Fort Worth, TX	0.24
Large Metro Average (N=48)	**0.40**	**Large Metro Average (N=48)**	**0.41**	**Large Metro Average (N=48)**	**0.28**

As of 2016, the nation's 48 largest metropolitan areas included 55 percent of its African-American population and 62 percent of its Hispanic population. In the year 2000, the average Black-White dissimilarity index value among these 48 large metropolitan areas stood at .61. Eleven large metropolitan areas met the criterion of being hyper-segregated—meaning that their Black-White DI values exceeded .70. The set of hyper-segregated metropolitan areas was led by former industrial giants with shrinking central cities in the Midwest: notably Detroit, Milwaukee, Chicago, Buffalo, Cleveland, and St. Louis. The Greater New York City metropolitan area, which includes Newark and adjacent communities, Westchester County, Nassau and Suffolk counties on Long Island as well as New York City, also met the hyper-segregation threshold in 2000. Although a good number

of northeastern and southern metropolitan areas are also on the top 25 Black-White segregation list for 2000, the only western metropolitan areas to appear are Los Angeles-Long Beach, San Francisco-Oakland, and Denver.

Sixteen years later, by 2016, the African-American population of the country's largest metropolitan areas had grown by 21 percent, raising the African-American population share from 15 percent in 2000 to 15.6 percent in 2016. These increases were accompanied by a decrease in Black-White segregation, with the average Black-White dissimilarity index among large metropolitan areas declining from .61 in 2000 to .55 in 2016. Along similar lines, the roster of hyper-segregated large metropolitan declined from 11 to 7. The decline in Black-White DI values was widespread, with most large metropolitan areas experiencing DI value declines in the range of 4 to 8 points. Among the notable exceptions were Providence, where the DI value fell by only 1 point; and Milwaukee, St. Louis, and Pittsburgh, where DI values fell by just 3 points. On the positive side of the ledger, Black-White DI values fell by 13 points in Kansas City between 2000 and 2016, by 12 points in Detroit, and by 9 points in Indianapolis. Comparing regions, the largest Black-White DI value declines between 2000 and 2016 were among metropolitan areas in the West.

The third column in exhibit 1 lists metropolitan areas according to their Moran's I values. As noted previously, Moran's I is a non-linear measure of spatial autocorrelation, or the extent to which spatial entities with high characteristic values (for example Black population shares by census tract) are tightly clustered in space. Despite its limitations,[12] Moran's I is arguably a more reliable measure than the dissimilarity index of how residential segregation is personally experienced by minority populations. With a few notable exceptions, the top 25 list of large metros based on 2016 Moran's I values corresponds closely to the top 25 2016 list based on DI values. The major exceptions—metropolitan areas that appear on the 2016 Moran's I list but not on the DI list—are mostly in the South, and include Jacksonville, Orlando, Nashville, Charlotte, Raleigh, and San Diego. African-American residents of these metropolitan areas are likely to experience extreme spatial separation racial isolation from Whites, although the metropolitan area is not highly segregated along Black-White lines.

Turning to measurements of Hispanic segregation, the trends run in the opposite direction, with the average Hispanic DI among large U.S. metropolitan areas having risen modestly from .40 in 2000 to .41 in 2016. This increase was accompanied by a whopping 52-percent increase in the Hispanic population, bringing the Hispanic population share of large U.S. metros to 21.8 percent in 2016. Seven large metros had Hispanic DI values above .5 in 2016: Providence (.56), Milwaukee (.54), Boston (.53), Chicago (.53), Miami-Ft. Lauderdale (.52), Cleveland (.51), and Los Angeles-Long-Beach (.51). This number was down slightly from 2000, when nine large metropolitan areas, including these seven plus Greater New York City and Philadelphia had Hispanic DI values above .50. Milwaukee, Chicago, Greater New York, and Cleveland were also on the list of Black-White hyper-segregated metropolitan areas in 2016, giving them the dubious distinction of topping two 2016 segregation lists. Other large metros with high levels of Black-White and Hispanic segregation in 2016 included Detroit, Boston, Buffalo, and Indianapolis. Unlike the top 25 segregation list for African-Americans, the 2016 top 25 list for Hispanics was not dominated by any geographic region.

12 Estimated Moran's I values are sensitive to the number, area, and perimeter values of the spatial units included in the Moran's I calculation.

The list of large metros in which Hispanics were spatially concentrated in 2016 was notably different from the 2016 segregation list. Among the metropolitan areas with very high Hispanic Moran's I values in 2016 but with lower DI values were Tampa-St. Petersburg (Moran's I = .56), San Jose (.56), San Antonio (.52), San Diego (.50), and Orlando (.46). Among all large U.S. metropolitan areas, the average 2016 Hispanic Moran's I value stood at a relatively low .28.

Exhibit 2A

Top 25 Medium-sized Metro Areas by 2000 and 2016 Black-White Segregation Measures

Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2000 Black-White Dissimilarity Index Value	Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2016 Black-White Dissimilarity Index Value	Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2016 Moran's I for Black Share of Tract Population
Provo-Orem, UT	0.79	Peoria, IL	0.67	Lancaster, PA	1.05
Flint, MI	0.76	Flint, MI	0.66	York-Hanover, PA	0.84
McAllen, TX	0.75	Dayton, OH	0.65	Worcester, MA	0.84
Dayton, OH	0.73	Birmingham, AL	0.65	Bridgeport, CT	0.80
Syracuse, NY	0.71	Syracuse, NY	0.65	Hartford, CT	0.78
Youngstown, OH-PA	0.71	Youngstown, OH-PA	0.65	Portland, ME	0.76
York-Hanover, PA	0.71	Rochester, NY	0.64	Dayton, OH	0.75
Birmingham, AL	0.70	Harrisburg, PA	0.62	Flint, MI	0.73
Toledo, OH	0.70	Chattanooga, TN-GA	0.60	New Haven, CT	0.66
Chattanooga, TN-GA	0.69	Bridgeport, CT	0.60	Knoxville, TN	0.63
Harrisburg, PA	0.69	Jackson, MS	0.60	Harrisburg, PA	0.61
Cape Coral-Fort Myers, FL	0.69	Albany, NY	0.60	Rochester, NY	0.58
Fort Wayne, IN	0.69	Toledo, OH	0.60	Winston-Salem, NC	0.58
Rochester, NY	0.69	Grand Rapids, MI	0.60	Wilmington, NC	0.58
Peoria, IL	0.68	Columbus, GA-AL	0.59	Huntsville, AL	0.57
Sarasota, FL	0.67	Hartford, CT	0.59	Durham, NC	0.55
Scranton-Wilkes-Barre, PA	0.67	Sarasota, FL	0.59	Cape Coral-Fort Myers, FL	0.54
Omaha, NE-IA	0.66	Shreveport, LA	0.58	Syracuse, NY	0.54
Boise City-Nampa, ID	0.66	Omaha, NE-IA	0.58	Youngstown, OH-PA	0.53
Beaumont, TX	0.65	Scranton-Wilkes-Barre, PA	0.58	Akron, OH	0.52
Akron, OH	0.65	Cape Coral-Fort Myers, FL	0.58	Asheville, NC	0.51
Brownsville, TX	0.65	Springfield, MO	0.57	Poughkeepsie, NY	0.51
Mobile, AL	0.64	Wichita, KS	0.57	Birmingham, AL	0.48
Bridgeport, CT	0.64	Akron, OH	0.57	Daytona Beach, FL	0.48
Lancaster, PA	0.63	McAllen, TX	0.57	Trenton, NJ	0.46
Mid-sized Metro Average (N=103)	**0.54**	**Mid-sized Metro Average (N=103)**	**0.49**	**Mid-sized Metro Average (N=103)**	**0.34**

Exhibit 2B

Top 25 Medium-sized Metro Areas by 2000 and 2016 Hispanic Segregation Measures

Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2000 Hispanic Dissimilarity Index Value	Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2016 Hispanic Dissimilarity Index Value	Mid-sized Metro Areas: 2016 Population between 250,000 and 1 million	2016 Moran's I for Hispanic Share of Tract Population
Reading, PA	0.67	Reading, PA	0.62	Lancaster, PA	1.08
Lancaster, PA	0.60	Scranton-Wilkes-Barre, PA	0.56	Allentown, PA-NJ	0.75
Hartford, CT	0.58	Springfield, MA	0.55	Poughkeepsie, NY	0.74
Allentown, PA-NJ	0.57	Salinas, CA	0.54	York-Hanover, PA	0.68
Springfield, MA	0.57	Allentown, PA-NJ	0.53	Hartford, CT	0.68
York-Hanover, PA	0.57	Hartford, CT	0.51	Reading, PA	0.68
Salinas, CA	0.56	Oxnard, CA	0.50	Bridgeport, CT	0.67
Oxnard, CA	0.52	Montgomery, AL	0.48	Salinas, CA	0.67
Worcester, MA	0.52	Omaha, NE-IA	0.48	Daytona Beach, FL	0.64
New Haven, CT	0.50	Lancaster, PA	0.48	New Haven, CT	0.59
Bridgeport, CT	0.50	Grand Rapids, MI	0.47	Rochester, NY	0.55
Grand Rapids, MI	0.48	Trenton, NJ	0.47	Tucson, AZ	0.52
Rochester, NY	0.48	Fayetteville, AR-MO	0.46	Trenton, NJ	0.51
Tucson, AZ	0.47	York-Hanover, PA	0.46	Scranton-Wilkes-Barre, PA	0.5
Durham, NC	0.47	Birmingham, AL	0.46	Salem, OR	0.47
Bakersfield, CA	0.47	Worcester, MA	0.45	Portland, ME	0.42
Trenton, NJ	0.46	Bridgeport, CT	0.45	Youngstown, OH-PA	0.42
Naples, FL	0.46	Youngstown, OH-PA	0.45	Springfield, MA	0.42
Omaha, NE-IA	0.45	Jackson, MS	0.45	Santa Barbara, CA	0.42
Manchester, NH	0.45	Des Moines, IA	0.45	Reno-Sparks, NV	0.41
Harrisburg, PA	0.45	Bakersfield, CA	0.45	Cape Coral-Fort Myers, FL	0.38
Fayetteville, AR-MO	0.44	New Haven, CT	0.45	Fort Wayne, IN	0.38
Sarasota, FL	0.44	Santa Barbara, CA	0.44	Sarasota, FL	0.38
Corpus Christi, TX	0.44	Manchester, NH	0.44	Modesto, CA	0.37
Santa Barbara, CA	0.43	Tucson, AZ	0.43	Oxnard, CA	0.37
Mid-sized Metro Average (N=103)	**0.35**	**Mid-sized Metro Average (N=103)**	**0.37**	**Mid-sized Metro Average (N=103)**	**0.27**

As of 2016, the nation's 103 mid-sized metropolitan areas,[13] those with populations between 250,000 and 1 million, included 14 percent of its African-American population and 16 percent of its Hispanic population. Going back to the year 2000, the average Black-White dissimilarity index value among these metropolitan areas stood at .54. This was eight points below the comparable value for large metropolitan areas. The nine metropolitan areas that met the criterion for being hyper-segregated along Black-White lines—Provo, Orem, Flint, McAllen, Dayton, Syracuse, Youngstown, York-Hannover, Birmingham, and Toledo—were mostly but not entirely in the

13 According to the U.S. Office of Management and Budget (OMB) metropolitan areas are defined as one or more adjacent counties or county equivalents that have at least one urban core area of at least 50,000 population. Micropolitan areas are defined similarly but include more than 10,000 residents and less than 50,000.

industrial Midwest. These same metropolitan areas also topped the list of most segregated mid-sized metropolitan areas in 2016, although none were hyper-segregated. The average 2016 Black-White DI value for these mid-sized metros was .49, down from five points from 2000.

The third column in exhibit 2 lists metropolitan areas according to their Moran's I values. With a few notable exceptions, the top 25 list of large metros based on 2016 Moran's I values corresponds closely to the top 25 2016 list based on DI values. African-American residents of mid-sized metropolitan areas in Pennsylvania and Connecticut were far more likely to live in conditions of extreme spatial segregation—close together with one another and far away from Whites—than Black residents of mid-sized metros in other states.

Turning to measurements of Hispanic segregation, the trends run in the opposite direction, with the average Hispanic DI among large U.S. metropolitan areas having risen modestly from .35 in 2000 to .37 in 2016. This change was accompanied by a whopping 72-percent increase in the Hispanic population, bringing the Hispanic population share of mid-sized U.S. metros up to 18 percent in 2016 from 13 percent in 2000. Seven mid-sized metros had Hispanic DI values above .50 in 2016: Reading (.62), Scranton-Wilkes Barre (.56), Springfield, MA (.55), Salinas (.54), Allentown (.53), Hartford (.51), and Oxnard, CA (.50). As with African-Americans, Pennsylvania was over-represented on the list of mid-sized metros with heightened Hispanic segregation levels in 2016.

The list of mid-sized metros in which Hispanics were spatially concentrated in 2016 was similar in composition to the 2016 segregation list to its immediate left. Four of the nine mid-size metropolitan areas with 2016 Hispanic Moran's I values above .60—a value indicating a level of spatial concentration corresponding to ghettoization—were in Pennsylvania. Among all mid-sized metropolitan areas, the average 2016 Hispanic Moran's I value stood at a relatively low .27.

Exhibit 3A

Top 25 Small Metro Areas Ranked by 2000 and 2016 Black-White Segregation Measures

Small Metro Areas: 2016 Population less than 250,000	2000 Black-White Dissimilarity Index Value	Small Metro Areas: 2016 Population less than 250,000	2016 Black-White Dissimilarity Index Value	Small Metro Areas: 2016 Population less than 250,000	2016 Moran's I for Black Share of Tract Population
Missoula, MT	0.96	Lewiston, ID-WA	0.74	Niles-Benton Harbor, MI	0.85
St. George, UT	0.95	Muskegon, MI	0.71	Kingston, NY	0.77
Lewiston, ID-WA	0.89	Niles-Benton Harbor, MI	0.70	Spartanburg, SC	0.72
Prescott, AZ	0.88	Fort Smith, AR-OK	0.69	Pittsfield, MA	0.60
Glens Falls, NY	0.82	Monroe, LA	0.67	Janesville, WI	0.54
Bismarck, ND	0.81	Glens Falls, NY	0.66	Holland-Grand Haven, MI	0.53
Wausau, WI	0.79	Lake Charles, LA	0.64	Springfield, OH	0.46
Mount Vernon, WA	0.77	Pocatello, ID	0.62	Danville, IL	0.46
Coeur d'Alene, ID	0.77	Pine Bluff, AR	0.61	Anniston, AL	0.45
Muskegon, MI	0.75	Laredo, TX	0.61	Auburn, AL	0.45
Bend, OR	0.74	Saginaw, MI	0.61	Decatur, IL	0.44
Niles-Benton Harbor, MI	0.74	Utica-Rome, NY	0.61	Utica-Rome, NY	0.41
Saginaw, MI	0.72	Johnstown, PA	0.60	Atlantic City, NJ	0.41
Medford, OR	0.72	Erie, PA	0.60	Bremerton, WA	0.39
Logan, UT-ID	0.71	Rochester, MN	0.59	Sandusky, OH	0.38
Lake Havasu City, AZ	0.71	Billings, MT	0.59	Duluth, MN-WI	0.37
Monroe, LA	0.70	St. Cloud, MN	0.59	Morristown, TN	0.35
Waterloo, IA	0.68	Waterloo, IA	0.59	Lafayette, LA	0.35
Redding, CA	0.68	Sheboygan, WI	0.58	Saginaw, MI	0.35
Billings, MT	0.67	Abilene, TX	0.58	Binghamton, NY	0.34
Kankakee, IL	0.66	Atlantic City, NJ	0.57	Huntington, WV-KY-OH	0.33
Oshkosh-Neenah, WI	0.66	Jackson, MI	0.56	Johnson City, TN	0.33
Vero Beach, FL	0.66	Great Falls, MT	0.56	Panama City, FL	0.33
Casper, WY	0.65	Mansfield, OH	0.56	Pascagoula, MS	0.32
Johnstown, PA	0.65	Huntington, WV-KY-OH	0.56	Lynchburg, VA	0.32
Small Metro Average (N=208)	**0.49**	**Small Metro Average (N=208)**	**0.44**	**Small Metro Average (N=208)**	**0.22**

Exhibit 3B

Top 25 Small Metro Areas Ranked by 2000 and 2016 Hispanic Segregation Measures

Small Metro Areas: 2016 Population less than 250,000	2000 Hispanic Dissimilarity Index Value	Small Metro Areas: 2016 Population less than 250,000	2016 Hispanic Dissimilarity Index Value	Small Metro Areas: 2016 Population less than 250,000	2016 Moran's I for Hispanic Share of Tract Population
Glens Falls, NY	0.54	Lebanon, PA	0.51	Holland-Grand Haven, MI	0.91
Tyler, TX	0.53	Pine Bluff, AR	0.50	Mount Vernon, WA	0.77
Santa Cruz-Watsonville, CA	0.51	Decatur, AL	0.49	Madera, CA	0.71
Decatur, AL	0.50	Fort Smith, AR-OK	0.49	Santa Cruz-Watsonville, CA	0.7
Green Bay, WI	0.50	Weirton, WV-OH	0.49	Boulder, CO	0.58
Kennewick-Richland, WA	0.49	Yuma, AZ	0.48	Gainesville, GA	0.48
Yakima, WA	0.48	Santa Cruz-Watsonville, CA	0.48	Dalton, GA	0.42
Holland-Grand Haven, MI	0.47	Yakima, WA	0.47	Morristown, TN	0.41
Utica-Rome, NY	0.47	Bangor, ME	0.47	Rome, GA	0.41
Fond du Lac, WI	0.46	Utica-Rome, NY	0.47	Vineland, NJ	0.4
Vineland, NJ	0.45	Joplin, MO	0.47	Medford, OR	0.4
Midland, TX	0.44	Holland-Grand Haven, MI	0.46	Bay City, MI	0.39
Erie, PA	0.44	Morristown, TN	0.46	Fort Smith, AR-OK	0.35
Mount Vernon, WA	0.43	Gainesville, GA	0.46	Lebanon, PA	0.35
Fort Smith, AR-OK	0.43	Huntington, WV-KY-OH	0.46	Norwich, CT	0.32
Lebanon, PA	0.42	Spartanburg, SC	0.46	Greeley, CO	0.32
Morristown, TN	0.42	Springfield, OH	0.45	Joplin, MO	0.31
Ocean City, NJ	0.41	Niles-Benton Harbor, MI	0.44	Atlantic City, NJ	0.29
Amarillo, TX	0.41	Green Bay, WI	0.44	Sandusky, OH	0.29
Madera, CA	0.41	Tyler, TX	0.44	Amarillo, TX	0.29
Norwich, CT	0.41	Cleveland, TN	0.44	Hanford-Corcoran, CA	0.29
Gainesville, GA	0.40	Vineland, NJ	0.43	Carson City, NV	0.29
Yuma, AZ	0.40	Williamsport, PA	0.43	Punta Gorda, FL	0.28
Dalton, GA	0.40	Rocky Mount, NC	0.43	Utica-Rome, NY	0.27
Sioux City, IA-NE-SD	0.40	Madera, CA	0.43	Santa Fe, NM	0.26
Small Metro Average (N=208)	**0.26**	**Small Metro Average (N=208)**	**0.33**	**Small Metro Average (N=208)**	**0.22**

As of 2016, the nation's 200-plus small metropolitan areas , those with a population less than 250,000, included 7 percent of its African-American population and 6 percent of its Hispanic population. Going back to the year 2000, the average Black-White dissimilarity index value among these metropolitan areas stood at .49. This was 12 points below the comparable value for large metropolitan areas, and 5 points below the comparable value for mid-sized metropolitan areas. By 2016, the average Black-White dissimilarity index value among small metropolitan areas had declined further to .44. Seventeen small metropolitan areas met the criteria of being hyper-segregated along Black-White lines in 2000; by 2016, the roster of hyper-segregated small metropolitan areas had fallen to just three: Lewiston, ID, Muskegon, MI, and Niles-Benton Harbor, MI. As with the set of mid-sized metros profiled in exhibit 2, a disproportionate share of Black-White-segregated small metropolitan areas were in Michigan and Pennsylvania. The third column

in the top of exhibit 3 lists small metropolitan areas according to the degree to which their Black residents are extremely spatially concentrated. The 13 metros at the top of this list, those with a 2016 Moran's I value of .4 or greater, are a diverse set that follow no regional or state pattern. Among all small metropolitan areas, the average 2016 Black Moran's I value stood at a relatively low .22.[14]

Turning to measurements of Hispanic segregation among small metropolitan areas, the trends are much more worrisome. From a relatively low base of .26 in the year 2000, the average Hispanic DI value for small metropolitan areas increased seven points to .33 in 2016. Befitting the general state of population flux in many small metropolitan areas, the list of metros with higher levels of Hispanic segregation in 2016 (in the middle column of the lower block of Exhibit 3B) did not match the comparable list in the left-hand column for the year 2000. The right-hand side list of small metros in which Hispanics were spatially concentrated in 2016 was similarly diverse. Given their small size to begin with, large influxes of any demographic group to the set of small metropolitan areas will tend to generate significant changes in segregation and spatial concentration patterns.

II. Patterns of Change

Having identified contemporary metropolitan Black-White and Hispanic segregation levels, we now turn to analyzing patterns of segregation change. As we have seen, Black-White segregation is in decline nationally, whereas Hispanic segregation is on the rise. These broad national trends mask sharp differences among individual metropolitan areas. For example, in Los Angeles, America's second largest metropolitan area,[15] the Black-White DI fell by an impressive 19 points between 2000 and 2016, from .64 to .45. Meanwhile, In Chicago, the nation's third largest metro, the Black White DI fell by a less impressive 7 points, from .79 to .72. In Orlando, the Hispanic DI rose by 3 points between 2000 and 2016, while 90 miles away, in Tampa-St. Petersburg, it fell by 4 points.

Metropolitan area size mattered more for Hispanics than African-Americans. Black-White DIs declined by an average of .06 between 2000 and 2016 among large metropolitan areas (those with a population of 1 million or more), by .05 among mid-sized metropolitan areas (those with a 2016 population between 250,000 and 1 million) and by .05 among smaller metropolitan areas (those with a 2016 population less than 250,000). The corresponding changes for Hispanic DIs were +.01 for large metropolitan areas, +.02 for mid-sized metropolitan areas, and +.06 for small metropolitan areas.

Beyond size, what other metropolitan area-specific factors were consistently associated with recent changes in Black-White and Hispanic DI values? To find out, I regressed 2000 DIs against their 2016 counterparts along with fifteen other metropolitan area-specific factors often thought to affect segregation levels. These additional factors included—

- **Population growth rate and initial share:** The author includes the overall population growth rate for each metropolitan area between 2000 and 2016, as well as Black and Hispanic population growth rates, to identify the association between population growth and segregation

14 This does not include the 98 metropolitan areas for which the calculated Moran's I values were not statistically significant.

15 The Los Angeles metropolitan area includes Los Angeles and Santa Ana counties, but not Ventura, Ontario, and Riverside counties. Ventura County is identified as the Oxnard metropolitan area, while Ontario and San Bernardino counties comprise the Riverside-San Bernardino metropolitan area.

outcomes.[16] Among the full metropolitan area sample, the 2000–2016 population growth rate ranged from a high of +123 percent in Gainesville, Florida to a low of -16 percent in Johnstown, Pennsylvania. The African-American population growth rate over the same period ranged from a high of +770 percent in Prescott, Arizona to a low of -50 percent in Valdosta, Georgia. The Hispanic population growth rate varied from a low of 15 percent in the Los Angeles metropolitan area to a high of +550 percent in the Scranton-Wilkes-Barre, Pennsylvania. The data also include the 2000 Black and Hispanic population shares of each metropolitan area.

- **Residential mobility rates:** The author includes information on residential mobility to identify the association between mobility and segregation outcomes.[17] Information on moving activity is published annually in the American Community Survey. Among the full sample of metropolitan areas, the share of homeowners who moved at least once between 2000 and 2009 ranged from a low of only 24 percent in Johnstown, Pennsylvania, to a high of 63 percent in Las Vegas, Nevada. The share of renters who moved at least once between 2000 and 2009 varied more narrowly, ranging from 63 percent in the Greater New York region to 94 percent in Provo-Orem, Utah.

- **Demographic and income characteristics:** Recent attitudinal studies have found younger residents, immigrants, and those with more education to generally be more willing to live in integrated neighborhoods than older residents, native-borns, and those with less education (Frey, 2014). To identify whether these relationships might apply at the metropolitan as well as neighborhood level, the author includes variables measuring the share of foreign-born residents as of the Year 2010; the share of adults with a bachelor's degree (also as of 2010); and the median population age (also as of 2010). To identify whether there might be an association between income and segregation, the author also includes a variable measuring median household income in 2010. Among the full metropolitan area sample, the share of foreign-born residents in 2010 ranged from a low of .8 percent in Parkersburg (West Virginia) to a high of 38 percent in Miami-Ft. Lauderdale. The share of adults with bachelor's degrees in 2010 ranged from a low of .8 percent in Dalton (Georgia) to a high of 32 percent in Boulder (Colorado). Median age varied from a low of 24.3 years in Provo-Orem (Utah) to a high of 54.8 years in Punta Gorda (Florida); and 2010 median household income varied between $31,264 in Brownsville (Texas) to $86,286 in San Jose (California).

- **Non-traditional land use regulatory regimes:** Historically, the most common approach used by communities to exclude unwanted residents was to zone out apartments and homes on smaller lots (Pendall, 2000). A 2006 Brookings report by Pendall, Puentes, and Martin identified those states that rely on zoning as their principal approach to land use regulation and those that have adopted alternative approaches. They characterized these alternative approaches as Reform (adding growth management regulations on top of zoning), Wild

16 Faster-growing metros may find it more difficult to coordinate racially exclusionary practices than slower-growing ones. Likewise, metropolitan areas with large minority populations may find it politically difficult to impose additional formal and informal restrictions.

17 Residential mobility is correlated with population growth, but it is not the same thing. Among the full sample of metropolitan areas, the correlation coefficient between 2000–2016 population growth rates and 2000-to-2009 residential mobility rates were .46 for renters and .58 for homeowners. All else being equal, we might expect residential segregation to be less severe in places where people move more frequently, whether in search of a better job, or to improve their neighborhood and housing situations.

West Texas (loosening the ability of zoning to limit land uses), and Exclusionary (allowing individual municipalities to specifically exclude apartment projects). Metropolitan areas in states in each of these non-traditional regulatory regime categories were identified using fixed-effect variables. A fourth fixed effect variable was used to denote metros in Florida, which was a member of the Reform group of states until 2009.

Exhibit 4 presents a full set of descriptive statistics for each of the above variables, organized by metropolitan area size group.

Exhibit 4

Descriptive Statistics for 2016 Dissimilarity Index Regressions, by Metro Area Size Category

	Variable	Mean and Standard Deviation Values for Large Metropolitan Areas (N=48)		Mean and Standard Deviation Values for Mid-sized Metropolitan Areas (N=103)		Mean and Standard Deviation Values for Small Metropolitan Areas (N=208)	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Dependent Variables ▶	2016 Black-White Dissimilarity Index	0.55	0.11	0.49	0.09	0.44	0.1
	2016 Hispanic Dissimilarity Index	0.41	0.08	0.37	0.08	0.33	0.08
Independent Variables ▶	2000 Black-White Dissimilarity Index	0.61	0.12	0.54	0.12	0.49	0.15
	2000 Hispanic Dissimilarity Index	0.4	0.11	0.35	0.11	0.26	0.10
	2000–2016 Population Growth Rate	21%	17%	21%	15%	21%	23%
	2000–2016 Black Population Growth Rate	32%	38%	50%	54%	117%	241%
	2000–2016 Hispanic Population Growth Rate	101%	53%	121%	73%	124%	72%
	2000 Black Population Share	15%	10%	12%	12%	11%	13%
	2000 Hispanic Population Share	12%	12%	12%	17%	8%	13%
	Reform LU Regime (0/1)	17%		13%		9%	
	Exclusionary LU Regime (0/1)	4%		3%		2%	
	Florida Location (0/1)	23%		14%		13%	
	Texas Location (0/1)	8%		7%		7%	
	% of Owners who Moved, 2000–2009	45%	7%	43%	6%	41%	6%
	% of Renters who Moved, 2000–2010	85%	6%	85%	4%	86%	4%
	2010 Median Household Income	$56,921	$8,939	$50,632	$8,401	$46,162	$6,205
	2010 Median Age (Years)	36.4	2.6	36.6	3.8	36.9	4.6
	2010 Percent College Graduates	20%	3%	17%	4%	15%	4%
	2010 Percent Foreign-born	14%	9%	9%	7%	6%	5%

Six sets of regression results are presented in exhibit 5, three each for Blacks and Hispanics, and two for each metro size category—large, mid-sized, and small. Recognizing that some of the included variables were unlikely to be statistically significant, but that including them might bias the effects of those that are, the author used backward stepwise regression to limit the set of included variables to those determined to be statistically significant.[18] Because the dependent variables are measured using different scales, the coefficient estimates are all presented in standardized form, making it possible to

18 Backward stepwise regression includes all potential independent variables in the initial regression model, and then sequentially eliminates those not determined to be statistically significant. As implemented in SPSS, backward stepwise regression also checks that previously-eliminated variables might subsequently re-enter the model.

compare the relative importance of each included variable. To allow for the possibility that Black-White segregation levels might affect changes in Hispanic segregation, and vice-versa, the author included Year 2000 Black-White and Hispanic DI levels in every regression, along with Black and Hispanic population growth rates and initial population shares.

Exhibit 5

Stepwise Regressions Comparing 2016 Black-White and Hispanic Dissimilarity Indices to 2000 Levels and Metro Characteristics

Dependent Variable & Metro Sample >>	2016 Black-White DI values in Metros with 1+ million residents	2016 Black-White DI values in Metros with 250,000 to 1 million residents	2016 Black-White DI values in Metros with 250,000 or fewer residents	2016 Hispanic DI values in Metros with 1+ million residents	2016 Hispanics DI values in Metros with 250,000 to 1 million residents	2016 Hispanic DI values in Metros with 250,000 or fewer residents
Independent Variable	**Standardized Coefficient**	**Standardized Coefficient**	**Standardized Coefficient**	**Standardized Coefficient**	**Standardized Coefficient**	**Standardized Coefficient**
2000 Black-White Dissimilarity Index	**.804****	**.77****	**.70****	**.39****	**.12***	DNE
2000 Hispanic Dissimilarity Index	**.11***	DNE	**.09**	**.46***	**.69****	.60**
2000–2016 Population Growth Rate	Did not enter (DNE)	**– .19****	DNE	– .33**	DNE	DNE
2000–2016 Black Population Growth Rate	DNE	**– .19****	**– .12**	**.52****	DNE	DNE
2000–2016 Hispanic Population Growth Rate	DNE	DNE	DNE	DNE	**.23****	**.22****
2000 Black Population Share	DNE	DNE	DNE	DNE	DNE	DNE
2000 Hispanic Population Share	DNE	DNE	DNE	.17	DNE	DNE
Reform LU Regime (0/1)	DNE	**– .10***	DNE	DNE	DNE	DNE
Exclusionary LU Regime (0/1)	DNE	DNE	DNE	DNE	DNE	DNE
Florida Location (0/1)	DNE	DNE	DNE	– .17*	DNE	DNE
Texas Location (0/1)	DNE	DNE	DNE	DNE	DNE	DNE
% of Owners who Moved, 2000–2009	DNE	DNE	**– .26****	DNE	DNE	**– .16***
% of Renters who Moved, 2000–2010	-.083	DNE	DNE	DNE	**– .28****	**– .32****
2010 Median Household Income	DNE	DNE	**– .11**	DNE	**– .10**	**– .30****
2010 Median Age	DNE	DNE	DNE	DNE	DNE	DNE
2010 Percent College Graduates	DNE	**.10**	**.23***	DNE	DNE	**.23****
2010 Percent Foreign-born	DNE	DNE	DNE	DNE	DNE	DNE
Constant	.215	.215	.399	– .032*	.65	.215
r-squared	.934	.78	.49	.75	.69	.52
Observations	46	102	204	47	102	205

** Indicates statistical significance at the .05 level*
*** Indicates statistical significance at the .01 level*

Among the key results—

- For both African-Americans and Hispanics, Year 2000 DI values were better predictors of Year 2016 DI values for larger metropolitan areas than for smaller ones. This suggests that segregation is characteristically more embedded in larger metropolitan areas. Supporting this finding of embeddedness, 2000 Black-White DI values were generally 3 to 10 times more important than other potential factors as predictors of 2016 Black DI values. For Hispanics, Year 2000 DI values were generally twice as important as other factors, suggesting a reduced degree of embeddedness.

- Higher levels of Hispanic segregation in 2000 in large and small metropolitan areas were strongly correlated with higher rates of Black-White segregation in 2016. Similarly, higher levels of Black-White segregation in 2000 were associated with higher rates of Hispanic segregation among large and mid-sized metropolitan areas in 2016. This suggests that the same practices and preferences that further Black-White segregation also serve to promote Hispanic segregation, and vice versa.

- The effect of population growth, although generally favorable to integration, varies by metropolitan area size. Population growth was associated with a decline in Black-White segregation levels between 2000 and 2016 in mid-sized metropolitan areas, but not in large or small ones. Population growth was strongly associated with a decline in Hispanic segregation levels during the 2000–2016 period, but only in large metropolitan areas.

- The population growth-integration association is different for African-Americans than Hispanics. Higher rates of African-American population growth were associated with reductions in Black-White segregation levels in mid-sized and small metropolitan area. Conversely, higher rates of Hispanic population growth were associated with an increase in Hispanic segregation levels in large metropolitan areas.

- Greater residential mobility—that is, having more opportunities to change house or move—is generally associated with greater integration, at least when measured at the metropolitan scale. This was especially true for African-American renters in large metropolitan areas and for Hispanic renters in mid-sized and smaller metropolitan areas. It was also true for African-American and Hispanic homeowners in small metropolitan areas.

- Measured at the metropolitan scale, median age and the share of foreign-born residents exerted no effect, positive or negative, on 2016 DI values for either African-Americans or Hispanics. This finding runs somewhat contrary to the conventional wisdom which suggests that younger residents and immigrants are more tolerant of diversity and more interested in living in integrated neighborhoods.

- Income levels, by contrast, do matter: measured at the metropolitan level, the presence of a wealthier population was generally associated with a higher level of integration. Hispanic DI values for 2016 were substantially lower in wealthier mid-sized and small metropolitan areas (measured by median household income), whereas 2016 Black-White DI values were slightly lower among wealthier and smaller metropolitan areas.

- "The assumption that education and integration are connected—specifically, that better-educated residents also prefer to live in integrated communities—is not born out by the data when measured at the metropolitan scale. Quite the contrary: in three of the six metropolitan area size categories, two Black and one Hispanic, a better-educated population (measured as the share of adults with a bachelor's degree) was associated with higher, not lower levels of segregation in 2016.

- How communities regulate land uses is only slightly associated with metropolitan segregation levels. Mid-sized metropolitan areas in states with so-called Reform land use regulatory regimes experienced larger declines in Black-White segregation than mid-sized metros in other states. This was not true for Hispanics. Being in a state with an exclusionary land use regime or in Texas, where land use regulations are less onerously applied, had no effect on 2016 segregation levels. By contrast, residents of large metropolitan areas in Florida—which switched from a quasi-reformed regulatory regime back to a zoning-based regime in 2009—experienced lower levels of Hispanic segregation in 2016 than in 2000.

V. Summary of Findings and Key Takeaways

This brief article uses recently-available Census data to provide a contemporary picture of Black-White and Hispanic residential segregation levels among U.S. metropolitan areas. It offers new findings in several areas:

- **Measured at the metropolitan scale, Black-White residential segregation continues to decline whereas Hispanic segregation is on the rise.** The decline in Black-White segregation levels is consistent across metropolitan area size categories, although larger metropolitan areas remain much more segregated along Black-White lines than smaller ones. Recent increases in Hispanic segregation levels have been more pronounced among smaller metropolitan areas.

- **Falling segregation levels are associated with population growth, but the effect varies by metropolitan area size.** For African-Americans, this growth-reduced segregation effect was greatest among mid-sized metropolitan areas. For Hispanics, the effect was most pronounced in large metropolitan areas. Higher rates of residential mobility, especially among renters, are also associated with declining residential segregation.

- **When it comes to reduced segregation, community demographic characteristics matter less than incomes.** The argument that better-educated metropolitan areas (measured as the share of adults with bachelor's degrees) and those with proportionately more immigrants should look upon integration more favorably is not born out by the recent data. By contrast, segregation levels did decline more between 2000 and 2016 in metropolitan areas with higher median incomes. For Hispanics, the income-segregation reduction effect was more pronounced in mid-sized and small metropolitan areas. For African-Americans, it was more pronounced among small metropolitan areas.

These results raise almost as many issues as they resolve, two of which are foremost. The first concerns the choice of spatial unit at which to analyze the connections between racial segregation and other urban outcomes. The second, which is informed by the first, concerns the appropriate role for federal policy.

Starting with the first issue, the results presented in this article suggest that when measured at the metropolitan scale, the associations between Black-White and Hispanic segregation levels and many of the factors thought to affect those levels are relatively weak, especially in large metropolitan areas where most of the nation's African-American and Hispanic populations are concentrated. This does not mean that such connections do not exist. Rather, to the extent that they do, they may be manifest at a smaller spatial scale—most likely that of the neighborhood. This reinforces the importance of anti-segregation and residential mobility programs (as well as anti-poverty programs) expressly targeting those neighborhoods where nearby job opportunities are few, and where minority residents are least able to secure better-quality and/or more affordable housing in the private marketplace. An increasing number of public housing agencies around the country are administering the Housing Choice Voucher program in this manner, and their progress should be closely followed.

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The Potential of the Fair Housing Act's Affirmative Mandate and HUD's AFFH Rule

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Abstract

The Fair Housing Act (FHA) is a powerful tool in the civil rights arsenal and has achieved a great deal, but its promise to address structural inequities that have undergirded the U.S. housing system has yet to be realized. HUD's Affirmatively Furthering Fair Housing (AFFH) rule is an important effort to do that, reflecting new learning and a refined approach to the core challenge of remedying ongoing barriers to fair housing that perpetuate disparities.

This article aims to provide details on how and why that rule was created, building on the experiences of two Obama-administration appointees involved in the rule's creation. After providing a brief background on the AFFH mandate of the FHA, this article explains the origins and theory behind the new rule and summarizes details of the rule and key initial critiques and experiences. It ends with some thoughts on how the approach embodied in HUD's rule could assist in ushering in a new era of equity planning.

Background: The Fair Housing Act's Power and Promise

The FHA is a robust and wide-ranging piece of civil rights legislation. As the courts have recognized, the act is designed and has been given broad application to fully achieve "the policy of the United States to provide, within constitutional limitation, for fair housing throughout the United States."[1] Although the act did not define "fair housing," it applies to any entity whose actions

1 Fair Housing Act, 42 U.S.C. § 3601.

influence housing,[2] and is to be "generous[ly]" interpreted to allow all who might be conceivably harmed to seek its protection."[3]

In creating the FHA, Congress recognized that simply combating future discrimination would not be enough to overcome the history of racialized policy and practices that led to dual housing markets and what the Kerner Commission (whose report was issued less than 2 months before the FHA's passage) recognized as "two societies" (Kerner, 1968).[4] To achieve that goal, the FHA went beyond antidiscrimination provisions and required the Federal government to take "affirmative" steps to overcome this legacy. Specifically, the FHA imposed on the federal government an obligation "affirmatively to further fair housing," which we refer to as the AFFH mandate.[5] This recognition of structural inequality and racism was visionary.

Realizing the potential of this aspiration in the 50 years since the FHA's passage has been a halting process, with many fits, starts, and backtracking. Efforts to implement the AFFH provisions have met a host of political, programmatic, and other roadblocks that prevented significant advances and led to what some commentators have termed a "fundamental imbalance in [the act's] statutory missions" (Davidson and Penalver, 2018).[6] The problematic track record with the AFFH mandate stands in stark contrast to other areas of the FHA, where those charged with implementing and enforcing it have operated with great dexterity to adapt to changes in the housing field.[7] One continuous question is whether the learning and adaption that have enabled the FHA to remain relevant in other domains can occur with AFFH.

One should examine the AFFH regulation against this backdrop in both ambition and approach.

2 The Fair Housing Act, 42 U.S.C. § 3604(a) defines discrimination to include "mak[ing] unavailable or deny[ing]" a dwelling based on a protected characteristic without limiting the entities who may be held responsible for such actions.

3 Another illustration of the strength of the FHA is that its mandates may be violated by actions that have a discriminatory effect (disparate impact), even without proof of discriminatory intent, as recently reaffirmed by the U.S. Supreme Court in Texas Dept. of Housing and Community Affairs v. Inclusive Communities Project, Inc., 135 S. Ct. 2507 (United States Reports 576, 2015). Similarly, the act establishes an enforcement regime that authorizes both private parties and the government to bring suit; it also establishes an administrative enforcement procedure. See Fair Housing Act, 42 U.S.C. §3608-14.

4 The Kerner Commission stated that "fundamental to the Commission's recommendations" was the need for "[f] ederal housing programs [to] be given a new thrust aimed at overcoming the prevailing patterns of racial segregation" (Kerner, 1968: 260).

5 The Fair Housing Act, 42 U.S.C §3608(d) states, "All executive departments and agencies shall administer their programs and activities relating to housing and urban development (including any Federal agency having regulatory or supervisory authority over financial institutions) in a manner affirmatively to further the purposes of this subchapter and shall cooperate with the Secretary to further such purposes." (See also Fair Housing Act, 42 U.S.C. § 3608(e)(5).) Litigation has made clear that the AFFH mandate applies to all Federal investments, including the Low-Income Housing Tax Credit Program. See "In Re: Adoption of Uniform Housing Affordability Controls by the New Jersey Housing and Mortgage Finance Agency," 848 A.2d 1 (N.J. Super. Ct. App. Div. 2004). https://caselaw.findlaw.com/nj-superior-court-appellate-division/1084626.html.

6 For a general discussion, see Smyth, Allen, and Schnaith (2015).

7 Following the addition of disability as a protected class under the FHA in 1988, HUD initiated regulatory guidance, technical assistance, targeted enforcement, and public engagement that have led to widespread refinements in housing construction and marketing and has markedly opened up housing to persons with disabilities.

The AFFH Rule's History and Theory of Change

Perhaps HUD's boldest effort to implement the AFFH mandate occurred immediately after the FHA was passed. HUD Secretary George Romney used the AFFH requirement as the basis for withholding water, sewer, and parkland grants from jurisdictions with exclusionary practices, including exclusionary zoning ordinances. Romney's "Open Communities" program put him in opposition to the Nixon administration and was eventually shut down.[8] Only in 1995 did HUD again take serious steps to enforce the AFFH obligations through its grants programs, issuing the Fair Housing Planning Guide and introducing its Analysis of Impediments (AI) requirement. As discussed later, that process has been widely criticized as ineffective. In 1998, HUD issued a Proposed AFFH Rule, which included establishing AFFH performance standards for participants in the Community Development Block Grant (CDBG) program,[9] but HUD received extensive public comments and chose not to issue a final rule.

With the 2008 election of President Barack Obama and his appointment of Shaun Donovan as HUD Secretary, the new administration revisited the AFFH mandate to determine how it could be revitalized as part of the administration's broad commitment to furthering equity. To do so, Secretary Donovan initiated what became a multiyear process to review and translate the AFFH mandate into policy and practice.

The crises the new administration faced as it began its work influenced its eventual focus and approach. At the end of 2008, the country was deep in the throes of the Great Recession, triggered by fundamental failures in housing finance oversight and regulation. Foreclosures were at a record high. The Gulf Region was still beset by failed recovery efforts following Hurricane Katrina. Also, the administration sought to respond to the growing challenge of climate change by incorporating resiliency measures into housing and community development resources and initiatives. Those and other pressing challenges had a deep and widely recognized racial dimension, as the foreclosure crisis destroyed Black and Latino wealth, the recession exacerbated preexisting disparities, and the post-Katrina failures fell particularly hard on minority communities (Faber, 2013; Squires and Hartman, 2006).

Given those dynamics, the new secretary and his team started with several premises that shaped their overall agenda and informed their approach to the AFFH mandate. First, HUD recognized that major challenges, ranging from climate change to ongoing racial disparities along numerous measures of well-being, required approaches that transcended public sector silos and would best be achieved by coordinated planning and integrated resource allocation. Applied to the AFFH effort, that suggested that previous approaches—which had been primarily driven by and focused on the agency's fair housing office—needed to be broadened and would require the full participation of and buy-in by the components of HUD responsible for community development and public and assisted housing. The goal was to ensure that HUD's annual distribution of more than $40 billion to state and local governments, public housing authorities, and Native American tribes were part of AFFH implementation. In fact, the ideal approach to the AFFH mandate would move beyond

8 For a complete summary of HUD's efforts, see Schwartz (2014).

9 CDBG is HUD's largest block grant program, providing more than $3 billion in grants to local jurisdictions annually. See https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs.

HUD programs and incorporate transportation, education, and other key elements that addressed barriers to achieving fully equal opportunities, such as with the cross-HUD-DOT-EPA Sustainable Communities Initiative.[10]

Second, HUD aspired to revisit how best to define the respective roles of the Federal government and state and local actors in operationalizing the AFFH mandate. Pursuant to the FHA's AFFH provisions, HUD had a legal obligation to further fair housing affirmatively and the legal authority to take enforcement action when its grantees failed to do so.[11] Beyond that starting point, myriad ways of using Federal authority to harness state and local housing and community-development capacity existed. Decades of poor experience with top-down, one-size-fits-all approaches to community development had inspired more locally driven and locally tailored comprehensive efforts, and state and local governments, private entities, and nonprofit groups had developed new capacities as a result.[12] In the AFFH context, that suggested focusing on the Federal government's ability to set overall direction, articulate policy and program options, incentivize participation, and provide resources for enhancing local capacity, including through data and technical assistance. Similarly, those efforts and increased capacities led to a desire to facilitate partnership and investment from state and local actors—especially critical given the awareness of the lack of a singular policy or approach to advance AFFH and the need to tailor actions to local circumstances in each geographic area.

Finally, many in the administration deeply believed in the importance and potential for robust community engagement to improve both process and outcome. They had an increased appreciation that although community participation had a long and mixed history in housing and civil rights practice and policymaking, engagement of community groups and the broader public could be the difference-maker between a paper exercise and meaningful action. Enabling meaningful and effective community engagement in the AFFH context had clear-cut challenges, however. The capacity of local communities, especially low-income communities of color, to use, access, and deploy information to influence public resource allocation was highly uneven across those communities. Further, what data would be most useful and how it might be shared to enable community groups to participate effectively was uncertain. Also, what would incentivize local groups to engage actively, especially if there were not a clear-cut link between participation and subsequent resource decisions and policy outcomes, was unclear. HUD's longstanding investments

10 HUD led this cross-agency initiative to support local and regional integrative planning efforts. See https://www.hudexchange.info/programs/sci/.

11 The importance of the AFFH legal obligation had been reinforced in 2007 when a federal court found that Westchester County had violated the False Claims Act by falsely certifying its compliance with the AFFH mandate. See *United States of America ex rel. Anti-Discrimination Center of Metro New York, Inc. v. Westchester County, New York*, 495 F.Supp.2d 375 (S.D.N.Y., 2007). http://www.relmanlaw.com/docs/ADCvWestchesterMotiontoDismiss.pdf. In the aftermath of this decision, HUD engaged with the plaintiff fair housing group and the county and entered into a consent order that set forth actions to place the county in AFFH compliance. That consent order became hotly contested and, following judicial findings that the county had violated the order, led HUD to suspend distribution of HUD funds to the county.

12 HUD's Choice Neighborhoods and the Department of Education's Promise Neighborhoods exemplify this newer orientation. See https://www.huduser.gov/portal/pdredge/pdr_edge_frm_asst_sec_101911.html and https://innovation.ed.gov/what-we-do/parental-options/promise-neighborhoods-pn/.

in local fair housing groups offered a starting point,[13] but experience with the Home Mortgage Disclosure Act (HMDA) and how the data it made available to promote equitable lending practices highlighted that the provision of data was just that: a starting point.

Each of those priorities had particular resonance given the existing state of the AFFH process.

Before HUD's AFFH final rule in 2015, recipients of HUD formula grants mainly complied with their "affirmatively furthering" obligation through the Analysis of Impediments (AI) process.[14] Jurisdictions were required to conduct an AI to fair housing in their jurisdictions and take appropriate action to address those impediments. The AI process, however, was widely recognized as highly flawed.

In 2009, HUD conducted a review of AIs gathered from program participants and found that about one-half of the AIs collected were outdated, incomplete, or otherwise inadequate (HUD, 2009). The Government Accounting Office (GAO) then conducted a more extensive review in 2010, collecting 441 AIs and comparing them to HUD guidance (GAO, 2010). Similar to HUD's own assessment, GAO found that a large share of jurisdictions did not have current AIs, and GAO questioned the usefulness of many of the AIs that did exist. GAO noted that HUD's regulations did not require a timeline for updating AIs, specific content or form of AIs, or even that AIs be submitted to HUD for review. GAO noted that most AIs were written by external consultants, and many did not seem to be signed by elected officials, suggesting that the AIs were not integral and were possibly irrelevant to any local decisionmaking process. Indeed, the content of the AIs did not feed into any other HUD process or funding requirement. GAO concluded that "[a]bsent any changes in the AI process, they will likely continue to add limited value going forward in terms of eliminating potential impediments to fair housing that may exist across the country" (GAO, 2010: 31).

HUD's Final Rule: From Theory to Implementation

In 2015, after nearly 7 years of internal and public debate, HUD moved past its aspirational theory and issued its final AFFH rule. The rule sought to operationalize the administration's new approach, while addressing many flaws GAO (2010) and others had identified. It delineated substantive objectives in a new way and articulated a new process that redefined the roles of the Federal government and state and local actors. In doing so, it reworked how fair housing issues are to be incorporated into participants' planning processes and into how HUD (and potentially other) resources would be allocated. Collectively, those modifications represent a significant shift in approach.

13 The Fair Housing Initiatives Program (FHIP) and the Fair Housing Assistance Program (FHAP) provide Federal resources to nonprofit groups, in the case of FHIP, and state and local agencies, in the case of FHAP, to pursue fair-housing-related activities. See https://www.hud.gov/program_offices/fair_housing_equal_opp/partners/FHIP and https://www.hud.gov/program_offices/fair_housing_equal_opp/partners/FHAP
In FY 2018, Congress' annualized appropriation was roughly $65 million for those programs. See https://www.hud.gov/sites/documents/FY_18_CJS_COMBINED.PDF.

14 For a description of the AI process, see HUD's 1996 Fair Housing Planning Guide at https://www.hud.gov/sites/documents/FHPG.PDF.

The Final Rule's Explanation of Core AFFH Objectives

To provide clarity of purpose, HUD's rule defined the duty to affirmatively further fair housing for the first time. Specifically, the AFFH mandate required "meaningful" actions to—

> "overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunity based on protected characteristics."[15]

The rule articulated four objectives for the AFFH effort: (1) to address significant disparities in housing needs and in access to opportunity, (2) to replace segregated living patterns with truly integrated and balanced living patterns, (3) to transform racially or ethnically concentrated areas of poverty into areas of opportunity, and (4) to foster and maintain compliance with civil rights and fair housing laws. By setting those four objectives, the rule made clear that furthering fair housing can entail both in-place investments and steps to promote mobility, thus addressing perhaps the preeminent fair housing tension. Further, it clarified that nonhousing disparities are relevant to AFFH objectives and that the specific actions to be taken by state and local actors would be determined locally rather than being dictated by HUD.

The Updated AFFH Process

The AFFH rule also sought to more clearly guide jurisdictions in identifying meaningful actions by introducing a new process with specific tools and clarifying the roles of the various participants. First, the rule clarified how states and participants should assess current conditions in their communities, replacing the much-criticized AI process with a standardized and very detailed Assessment of Fair Housing (AFH). Provided by HUD, the assessment tool included specific questions to be answered in five main topic areas.[16] The analysis sought to push jurisdictions to go beyond describing patterns of segregation and to consider disparities in opportunity that accompany segregation. For example, participants must assess racial and ethnic disparities in the quality of neighborhood-based services, such as schools, employment, and transportation. Along a similar vein, the AFH contained a section focusing specifically on areas of racial or ethnic concentration of poverty. Those analyses seek to help localities assess residential segregation through a lens that focuses on the link between racial separateness and inequality.

Consistent with a shift in HUD's role in the process, HUD provides detailed data publicly on all jurisdictions and their surrounding regions, including data on segregation, location of subsidized housing, and disparities in measures of opportunity to facilitate that analysis. In doing so, HUD seeks to serve as a partner to state and local actors, which is especially helpful to entities without significant data capability, and to "democratize" the inputs relevant to the process. The rule also

15 The AFFH mandate is 24 C.F.R. § 5.152. The rule explains that "meaningful actions" means "significant actions that are designed and can be reasonably expected to achieve a material positive change that affirmatively furthers fair housing by, for example, increasing fair housing choice or decreasing disparities in access to opportunity."

16 Specifically, those topic areas are (1) a demographic summary; (2) a collection of analyses of segregation, racially or ethnically concentrated areas of poverty, disparities in access to opportunity, and disproportionate housing needs; (3) an analysis of publicly supported housing; (4) an analysis of disability and access; and (5) fair housing enforcement efforts.

required a robust community engagement process, specifying several steps designed to ensure that community input is incorporated into the final outcomes.[17]

An important consideration is that, unlike AIs, AFHs must be submitted to HUD. Within 60 days, HUD needs to determine whether the AFH is accepted, and if it is not accepted, provide reasons for the nonacceptance and guidance on how participants should revise the AFH so that it can be accepted.[18] Jurisdictions must reference their AFH priorities and goals in their next administrative plan that is required for HUD funding (for example, consolidated plans),[19] and they need to have an AFH accepted by HUD before receiving that funding. In theory, strategies proposed in the AFH and the spending of resources, at least HUD resources, are directly linked, although the AFH may include goals for non-HUD resources as well. A "learning-loop" is also built into the process, which begins with the submission of an AFH to HUD, with possible feedback before acceptance; continues as a jurisdiction translates its AFH goals and strategies into the jurisdiction's consolidated plan; and culminates as that jurisdiction develops its next AFH (approximately 5 years later), in which progress on those goals is assessed. Another avenue of learning could occur if HUD, researchers, nonprofit intermediaries, and national affiliates of jurisdictions collect and disseminate lessons that can strengthen the process and further the desired goals of the rule.

Finally, in recognition that fair housing issues cross jurisdiction and agency boundaries, the final rule notes that HUD not only permits but encourages collaboration through jointly submitted AFHs. Collaboration can occur among multiple jurisdictions and between jurisdictions and public housing agencies (PHAs). PHAs were not previously required to conduct AIs, so they are conducting comprehensive AFHs for the first time.[20]

Initial Critiques of the AFFH Rule

Although many commentators respected the substantial shifts HUD made in its approach to the AFFH implementation process, public comments were extensive and often quite heated, reflecting widely different perceptions about the purpose, value, and desired outcomes at issue. Criticism was not limited to those individuals expressing hostility or indifference to the FHA's mandate; stakeholders supportive of fair housing goals also raised a range of concerns during the rule's development and after its issuance.

The fair housing advocacy community raised significant concerns about the lack of enforcement tools and processes in the new rule, questioning whether HUD had struck the appropriate balance between support to state and local actors and accountability for those who did not respond

17 Community input is required before the drafting of the AFH; the draft AFH must be made available for public comment, and akin to the federal rulemaking process, jurisdictions must reference public comments in their AFH submission and explain their reason for not addressing specific comments in the content of the AFH.

18 Acceptance means that the plan is complete and consistent with fair housing and civil rights laws. Acceptance does not deem a jurisdiction necessarily successful in meeting all its fair housing obligations.

19 Consolidated plans are the planning and reporting requirements for CDBG recipients. Since 1995, CDBG recipients have been required to conduct AIs as part of their consolidated plans (although the AI itself was not included or referenced in those plans). See Bostic and Acolin (2017).

20 Before HUD's final rule, PHAs self-certified that they were meeting their AFFH obligations as part of their HUD planning process.

meaningfully to the new process.[21] Fair housing advocates noted the long history of segregated housing patterns sometimes reinforced by existing municipal boundaries and observed that even well-intentioned local jurisdictions frequently faced opposition if they sought to promote integration and to otherwise address fair housing challenges. Thus, fair housing critics questioned whether the rule included sufficient monitoring tools and assessment mechanisms to determine when local actors appropriately used the discretion they had been granted. The rule's "default approval" provision, by which HUD would deem an AFH accepted if HUD did not disapprove or raise concerns about it within 60 days, exacerbated that concern.[22] Although the legal significance of acceptance was uncertain, fair housing advocates saw it as a step toward a safe harbor that might insulate from liability entities who failed to take meaningful action.

In tension with that concern, many state and local governments and other actors responsible for complying with the new rule were skeptical that HUD would be able to embrace a more collaborative role and meet its obligation to support communities with data and technical assistance. For some HUD grantees responsible for undertaking the new process, HUD's rhetoric outstripped the reality of the process that had been set up. For example, the rule strongly encouraged collaboration between different actors and joint submission but did not provide an assessment tool designed to be used for such collaborations nor incentives (financial or otherwise) to do so. Similarly, on the flip side of the concern raised by fair housing advocates, state and local actors wondered whether HUD would support their discretionary decisionmaking.

Finally, some people had questions about scale: whether the resources at issue were sufficient to meet the AFFH objectives through the process the AFFH rule set forth. In other words, some doubted that the rule could satisfy the AFFH mandate because it neither contributed significant new resources nor changed existing statutory or regulatory terms of HUD programs to expand the options from which state and local governments might choose. From a resource perspective, some noted the lack of new, available HUD funding and that other public resources, such as those involving transportation and education, which were larger and arguably more critical contributors to shaping ongoing development patterns, were not subject to the rule. Others questioned whether HUD needed to provide greater flexibility in the way its existing program funds, which are significant, could be used.

Early Indications

HUD issued its final rule in July of 2015, which made the first AFHs due to HUD in 2016.[23] The early stage of any new process entails considerable uncertainty, and AFFH was no exception. With no existing AFH's to serve as models, and an entirely new process, grantees and HUD staff were learning as they were doing. The rule happened to be passed when a particularly small number of grantees was up next in the consolidated planning cycle, permitting HUD (and philanthropy) to focus attention and technical assistance on "first submitters." The Ford Foundation and Open

21 For a good articulation, see Allen (2015).

22 See final rule, Office of Federal Register, 2015.

23 The timing of a jurisdiction's AFH depends on when their next consolidated plan is due, generally running on a 5-year cycle.

Society Foundations, in particular, provided funding for technical assistance on the ground in numerous jurisdictions.

By the end of 2016, 15 AFHs representing 26 program participants had been submitted to HUD and received an official notice regarding whether they were accepted. Eight of those submissions were accepted outright. The remainder received initial feedback from HUD about needed improvements. Of those, three were quickly resubmitted and formally accepted. The remaining four were formally not accepted, but subsequent, updated submissions from those participants were accepted. Although those 2016 submissions were quite early in the rule's implementation, we gained several insights from them.

First, HUD proactively provided feedback to submitters such that submissions could be corrected for minor omissions and be resubmitted for timely acceptance, evidence of a learning loop for both grantee and HUD. Although such a mechanism was intended by the rule, it required HUD staff to work much more in partnership with submitters toward a common goal (acceptance) than a pure "compliance stance" typically permits.

Second, to some HUD's rejection of a sizable number of AFHs was surprising. In the 50 years since the passage of the FHA, HUD has withheld funding on an AFFH basis only a handful of times (Schwartz, 2014). Those four nonacceptances initially put six jurisdictions and PHAs at risk of not receiving HUD funding.[24]

Finally, more than one-half of the earliest AFH submissions were notably joint submissions, consistent with HUD's encouragement of collaboration and its emphasis on coordinated planning across jurisdictional or participant silos.

Further Observations for Equity Planning

Opportunities based on where one lives have profound and lifelong consequences. Understanding of that reality is growing[25] and as such, the effort to translate the AFFH mandate into operational reality is notable. As an innovation in equity planning and how it informs the use of Federal housing and community development resources to further fair housing, the new effort marks a significant departure from HUD's previous approach. It may also demonstrate the potential for equity planning in other realms.[26] Thus, the rule (and its implementation) is significant not only as it applies to the AFFH mandate but also more broadly as a potentially innovative mechanism that could herald experimentation and new approaches to realize equity concerns more broadly.

24 Most AFH submissions were collaborations, either between a jurisdiction and its PHA, or among multiple jurisdictions, itself a goal of the new AFFH rule. For access to early submitted AFFHs, see https://steil.mit.edu/civil-rights-and-fair-housing-city.

25 See, for example, Banks (2018); Chetty, Hendren, and Katz (2016).

26 A growing body of experience and literature about efforts to incorporate equity planning in public programs (at all levels of government) suggests potential value in broader investigation into common challenges and successes. See, for example, Corburn et al. (2015); Federal Highway Administration (2017); Oregon Education Investment Board (2018).

As such, the AFFH rule can be used to examine a key set of questions that ideally might be applied in policy domains beyond housing and community development. Critical questions that could be used to inform and strengthen equity-planning efforts more broadly include the following:

- How would one best integrate public- (and possibly private-) sector funding streams and planning processes across levels of government and agencies to further equity principles? Information from other Federal, state, and local efforts, such as the Sustainable Communities Initiative, could contribute to learning in this area (Chapple et al., 2017).

- What "carrots and sticks" for state and local governments and actors are most useful to enable and incentivize them to achieve desired equity outcomes? More specifically, which of the supports that HUD and philanthropy provided to state and local actors were most helpful, and in what ways can data, in particular, better lead to effective programs?

- Does such an approach allow Federal, state, and local agencies to hold bad actors accountable, while effectively supporting well-intentioned recipients? What mechanisms might be developed to enable agencies to successfully differentiate between the two?

- What lessons can be drawn about how best to develop meaningful community participation, especially in low-income communities and communities of color? Such participation presumably involves effective local capacity on a jurisdiction-by-jurisdiction basis and national entities or intermediaries that can help support them.[27]

- How can one learn from such a process on an ongoing basis so that Federal, state, and local agencies can refine the process and so that recipients and community actors can improve decisionmaking and desired results? In particular, how can one build in, from the outset, meaningful opportunities for researchers and participants to provide feedback, and how can community actors be regularly informed and engaged about the effect of their involvement?

Finally, although the long-run effects of the rule cannot be assessed yet, lessons from the earliest submissions suggest some optimism that the rule embodies an important new approach that can and should be refined over time. We firmly believe it is possible to build on the rule and develop an approach to equity planning and fair housing programming consistent with the understanding that Congress set forth when it enacted the FHA and included the AFFH mandate as one of its two statutory goals.

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27 In an ideal world, one would plan over a multiyear period for what local and national capacities should be created. It is noteworthy, for example, that the manner in which community groups used and applied HMDA data evolved over time.

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Racially Concentrated Areas of Affluence: A Preliminary Investigation

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Abstract

"Racially/Ethnically Concentrated Areas of Poverty" (RECAPs) have become an official focus of policy attention for the U.S. Department of Housing and Urban Development (HUD) through the 2015 rule regarding local governments' obligations to Affirmatively Further Fair Housing. In this article, we argue for equal attention to the other end of the segregation continuum, affluent White neighborhoods, or what we call "Racially Concentrated Areas of Affluence" (RCAAs). We examine the prevalence and characteristics of RCAAs in the 50 largest metropolitan areas of the United States. Our findings show that RCAAs, as we define them, are not as prevalent as RECAPs, accounting for an average of 2.19 percent of all tracts in the 50 largest metro areas compared with RECAPs, which are an average of 4.68 percent of metro tracts. RCAAs are more common in several metropolitan areas than RECAPs. The two phenomena seem to be related; controlling for group size, the correlation between metro area shares of RCAAs and RECAPs is moderately positive. We conclude by offering reasons for focusing policy attention on RCAAs that include acknowledging the various public policies that have created these enclaves of advantage and the ways in which current and past public policies have subsidized them.

Concentrations of poverty combined with racial segregation produce conditions that have been the target of urban and housing policy since the 1980s. Deconcentrating poverty was the objective behind HOPE VI, Moving to Opportunity (MTO), and various HUD initiatives that focused on dispersing subsidized households more widely throughout metropolitan areas. The confluence of race and poverty is the specific target of HUD's recent regulatory initiative related to Affirmatively Furthering Fair Housing (AFFH). The 2015 AFFH rule requires local governments to study what HUD calls "Racially/Ethnically Concentrated Areas of Poverty" (RECAPs) to inform local efforts to further fair housing goals. The orientation of much recent housing policy during this time period has been to deconcentrate the poor and desegregate people of color, either by facilitating or forcing their movement out of the neighborhoods in which they predominate, or by redevelopment

schemes aimed at introducing more upscale housing and higher income residents (Goetz, 2003). Countless studies by academics of the dynamics of high-poverty, segregated neighborhoods and the prospects for their improvement have accompanied this strategy (Jargowsky, 1997, Sharkey, 2013). The media, for their part, have produced a steady stream of sensationalized reporting on the "pathologies" of these neighborhoods, especially during the 1980s and 1990s, fueling both academic attention and a policy focus (Macek, 2006).

Curiously, although low-wealth communities of color have been thoroughly problematized and portrayed as the most recognizable example of racial and income segregation in the United States, relatively little attention has been given to the other side of the segregation dynamic—the affluent, White community. Racially Concentrated Areas of Affluence (RCAAs) are not currently referenced in Federal housing policy, nor have they been scrutinized to the extent that RECAPs have. However, patterns of segregation in the United States show that of all racial groups, Whites are the most severely segregated (Feagin, 2014). Research also tells us that the segregation of affluence is greater than the segregation of poverty (Reardon and Bischoff, 2014). The fact that segregation of the poor and the wealthy is proceeding apace, confirms Sheryll Cashin's (2004: 185) observation that "the favored quarter, like the Black ghetto, represents an extreme of American separatism."

Concern about racially concentrated areas of affluence as an expression of problematic separatism is largely absent from our national housing policy agenda and the public imagination more broadly. The continued elision of White neighborhoods of concentrated affluence and social power within normative inquiry reinforces the decades-old tendency to problematize low-income communities of color, while at the same time sparing White neighborhoods and the advantages they embody from examination of any kind. Analyses of segregation that disregard RCAAs understate the degree to which advantage and disadvantage, opportunity and inopportunity, and mobility and immobility are integrally linked. Although our chief objective is not to exhaust the interconnections of these divergent social formations, we see these linked dualities as the normative compass guiding our inquiry into RCAAs. We also see our project as contributing to the growing body of scholarship within the relatively new field of *critical whiteness studies*. We contribute to this work by empirically exploring not only the "public and psychological wage" that whiteness confers (Du Bois, 2017; Roediger, 1991) but also the material. In other words, our concern is how whiteness—particularly in the neighborhood context—confers unearned distributive advantages (Lipsitz, 2006).

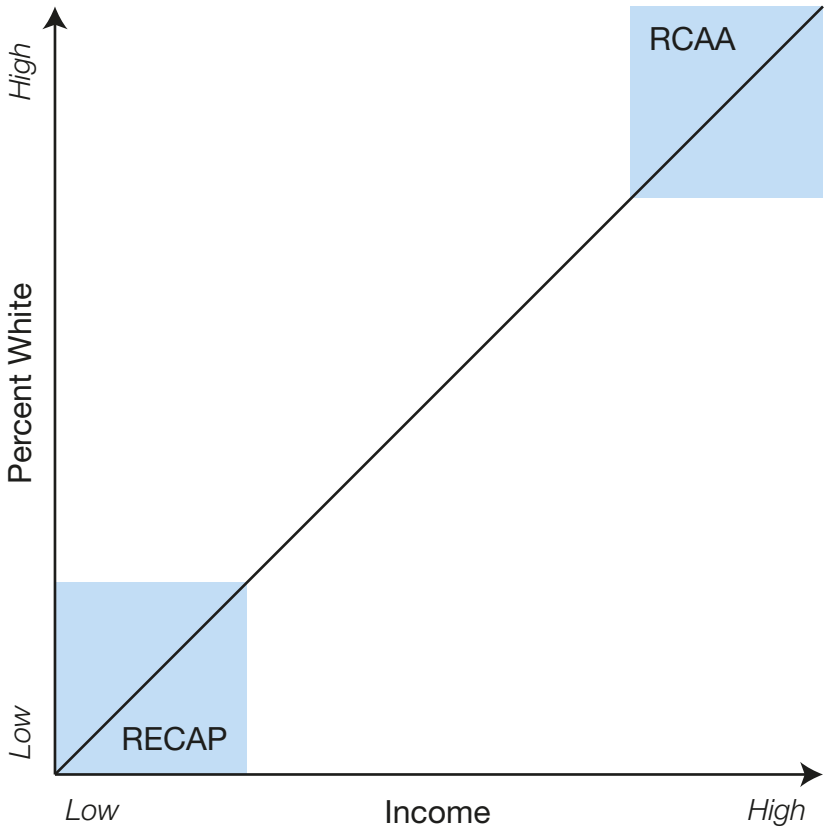
In this article, we examine both racially concentrated poverty and racially concentrated affluence in the largest 50 metropolitan areas in the United States. Our purpose is to shed light on both extremes of residential segregation in American urban areas. Our interest is uncovering the extent of this settlement pattern by mapping the geographic location of these neighborhoods, preliminarily testing hypotheses about the prevalence and nature of RCAAs and assessing the degree to which they correlate with other dimensions of metropolitan growth dynamics (that is, overall segregation indices and economic and demographic characteristics).

In this research, we conceptualize neighborhoods as occupying points in a two-by-two field defined by race and affluence. In exhibit 1, the vertical axis is defined by the racial makeup of neighborhoods, from completely non-White to completely White. The horizontal axis is defined by wealth from least to most affluent. RECAPs occupy the lower left extreme of the plot, whereas

RCAAs are the neighborhoods in the upper right. Because of the high correlation between race and income in the United States, we expect that metropolitan areas will present a distribution of neighborhoods that resembles to some degree the relationship depicted in exhibit 1; namely, that as neighborhood income increases, the percentage of residents who are White also increases.

Exhibit 1

Racially Concentrated Areas of Poverty and Affluence Continuum



Racially Concentrated Affluence and Poverty

Residential segregation has long been a defining characteristic of American metropolitan areas and a subject of extensive social science and public policy concern. Although most indicators of racial segregation show modest declines in recent years, segregation remains a central characteristic of many metropolitan areas (Lichter, Parisi, and Taquino, 2015; Logan and Stults, 2011). Concentrations of poverty, having abated somewhat during the 1990s, grew again with the turn of the century (Kneebone and Nadeau, 2015).

The "costs" of segregation have been carefully enumerated by many (for example, Anderson, 2010). For most scholars, the focus has been on widespread and persistent patterns of racial segregation

in American communities and how these patterns create and reinforce a range of inequalities. A large body of research has also documented the negative impacts of concentrated poverty on economic and social opportunities and outcomes. Racially concentrated areas of poverty entrench these negative impacts for minority populations and reinforce socio-economic disparities along racial lines. Inequalities in affluence and income are among the most obvious costs of segregation: gaps in wealth and income due to gaps in education and job-readiness from discrimination and differences in educational experiences and benefits of place. Inequalities in housing equity, housing conditions, and lending and availability of credit are related outcomes of residential segregation (Lipsitz and Oliver, 2010).

Economic inequalities are not the only costs of high levels of segregation. Exposure to harmful environmental conditions and crime in segregated, low-wealth communities combine with diminished public services to make life more dangerous (Hartman and Squires, 2010), leading to inequalities in life expectancy between Whites and Blacks and rich and poor (Jackson et al., 2000; Anderson, 2010). Even the access to critical types of social capital is unevenly distributed across communities, leaving residents of low-wealth communities with social networks that are less helpful in achieving upward mobility (Briggs, 1998). Strong patterns of segregation are worrisome because they are "structures of oppression" (Young, 2002). Segregation is a "self-reinforcing dynamic" (Galster, 1999) that exaggerates race and class differences and reinforces discrimination.

Public policy, furthermore, is implicated in the creation and maintenance of spatial inequality in American urban areas, whether it is the role of Federal and local housing programs in producing segregated communities of color, or the impact of local zoning, land use controls, and systems of local public finance in creating and protecting areas of White affluence. Despite this dual complicity, for policymakers (and most social scientists) concerned with addressing problems of segregation, the focus is typically on the conditions and dynamics within segregated communities of color and low-wealth neighborhoods. This focus has produced an overwhelming orientation of public policy toward altering the pattern of residential settlement among people of color and the poor. Our policies have, in fact, placed "no onus on Whites to adjust and contribute to a new multicultural ethos" (Cashin, 2004: 81).

Research shows, however, that economic segregation is increasing at both extremes of the wealth distribution (Reardon and Bischoff, 2014) and that the segregation of Whites in the United States exceeds that of any other racial group (Feagin, 2014). Indeed, some of the worried-about "costs" of residential segregation apply to the actions of affluent Whites attempting to isolate from others. As Tilly (1999) noted, the isolation of low-income communities and people of color occurs against the backdrop of *opportunity hoarding*, the corralling of resources for the exclusive benefit of already advantaged groups. Just as segregation reinforces the social locations of those already disadvantaged, it too reinforces the tendency of the White and wealthy to legitimate and enclose their advantages for in-group consumption (Anderson, 2010). For example, Reardon and Bischoff (2014) suggested the erosion of "social empathy" that results from close physical proximity between the middle classes and the poor could enhance the likelihood of "self-interested investments" that serve narrow interests at the expense of more universal social and economic needs. The converse may also be true; support for more universal public goods declines under

conditions of segregation. As Anderson (2010: 61) noted: "Whites favor tax limitations more strongly in more ethnically diverse jurisdictions so they do not have to share their tax contributions with other groups" (see also the findings in Alesina et al., 1999).

Although Tilly, Anderson, and others refer to this dynamic as opportunity hoarding, we argue that it is better understood as "advantage hoarding." People who benefit from unjust socio-economic relations and neighborhood exclusivity do not have to actively "seize the opportunity" because neighborhood conditions confer automatic benefits. Advantages such as high and rising property values, quality schools, safety, and so on accrue merely through residence in such neighborhoods.

Hoarding is but one of the many mechanisms that link the divergent trajectories of marginalized neighborhoods on the one hand and exclusive neighborhoods on the other. Some have argued that segregation leads to high levels of land consumption in metropolitan areas, as the White and the wealthy move ever outward to separate themselves from other segments of society (Cashin, 2004). The willingness of Whites and affluent families to pay for exclusivity increases land and housing costs. Others point to the creation and maintenance of social divisions resulting from segregation; the extreme separation of races leads to greater fear of "the other" by both Blacks and Whites (Feagin, 2014). Iris Marion Young (2002) argued that social and political indifference is facilitated "when privileged classes live in separate political jurisdictions" and are thus able to keep resources and insulate themselves from the less fortunate.

Others point to how race and class segregation work in ways that obscure the privileges of the favored. Again, as Young (2002: 208) argued, "segregation makes privilege doubly invisible to the privileged" by keeping disadvantage out of sight and normalizing advantage. Anderson (2010) noted that racial separation allows the favored group to enjoy advantages without personally discriminating against the disadvantaged. According to the argument, the pursuit of the favored group's well-being and the enjoyment of the highest quality public and private services are achieved in isolation. All this combines to insulate the favored group and reduce their incentives to support services they do not see or use. This contrasts with suburban Black middle-class neighborhoods, which tend to be more economically diverse (Patillo, 2005), spending more of their tax revenues on redistributive policies at the expense of commercially attractive public investments (Phelan and Schneider, 1996; Anderson, 2010). These realities are likely becoming increasingly acute given growing economic inequality in the United States during the past 30 years, which is largely a result of increased income and wealth accumulation of the top end of the income distribution (Saez, 2013; Shapiro, 2017).

In recent years, a body of research has grown on the topic of the so-called "super-rich" and what researchers are calling "alpha territories." Alpha territories are areas of global cities in which the super-rich live and invest (Atkinson, Parker, and Burrows, 2017; Burrows et al., 2014; Wissink, Koh, and Forrest, 2014). This literature is more an investigation of contemporary capitalism, the behavioral and investment patterns of a global elite, and their impact on cities across the world than it is an examination of residential segregation (for example, Beaverstock, Hubbard, and Short, 2004; Pow, 2011; Frank, 2007; and Hay and Muller, 2012).

Studies focusing on the segregation of affluence include the work of Coulton et al. (1996) on the relationship between concentrated poverty and concentrated affluence. They found little correlation at the metropolitan level, although they did note that MSAs with higher levels of racial or ethnic segregation also saw high rates of economic segregation. Massey and Eggers (1993) also looked at the segregation of affluence and poverty and their spatial isolation from each other. They too found evidence that rates of racial segregation influenced the level of poor-affluent segregation in the 1970s and 1980s. St. John (2002) examined the rate at which affluent households (both Black and White) live in neighborhoods where 50 percent or more of the households are affluent. St. John's analysis of 335 MSAs using 1990 census data shows that concentrations of affluence were greater in metro areas with economic bases that had more fully experienced restructuring away from durable goods manufacturing and toward global finance and services. The study also shows that greater income inequality and higher absolute levels of income in metropolitan areas were associated with higher rates of concentrated affluence. Like Coulton et al. (1996) and Massey and Eggers (1993), St. John found that Black/White segregation was related to the concentration of affluence. Lee and Marlay (2007) provided a descriptive analysis of affluent neighborhoods in the largest 100 U.S. metropolitan areas that shows that the concept is robust to a range of different measures.

These previous studies of concentrated affluence are based on census data from 2000 and earlier. Furthermore, although they suggest that racial segregation and income segregation are related, they do not examine the phenomenon of White affluence directly. Given the meta-analysis by Johnson (2008) showing that Whites more than Blacks benefit from concentrated affluence, we argue the importance of investigating places of White affluence in the American urban system. In the following analysis, we look at the two extremes of racial and economic segregation in American metropolitan areas: racially/ethnically concentrated areas of poverty (RECAPs) and racially concentrated areas of affluence (RCAAs).

Methods

Data and Variables

All data used in our analyses originate from the American Community Survey (ACS) 2012–2016 5-year estimate. We use several variables from the ACS that depict the economic and demographic characteristics of individuals and households and the characteristics of the housing stock. All measures are at the census tract level. Our study covers the largest 50 metropolitan areas in the United States. We summarize our findings on concentrated poverty and affluence by region. We do so for ease of presentation, but also because regions capture important differences in urban development history in the United States, and the evidence shows that patterns of segregation vary significantly by region. Jargowsky (1997), for example, showed that concentrations of poverty have varied by region, with the phenomenon growing first in the Midwest and Northeast and then spreading to other areas. Massey and Denton (1989) and Denton (1994) demonstrated that rates of segregation and hypersegregation of Blacks and Hispanics have also varied significantly by region, with Northeast and Midwest metropolitan areas scoring highest on most indices of residential segregation.

Defining Racially/Ethnically Concentrated Areas of Poverty (RECAPs)

We use a well-established set of criteria for identifying RECAPs to define them in our work. According to HUD, a RECAP is a census tract in which more than 40 percent of the residents have incomes less than the Federal poverty level and more than 50 percent of the residents of the census tract are people of color (HUD, 2011). We considered individuals to be people of color if they did not identify themselves as "Not Hispanic or Latino: White Alone." We could find no theoretical or empirical justification for the racial threshold in the RECAP definition, which appears to be simply an arbitrary level adopted by the Federal government. The justification for the poverty threshold, however, does have an empirical basis. Jargowsky and Bane (1991) argued that the 40-percent poverty threshold is confirmed by their field research in metropolitan areas across the country. Neighborhoods that knowledgeable local informants regarded as ghettos, barrios, and slums consistently matched census tracts that had poverty rates of 40 percent or more. Since then, the 40-percent threshold has been widely adopted and has been argued to be the degree of neighborhood poverty above which disadvantage accelerates.

Defining Racially Concentrated Areas of Affluence (RCAAs)

Our objective in defining RCAAs is to mirror as much as possible the dimensions and methods that constitute the RECAP definition. To think of these phenomena as two ends of the same continuum requires conceptual and operational symmetry. We seek to incorporate four important characteristics of the RECAP definition into the RCAA definition. First, and most obviously, the neighborhood is defined both by race and by income. Second, to the extent possible, we wish to identify an empirical justification for the race and income thresholds we use (noting as we have previously that the RECAP definition itself fails this standard for race). Third, we seek a definition that is invariant across metropolitan areas. The RECAP definition uses the national poverty level and does not adjust for cost of living across metro areas. It also uses a uniform standard of 50 percent people of color that does not adjust for the degree of racial diversity by metro area. Finally, we seek to mirror the RECAP definition by avoiding a definition that predetermines the prevalence of RCAAs across or within metro areas. This aspect of the definition is reflected in the use of absolute measures of income and race rather than defining these neighborhoods as occupying some percentage of the total distribution of neighborhoods.

We posit that, in the same way neighborhood disadvantage is associated with concentrated poverty and high concentrations of people of color, conversely, distinct advantages are associated with residence in affluent, White communities. We hypothesize that the returns of living in predominantly White and affluent neighborhoods are nonlinear and accelerate at the high end. What we seek in a definition of RCAAs is the combination of the level of whiteness and affluence at the neighborhood scale at which returns accelerate. We use census tract median home value as a proxy for neighborhood advantage. Home values represent a reasonable indicator of neighborhood advantage because they not only capture the quality of the housing stock, they also capture neighborhood characteristics associated with advantages, including good schools, low crime, job proximity, and environmental quality. Finally, and most obviously, they are themselves a form of wealth.

We conduct nonlinear regression analysis to investigate the impact of percent White and median household income on home values and include a variety of controls associated with neighborhood advantage, including share of adults with a college degree, home ownership rate, and whether the tract was in a central city. We also included a metro area fixed effect to account for systematic differences between metro areas. We operationalize share White as a categorical variable broken into 5 percentage-point increments and interact that variable with median household income. The analysis, summarized in the appendix, describes a non-linear relationship between percent White and home values, with an inflection point estimated at 80 percent (see appendix for details of this step).

Finding a threshold for concentrated affluence using these methods proved more difficult as the model estimated a constant, linear return to household incomes. Without a strong empirical justification for an income threshold, we turn to previous studies of concentrated affluence. Unfortunately, the literature provides no consistent guide for defining the concept. Lee and Marlay (2007), for example, operationalized affluent neighborhoods as those in the highest 2 percent in income across the 100 largest metro areas they study. Solari's (2012) study of concentrated affluence defines such neighborhoods as the top 10 percent within a metro area's neighborhood-income distribution. These definitions, however, violate our fourth guideline for a definition of RCAAs and are inconsistent with the methods used to define RECAPs.

Massey and Eggers used family income of more than $30,000 in 1979 as the basis of their examination of affluence in the 1970s. This was slightly more than 50 percent above the national family median income in 1979. In his study of concentrated affluence, St. John used a threshold equal to four times the poverty rate. This produced an income level around $100,000, although St. John used a cost of living index that produced a threshold that varied by metro area (and therefore violates our third guideline and is inconsistent with the methods used to define RECAPs).

The greatest convergence in previous research on an income level to define affluence puts the threshold at roughly two times the national median. Coulton et al. (1996), for example, used a 1990 median family income of over $75,000, which was just over two times the national median in the 1990 census. They argued that such a standard was consistent with other research on affluence, citing Kosters and Ross (1988) and Blackburn and Bloom (1985).

We adopt a median household income of $125,000 as our standard. This level is, like Coulton et al., slightly greater than two times the national median in 2016. To achieve our other objective in establishing a definition of RCAA that is symmetrical with that of the RECAP, we use a constant measure of income and do not adjust for cost of living. Thus, our definition of RCAA is a census tract in which 80 percent or more of the population is White and has a median income of at least $125,000.

Analysis

The distribution of census tracts along the two dimensions that define RECAPs and RCAAs is shown for a sample of metro areas in exhibit 2. Rather than being linear, as depicted theoretically in exhibit 1, the relationship between percent White and income in census tracts is in fact

curvilinear in most metropolitan areas. This is due to one variable, percent White, having an upward limit of 100, whereas the other variable, income, has no upper bound (although is top-coded at $250,000). The curvilinear form of this relationship is common to most of the metropolitan areas in our sample and is shown in both the Pittsburgh and Salt Lake City plots. In a small number of metro areas, the relationship is not very distinct. As shown for San Jose, the scatterplot is much more diffuse.

Exhibit 2

Income and Racial Distribution for Sample MSAs (RECAPs/RCAAs Highlighted) (1 of 2)

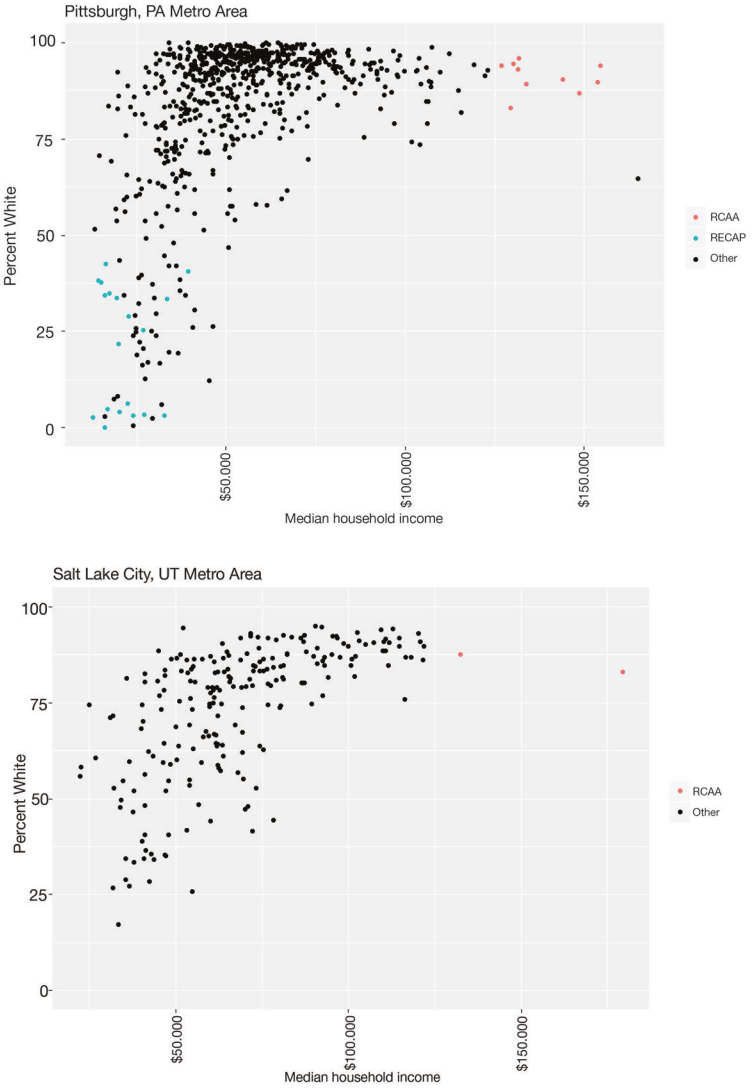
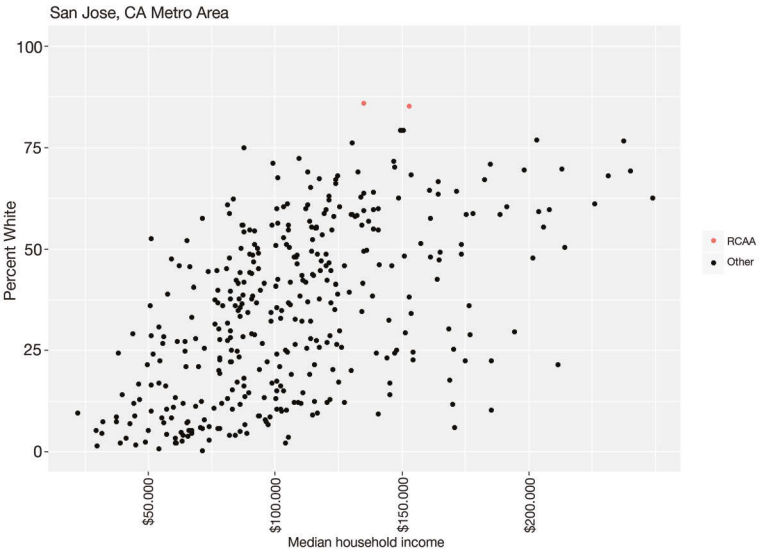


Exhibit 2

Income and Racial Distribution for Sample MSAs (RECAPs/RCAAs Highlighted) (2 of 2)



Segregation by Race

Exhibit 3 shows the isolation index for Whites and people of color in our 50 metropolitan areas sample. The isolation index measures the degree to which a person of a particular category is surrounded by members of the same group (Massey and Denton, 1993). In 70 percent of the metro areas in our sample, Whites lived in more segregated neighborhoods compared to people of color. Average White isolation in our sample was 25 percent higher than the isolation for people of color. Overall, the typical White person lived in a neighborhood that was 71 percent White, whereas a typical person of color in our sample lived in a neighborhood that was 57 percent people of color. The 10 metro areas with the highest levels of racial isolation of Whites were in the Midwest or Northeast and, not surprisingly given the dynamics of the isolation index, also tended to have larger White populations. Conversely, metro areas with the highest racial isolation for people of color tended to be in the South and West regions and tended to have larger shares of non-White populations.

Exhibit 3

Average Metro Area Racial Isolation Index by Region

Region	N Metro Areas	White		People of Color	
Midwest	10	0.82	(0.04)	0.53	(0.1)
Northeast	7	0.81	(0.07)	0.53	(0.11)
South	22	0.68	(0.08)	0.6	(0.1)
West	11	0.61	(0.12)	0.58	(0.15)
Total	50	0.71	(0.11)	0.57	(0.12)

Note: Standard deviation in parentheses.

Another way to document racial concentrations is to analyze the shares of Whites and people of color that live in racially/ethnically concentrated census tracts. Exhibit 4 shows that in every region, larger percentages of Whites live in majority White tracts compared to the share of people of color who live in majority POC tracts. This pattern holds in the aggregate, but also for 90 percent of the individual metro areas in our sample, greater shares of Whites live in majority White neighborhoods compared to people of color. More than 80 percent of Whites in our sample metro areas live in census tracts that are majority White compared with 57 percent of people of color.

Exhibit 4

Average Metro Area Racial Concentration by Region

Region	N Metro Areas	Share POC Living in Majority POC Tracts		Share of Whites Living in Majority White Tracts		Share of Whites in 80+% White Tracts	
Midwest	10	50.95	(12.67)	93.59	(3.19)	67.85	(10.77)
Northeast	7	50.74	(14.5)	91.21	(6.69)	65.32	(17.68)
South	22	60.97	(14.22)	79.03	(12.9)	33.04	(16.61)
West	11	60.59	(26.4)	71.19	(19.45)	22.9	(20.16)
Total	**50**	**57.45**	**(17.52)**	**81.92**	**(15.02)**	**42.29**	**(24.35)**

Note: Standard deviation in parentheses.

Exhibit 4 also presents White racial concentration using our more conservative 80-percent threshold. In the average metropolitan area in the Northeast, for example, two-thirds of all Whites live in census tracts in which 80 percent or more of the residents are also White. In contrast, in Western metro areas the average is less than one-fourth of Whites. In 19 of the sample metro areas the share of Whites living in tracts with 80 percent or more Whites is greater than the share of people of color living in tracts with 50 percent or more people of color.

Income Concentration

Our analysis shows that 38 percent of metro areas had higher rates of concentrated affluence compared with concentrated poverty. In many cases, rates of concentrated affluence far outstripped rates of concentrated poverty. The average metro area in our sample had more than five times as much concentrated affluence compared with concentrated poverty.[1] Places with the highest rates of concentrated affluence include wealthy metro areas in the West and Northeast such as San Jose, Washington, D.C., and San Francisco.

1 This does not include San Jose, which was a significant outlier with 203 times as much concentrated affluence as concentrated poverty. The median for the sample (including San Jose) was 2.3 times.

Exhibit 5

Average Metro Area Income Concentration by Region

Region	N Metro Areas	Share Tracts w/ Concentrated Affluence		Share of Tracts w/ Concentrated Poverty	
Midwest	10	9.09	(3.77)	9.2	(4.14)
Northeast	7	14.01	(9.97)	5.13	(2.33)
South	22	11.19	(9.12)	5.33	(4.23)
West	11	18.86	(14.68)	2.27	(1.6)
Total	**50**	**12.85**	**(10.34)**	**5.4**	**(4.14)**

Note: Standard deviation in parentheses.

Metro areas with the highest rates of concentrated poverty like Memphis, TN, Milwaukee, WI, and Detroit, MI, tended to be in the South and Midwest; metro areas in the Midwest, on average, had the lowest rates of concentrated affluence and the highest rates of concentrated poverty. In contrast, on average, metro areas in the West showed the highest rates of concentrated affluence and the lower rates of concentrated poverty. One metro area, Salt Lake City, UT, had zero areas of concentrated poverty.

Racially Concentrated Areas of Affluence and Poverty

In the previous section, we analyzed the prevalence and degree of racial or ethnic concentrations and income concentrations separately. In this section, we will directly explore both ends of the income/racial distribution and compare the prevalence and characteristics of RCAAs and RECAPs.

Exhibit 6 shows the distribution of RCAAs and RECAPs summarized by region. We find that in our sample, RCAAs are more common in the Midwest and Northeast. RECAPs are most common in the Midwest. The West region has, on average, the fewest RCAAs and the fewest RECAPs despite being the most racially diverse region in our sample.

Exhibit 6

Average Share of Census Tracts that Qualify as RCAA and RECAP by Region

Region	N Metro Areas	RCAA		RECAP	
Midwest	10	2.17	(1.01)	7.42	(4.09)
Northeast	7	3.58	(2.83)	4.21	(2.22)
South	22	2.06	(1.36)	4.92	(4.29)
West	11	1.57	(1.53)	1.99	(1.69)
Total	**50**	**2.19**	**(1.68)**	**4.68**	**(3.92)**

Note: Standard deviation in parentheses.

Exhibit 7 shows the metro areas with the highest rates of RCAAs and RECAPs. Metro areas with high rates of RCAAs tend to be in Whiter metro areas. The list of metro areas with the highest rates of RECAPs is dominated by *rustbelt* metro areas like Milwaukee, Detroit, Cleveland, and Buffalo. Chicago is the only city that appears on both lists. Salt Lake City and San Jose were the only metro areas that had no RECAP, and Las Vegas was the only metro area in our sample without any RCAA.

Exhibit 7

High Concentrations of RCAA and RECAP

RCAA				RECAP			
Rank	Metro Area	N RCAA	Share of Total Tracts	Rank	Metro Area	N RECAP	Share of Total Tracts
1	Boston, MA	79	8.77	1	Memphis, TN	52	21.67
2	Denver, CO	33	5.37	2	Milwaukee, WI	58	13.55
3	New York, NY	229	4.97	3	Detroit, MI	168	13.09
4	Washington, DC	65	4.88	4	Cleveland, OH	81	12.82
5	Philadelphia, PA	68	4.65	5	New Orleans, LA	39	9.95
6	Baltimore, MD	28	4.17	6	Phoenix, AZ	80	8.16
7	Raleigh, NC	9	4.05	7	Buffalo, NY	23	7.93
8	Nashville, TN	15	3.99	8	Birmingham, AL	17	6.46
9	Minneapolis, MN	30	3.82	9	Chicago, IL	135	6.14
10	Chicago, IL	74	3.37	10	Oklahoma City, OK	21	5.82

Exhibit 8 shows the average concentration of White affluent households living in RCAAs and the average concentration of poor POC living in RECAPs. In our 10 Midwestern metro areas, for example, just 7.5 percent of affluent Whites lived in RCAAs. In those same metro areas, 24.8 percent of people of color under the poverty line lived in RECAPs. These regional figures mirror the patterns in exhibit 6. On average, metro areas in the Northeast and the Midwest had the highest shares of affluent Whites living in RCAAs and poor people of color living in RECAPs. The West, while being quite affluent overall, showed the lowest rates of affluent Whites living in areas of concentrated White affluence. Across all metro areas, the rate at which people of color below the poverty line live in RECAPs (15.64) is more than twice the rate at which White affluent households live in RCAAs (6.8).

Exhibit 8

Concentration of White Affluence and Poor POC in RCAAs and RECAPs

Region	N Metro Areas	Share Poor POC in RECAP		Share White Affluent HH in RCAA	
Midwest	10	24.81	(11.22)	7.52	(2.75)
Northeast	7	19.62	(9.89)	9.88	(5.29)
South	22	14.58	(7.28)	6.75	(3.69)
West	11	6.9	(5.01)	4.27	(3.69)
Total	**50**	**15.64**	**(10)**	**6.8**	**(4.04)**

Note: Standard deviation in parentheses.

Characteristics of RECAPs and RCAAs

Comparing the income characteristics of RECAPs and RCAAs with the average tract in their respective metro areas, we find that, on average, RCAA tracts have more than twice the median household income of the average tract in their metro area.

As expected, poverty rates in RCAAs are also significantly lower and are, on average about 20 percent of a typical tract. On average, RCAAs tracts are more income homogenous than RECAPs. The average RCAA in our sample was 57 percent affluent, whereas the average RECAP had a poverty rate of 48 percent. The typical RCAA tract had a rate of affluence 3.2 times that of a typical tract, whereas RECAPs on average had a poverty rate 3.2 times that of a typical tract. The figures presented in exhibit 9 did not vary significantly by region.

Exhibit 9

Average Income Characteristics of RCAAs and RECAPs by Region

	All Tract Average	RCAA Average	RECAP Average
Median Income	$64,589	$147,719 *(2.29)*	$23,071 *(0.36)*
Percent Affluent	17.8	57.2 *(3.21)*	2.9 *(0.16)*
Percent Poverty	15.0	3.2 *(0.21)*	48.0 *(3.20)*

Note: Values in italics represent ratio to all tract average.

Exhibit 10 details the racial breakdown of RCAAs and RECAPs and how the racial characteristics compare with typical metro area tracts. By definition, little racial variation occurs within RCAAs; RCAAs look the same across all regions. RECAPs, however, show a much wider range of racial characteristics. In the Midwest and the South, RECAPs are majority Black (65 percent and 59 percent Black, respectively). In the West, Hispanics are the largest racial/ethnic group in RECAPs, and northeastern RECAPs are a mixture.

Exhibit 10

Average Racial Characteristics of RCAAs and RECAPs

	All Tract Average	RCAA Average	RECAP Average
Pct. Asian	5.6	4.2	4.3
		0.8	*0.8*
Pct. Black	16.5	1.9	49.9
		0.1	*3.0*
Pct. Hispanic	16.1	4.2	26.1
		0.3	*1.6*
Pct. White	58.6	87.5	16.4
		1.5	*0.3*

Note: Values in italics represent ratio to all tract average.

Geography of RCAAs and RECAPs

On average, RCAA tracts are farther from the urban core than the average census tract in a region and much farther away from the core compared to the typical RECAP (see exhibit 11). A typical RCAA in our sample is more than twice as far away from the core as the typical RECAP. RECAPs in our sample were also twice as dense on average as the typical metro area tract and more than four times as dense as the typical RCAA. RCAAs are more likely to be in suburban areas compared to the typical tracts, whereas RECAPs are almost 2.5 times more likely to be in central cities.

Exhibit 11

Distance from Central Business District and Population Density

	All Tract Average	RCAA Average	RECAP Average
Dist. From Core	15.0	17.0	8.0
		1.13	*0.53*
Pop Density	5,132	2,283	9,704
		0.44	*1.89*
Share Located in Central City	30.3	10.8	73.6
		0.36	*2.43*

Notes: Distance from core in miles and population density in thousands of residents per square mile. Values in italics represent ratio to all tract average.

Some metro areas deviated from this central city/suburban dynamic between RCAAs and RECAPs. Most RECAPs were in suburban areas in the Riverside, CA; Miami, FL; Louisville, KY; and Virginia Beach, VA metro areas. Conversely, some metro areas had most of their RCAAs in the central city including Los Angeles, CA; Charlotte, NC; New Orleans, LA; Tampa, FL; and Virginia Beach, VA.

Exhibit 12 maps four representative metro areas and highlights the location of RCAAs and RECAPs. We see a common pattern of RECAPs clustered in central cities, which is consistent with other research (Jargowsky, 1997). The "classic" pattern of central city RECAPs and suburban RCAAs is shown in the map of Minneapolis and St. Paul, MN. Los Angeles, in contrast, shows a mix of RCAAs and RECAPs within the central city boundaries. In some metro areas like St. Louis, MO and Chicago, IL, we also observe a directional dividing line between RCAAs and RECAPs consistent with patterns of racial segregation in these metro areas.

Exhibit 12

Mapping RCAAs and RECAPs (1 of 2)

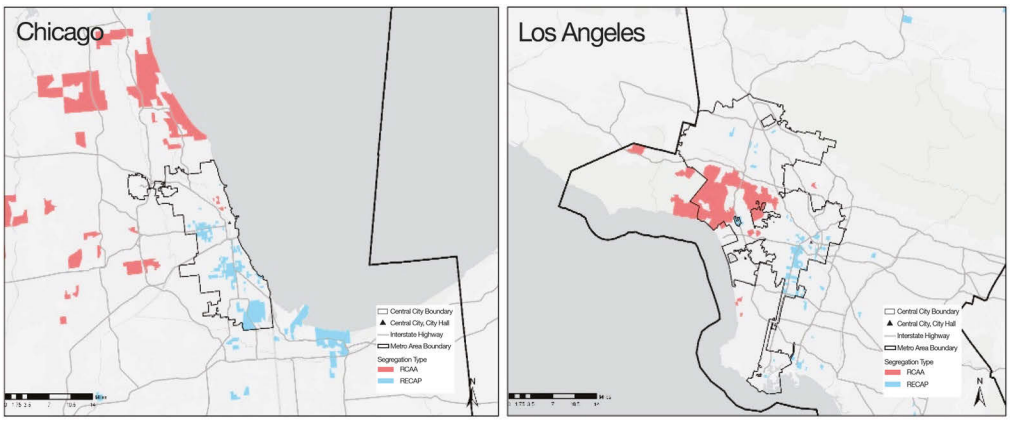
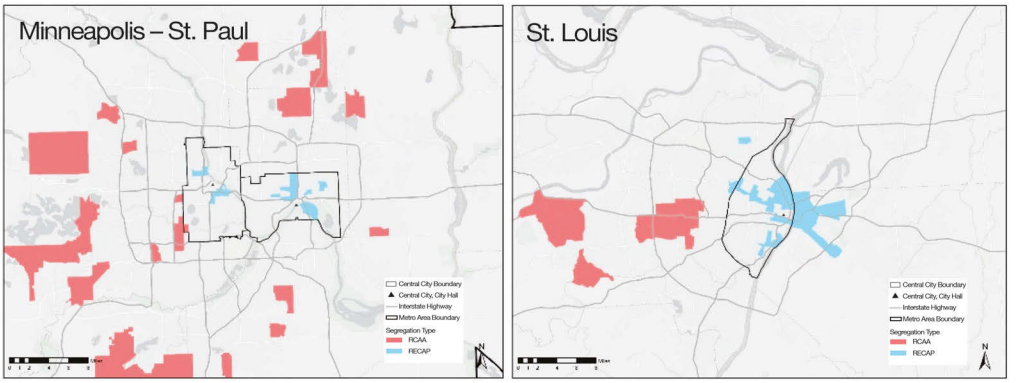


Exhibit 12

Mapping RCAAs and RECAPs (2 of 2)

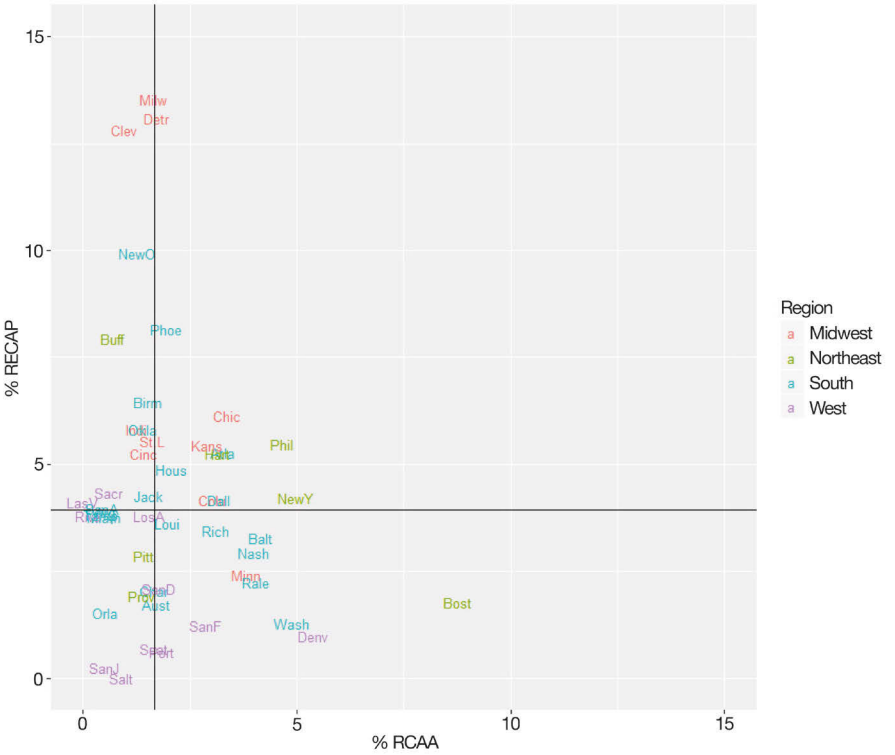


Correlation between RCAAs and RECAPs

In the previous section, we analyzed and compared different characteristics of RCAAs and RECAPs compared with the typical neighborhood. In this section, we examine whether the prevalence of RECAPs and RCAAs is correlated. For this preliminary analysis, we began with a scattergram that features the share of metro area tracts that qualify as RCAAs on the x-axis and the share of tracts that qualify as RECAPs on the y-axis (exhibit 13). The lines on the scattergram represent the median values of share RCAA (X%) and share RECAP (Y%) of our sample respectively. One can see much greater variation in the prevalence of RECAPs across metro areas (measured as a percentage of all tracts within a region). The range would seem greater except that the biggest outlier, Memphis, TN, is not pictured in the diagram because it is so out of scale with the rest of the metro areas in our sample. Following Memphis, the Midwestern cities of Milwaukee, WI, Cleveland, OH, and Detroit, MI have the highest percentage of tracts meeting the RECAP definition. Western cities typically rank low in prevalence of RECAPs. The range in the prevalence of RCAAs is much more limited, with Boston, MA standing out with the highest percentage. Cities appearing in the upper right quadrant rank relatively high on both RECAPs and RCAAs.

Exhibit 13

Relationship between RCAAs and RECAPs



Notes: Memphis, TN is a RECAP outlier with greater than 20 percent of tracts qualifying as RECAP. It is not pictured in this graphic to improve readability.

In exhibit 14, we create a simple typology that places the 50 metro areas in our sample into one of four categories based on whether their share of each neighborhood type is above or below the median value for our sample. This results in four mutually exclusive categories. First, *Low/Low* metro areas have below the median percentage of RCAAs and RECAPs. *High/High* metro areas have shares that qualified as RCAAs as well as RECAPs above the median. The off-diagonal categories are metro areas that have high levels of one type and low levels of the other.

We find strong regional trends in this categorization. Most of the metro areas in the High/High category are rust belt metro areas in the Midwest and Northeast. The category includes the largest cities in our sample. New York, Chicago, Houston, Philadelphia, and Phoenix are five of the six most populous central cities in the country and their metro areas are above the median in both RCAAs and RECAPs. There are no Western cities in the High/High category.

Exhibit 14

Correlation in Prevalence of RECAPs and RCAAs

	Low RCAA	High RCAA
High RECAP	Birmingham-Hoover, AL Buffalo-Cheektowaga-Niagara Falls, NY Cincinnati, OH-KY-IN Cleveland-Elyria, OH Indianapolis-Carmel-Anderson, IN Jacksonville, FL Las Vegas-Henderson-Paradise, NV Memphis, TN-MS-AR Milwaukee-Waukesha-West Allis, WI New Orleans-Metairie, LA Oklahoma City, OK Sacramento-Roseville-Arden-Arcade, CA St. Louis, MO-IL San Antonio-New Braunfels, TX	Atlanta-Sandy Springs-Roswell, GA Chicago-Naperville-Elgin, IL-IN-WI Columbus, OH Dallas-Fort Worth-Arlington, TX Detroit-Warren-Dearborn, MI Hartford-West Hartford-East Hartford, CT Houston-The Woodlands-Sugar Land, TX Kansas City, MO-KS New York-Newark-Jersey City, NY-NJ-PA Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Phoenix-Mesa-Scottsdale, AZ
Low RECAP	Los Angeles-Long Beach-Anaheim, CA Miami-Fort Lauderdale-West Palm Beach, FL Orlando-Kissimmee-Sanford, FL Pittsburgh, PA Providence-Warwick, RI-MA Riverside-San Bernardino-Ontario, CA Salt Lake City, UT San Jose-Sunnyvale-Santa Clara, CA Seattle-Tacoma-Bellevue, WA Tampa-St. Petersburg-Clearwater, FL Virginia Beach-Norfolk-Newport News, VA-NC	Austin-Round Rock, TX Baltimore-Columbia-Towson, MD Boston-Cambridge-Newton, MA-NH Charlotte-Concord-Gastonia, NC-SC Denver-Aurora-Lakewood, CO Louisville/Jefferson County, KY-IN Minneapolis-St. Paul-Bloomington, MN-WI Nashville-Davidson-Murfreesboro-Franklin, TN Portland-Vancouver-Hillsboro, OR-WA Raleigh, NC Richmond, VA San Diego-Carlsbad, CA San Francisco-Oakland-Hayward, CA Washington-Arlington-Alexandria, DC-VA-MD-WV

The Low/Low category contains an over-representation of metro areas from the West and no Midwest metro areas at all. In contrast to the pattern of large central cities having high rates of both RCAAs and RECAPs, Los Angeles is in the Low/Low category. These are some of the most racially diverse metro areas in our sample like the Los Angeles, CA MSA, which was only 30 percent White in 2015.

Exhibit 15

Segregation Typology by Region

Region	High RCAA/ High RECAP	High RCAA/ Low RECAP	Low RCAA/ High RECAP	Low RCAA/ Low RECAP	Row Total
Midwest	4 (36)	1 (7)	5 (36)	0 (–)	10 (20)
Northeast	3 (28)	1 (7)	1 (7)	2 (18)	7 (14)
South	4 (35)	8 (57)	6 (43)	4 (36)	22 (44)
West	0 (–)	4 (29)	2 (14)	5 (46)	11 (22)
Total	**11**	**14**	**14**	**11**	**50**

Metro areas that had low levels of RCAAs and high levels of RECAPs, unsurprisingly tended to be poorer metro areas with larger shares of people of color including Memphis, TN, and New Orleans, LA. This category also includes metro areas with struggling central cities such as Buffalo, Cleveland, Milwaukee, and St. Louis. Conversely, the high-RCAA/low-RECAP category contains

six of the 10 wealthiest metropolitan areas such as San Francisco, Washington, D.C., Boston, and Portland. This category also includes the only Midwestern metro area that registered a low number of RECAPs, Minneapolis-St. Paul. Exhibit 14 lists all metro areas in the four quadrants, and exhibit 15 summarizes the findings by region.

Accounting for Group Size

Measures of concentration like RCAA and RECAP are significantly correlated with group size. That is, the prevalence of RCAAs and RECAPs depend in part on the overall share of people within a metro area who are White and affluent on the one hand, and of color and poor on the other. We found simple bivariate correlations of 0.72 for RCAAs and 0.46 for RECAPs.[2] As a test of robustness and to better understand the relationship between RCAAs and RECAPs, we performed two OLS regressions to control for the group size of White affluent households and poor people of color using inverse hyperbolic sine transformed variables to increase normality and compared the standardized residuals from each equation. This allowed us to begin to understand how group size affects RCAAs and RECAPs and to chart a more valid analysis of the correlation between these two phenomena.

The control equations for each type of segregation are below:

$$\textit{Metro Share RCAA} = \gamma\_0 + \beta\_(1)\ \textit{Household Share White \& Affluent} + \epsilon$$

$$\textit{Metro Share RECAP} = \gamma\_0 + \beta\_(1)\ \textit{Population Share Poor POC} + \epsilon$$

Without controlling for group size, we find little, if any, correlation between metro areas that have high rates of RCAAs and RECAPs (-0.07). After controlling for group size, we find a stronger albeit still moderate positive correlation between metro areas' shares of RCAAs and RECAPs (0.36, $p < 0.05$).

Conclusion

The investigation of RCAAs, we argue, is necessary to achieve a fuller understanding of inequality and segregation in American metropolitan areas. Although public policy in the United States focuses on and problematizes RECAPs—the confluence of large minority populations and poverty—such concentrations are mirrored by exclusionary enclaves of White affluence. These enclaves represent a second form of extreme segregation in American metropolitan areas.

What is the value added of investigating RCAAs? We suggest four reasons for focusing on RCAAs. In addition to the extensive research that has focused on the damage to one's life chances from living in an RECAP (that is, the "neighborhood effects" literature), some scholars have focused on the inherent problematic nature of residential segregation and the importance of diversity for well-functioning communities (in both a social and political sense; Anderson, 2010). In this argument, the reality of intense segregation damages the larger polity by making intergroup relations problematic, and by creating and intensifying cross-group hostilities and mistrust. According to

2 Variables transformed using an inverse hyperbolic sine transformation to normalize data. We used this rather than a simple log transformation due to the fact that the inverse hyperbolic sine transformation is defined at zero.

this argument, the intense segregation of affluent Whites is as problematic as that of low-income minority families.

Second, RCAAs may themselves exhibit characteristics that have been identified as public policy problems. Our analysis, for example, shows that most RCAAs may contribute significantly to sprawled development; they tend to be distant from metropolitan centers and are often on the periphery of metro areas. Further, RCAAs have a dramatically lower population density than RECAPs and a lower population density than metro areas overall. These land use patterns apply to most suburban development, and no evidence suggests that RCAAs represent more extreme cases of sprawled development, although the question is worth exploring.

Third, RCAAs may represent a public policy issue to the extent that they have been created and maintained through exclusionary and discriminatory land use and development practices. Postwar patterns of suburbanization in many metropolitan areas were characterized by White communities erecting barriers to affordable housing and engaging in racially exclusionary practices (Danielson, 1976). Historical analysis of RCAAs could provide clues into how they emerged over time and the politics of their origins.

Finally, in failing to recognize RCAAs, we fail to acknowledge how society remains deeply structured not simply by legacies of White preferential treatment, but by a system that continues to, in fact, *reward* whiteness. In ignoring RCAAs, we render whiteness normative, treating the unearned benefits it confers as apolitical and natural. Our one-sided problematization of the segregation dynamic does not challenge the public, psychological, and material wage of whiteness, it reinforces it. Through our misrecognition of the problem, we rob ourselves of the very tools necessary for confronting it via policy and action. Without, for example, identifying and investigating RCAAs, it is impossible to determine whether the distribution of public policy benefits within metropolitan areas is fully equitable. For example, it is possible to examine the spatial distribution of public subsidies across a range of policy areas, and to estimate the degree to which Federal and local policies support RCAAs. In a companion paper, for example, we have estimated the volume and value of Federal housing subsidies, including HUD programs, tax expenditures, and tax credit investments going to RCAAs in a single metropolitan area and compare that with the flow of subsidies into RECAP neighborhoods in the region (Goetz, Damiano, and Hicks, 2015). Although RECAPs are the site of much of the investment in subsidized housing that is funded by the HUD budget, RCAAs are the sites of millions of dollars in tax expenditures for housing, virtually all through the mortgage interest deduction. Preliminary results of this analysis suggest that in the Minneapolis-St. Paul metropolitan area, three times more Federal housing subsidy goes to RCAAs as RECAPs. We estimate that in 2012 RCAAs in the Minneapolis metro received more than $170 million in Federal housing subsidies, whereas RECAPs received less than $60 million. As many policy makers seek to reduce disparities between communities of color and Whites, this type of analysis can assist the assessment of equity and efficiency in public investment across both RECAPs and RCAAs.

Our initial analysis of RCAAs in the largest 50 metro areas in the United States allows for a more thorough understanding of the dynamics of wealth and race. The extreme ends of the race/affluence segregation continuum manifest themselves quite differently across regions. RCAAs

are more common in some parts of the country and less so in others. The same can be said of RECAPs. The socioeconomics and demographics of RCAAs and RECAPs vary across regions as well, as do the spatial characteristics of these types of neighborhoods. Our analysis has been sufficient to expose such variation but is ill-suited to explain differences across metros. Subsequent investigations need to focus on, among other things, intra-metropolitan variation in the prevalence and characteristics of RCAAs. Future research will also focus on how RCAAs may (or may not) differ from areas that meet one but not both thresholds that define RCAAs. That is, how do RCAAs differ from racially homogeneous neighborhoods without concentrations of affluence, or from affluent neighborhoods that are more racially diverse? This article also supplies only a snapshot of the RCAA phenomenon. Analyses of how RCAAs have developed and evolved over time, and how that evolution is tied to changes in the American political economy, are also overdue.

Appendix

RCAA Definition

Exhibit A1 shows the estimated marginal effect of an increasing census tract share of White residents on census tract home values according to our model. Exhibit A1 illustrates that even after controlling for median household income and other neighborhood characteristics associated with advantage, non-linear returns to living in a Whiter neighborhood exist. We included a metro area fixed effect and an interaction term between race and median household income to allow for a non-linear relationship between race and income.

Using an ordinary least squares model, we estimated the following equation:

$$log(med.val.) = \alpha + \beta_1 * pctwhite + \beta_2 * log(medinc) + \beta_3 * pctwhite \times log(medinc) + \beta_4 * centralcity + \beta_5 * pctown + \beta_6 * pctbachdegree + \epsilon$$

Exhibit A1

Relationship between Neighborhood Percent White and Median Home Value

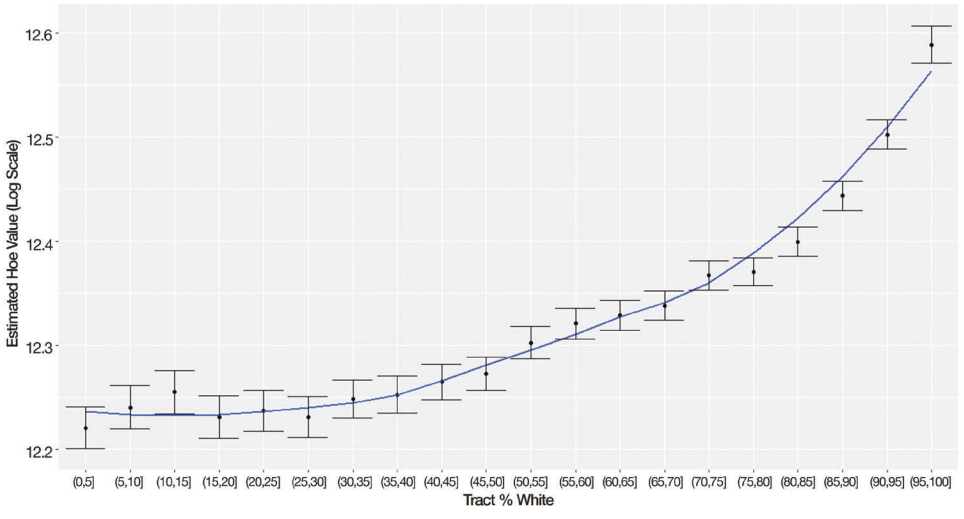


Exhibit AI represents the average marginal effect (AME) of race on the expected median home value of a particular census tract. The function is estimated at 5 percentage-point intervals between 0 and 100. The error bars represent the confidence intervals for each estimate. The line represents a Locally Estimated Scatterplot smoothing function (LOESS).

In order to establish a threshold for a whiteness concentration, we compare the results of two independent procedures. First, we used a distance-based measure to find the point on the curve that is the farthest distance from a hypothetical straight line between the first and last points on the curve. This method yielded an inflection point of 77 percent White. Second, using the R-package "cpr," we ran an optimization sequence. The routine creates a b-spline regression model with a high number of knots. The algorithm then assesses the relative influence of each knot on the spline function, remove the least influential knot, refit the regression model, reassess the relative influence of each knot, and so forth. We chose the model where root mean square error (RMSE) is minimized (DeWitt et al., 2017). The RMSE is defined as follows:

$$RMSE = \sqrt{\frac{\Sigma(\hat{y}_i - y_i)^2}{n}}$$

This process identified a knot at 83 percent White. Using these two estimates, we have chosen 80 percent White as a threshold for concentrated whiteness.

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Are Location Affordability and Fair Housing on a Collision Course? Race, Transportation Costs, and the Siting of Subsidized Housing

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Abstract

In this article, we explore whether efforts to incorporate location affordability, which account for housing and transportation costs, in the siting of subsidized housing present potential conflicts with the Fair Housing Act goals. To do so, we look at housing and transportation costs and the siting of subsidized housing through the Low-Income Housing Tax Credit (LIHTC) program by race across the country and then by the 25 largest metropolitan statistical areas. We find that areas with lower housing and transportation costs tend to be more highly minority, and units developed through the LIHTC program are often sited in these neighborhoods. We conclude by suggesting ways that location affordability can be incorporated in the siting of subsidized housing so that it does not have a disparate impact, and highlight that siting decisions should also account for the positive impact that LIHTC properties can have on low-income neighborhoods.

In 2014, the U.S. Department of Housing and Urban Development (HUD) released the Location Affordability Index (LAI), a publicly available online tool that allows users to compare the location affordability of various neighborhoods throughout the United States. Some have called for the LAI, or similar indices, to be considered in decision-making criteria on the siting of new publicly subsidized low-income rental housing developments (Belsky, Goodman, and Drew, 2005; Bogdon and Can, 1997; Coulombel, 2018; Haas et al., 2006; Hamidi, Ewing, and Renne, 2016; Holtzclaw, 1994; Holtzclaw et al., 2002; Jewkes and Delgadillo, 2010; Saberi et al., 2017). In this article, we explore whether such efforts to incorporate location affordability in the siting of subsidized housing could run counter to Fair Housing Act goals.

Because households spend more on transportation than on any other household budget item (other than housing), locating affordable housing in neighborhoods with low transportation costs could lead to substantial household savings. As a result, we have seen policies that promote more generous mortgages and affordable housing construction in areas with good transit access and lower than average transportation costs (Blackman and Krupnick, 2001; Center for Neighborhood Technology, n.d.; Chatman and Voorhoeve, 2010). However, we raise concerns in this article that efforts to use location affordability criteria in the siting of new affordable housing pose a tension with Fair Housing Act goals. This concern is of particular importance considering the 2015 ruling in *Texas Department of Housing and Community Affairs et al. v. Inclusive Communities Project, Inc., et al.* In this case, the Supreme Court ruled in favor of the Inclusive Communities Project, which argued that the way the State of Texas awarded funding through its Low-Income Housing Tax Credit (LIHTC) program resulted in properties being disproportionately developed in predominately Black neighborhoods.

In this article, we seek to answer a simple empirical question: is incorporating location affordability into the siting of new subsidized housing projects likely to steer such developments into predominantly Black and Hispanic neighborhoods? In other words, could the well-intentioned use of location affordability as a programmatic criterion for awarding housing subsidies inadvertently contradict local Fair Housing Act efforts? Conversely, could Fair Housing Act policies concentrate vulnerable households in areas with high transportation costs? Furthermore, does the answer vary across metropolitan regions, perhaps conditioned by differing spatial patterns of racial and ethnic segregation, housing costs, and transportation infrastructure?

To address these questions, the rest of the article is structured as follows. First, we briefly review existing scholarship on location affordability and the Fair Housing Act. Next, we describe the data we rely upon for location affordability and the locations of subsidized rental housing developments and the techniques we use to analyze them. We then present results of our national-scale analysis of whether location affordable places overlap with racialized enclaves, followed by metropolitan-specific analyses of the same. We then continue with a discussion of our findings, which in brief, are that Black and Hispanic households tend to live in neighborhoods with lower transportation costs, and these are often the neighborhoods where LIHTC units are sited. Although the insertion of subsidized housing into lower transportation cost areas is appealing from a housing affordability perspective, it also presents distinct fair housing challenges. Specifically, if our goal is to use existing programs to reduce racial concentration, particularly racial concentration in low

opportunity neighborhoods, then transportation costs may not be an ideal factor to consider when siting affordable housing.

Location affordability: an emergent concept

Beginning in the late 1990s, scholarship began to draw specific attention to transportation costs often forming the largest share of basic household expenses after housing (Bogdon and Can, 1997; Belsky et al., 2005). The operationalization of location affordability took a major step forward when the Center for Neighborhood Technology (CNT) released its Housing + Transportation (H+T) Affordability Index (Haas et al., 2006). One early policy effort that aimed to take advantage of this new tool was the Location Efficient Mortgage (LEM). The LEM was predicated on modifying mortgage underwriting standards to allow homebuyers to borrow more than they normally could, provided they purchase homes in locations where they could save on transportation costs. Due to a variety of reasons, including skepticism from lenders and widely available credit alternatives, the LEM was abandoned in 2008 amidst anemic uptake (Hamidi, Ewing, and Renne, 2016).

Examining defaults on more than 8,000 Federal Housing Administration-insured loans, Blackman and Krupnick (2001) found no significant relationship between measures of location affordability and mortgage default. Recent studies have found that transportation costs play only a small role in household location decisions and that households do not shift transportation spending by much after moving to a more or less transportation affordable neighborhood (Tremoulet, Dann, and Adkins, 2016; Smart and Klein, 2017). One potential issue is that a focus on average and total expenditures measures of neighborhood affordability masks substantial variation in the expenditures of the households that live within them (Guerra and Kirschen, 2016). Individual factors, such as income and household size, explain much more of the variation in household transportation expenditures than location affordability (Guerra and Kirschen, 2016; Guerra et al., 2018; Smart and Klein, 2017).

Despite the failure of the LEM, and critiques of location affordability more generally, the concept of location affordability has grown, not receded, in prominence. An updated version of the H+T index fixed some of its methodological flaws and gained an official stamp of approval when HUD adopted the LAI in 2014 (Haas, Newmark, and Morrison, 2016). The LAI is in turn facilitating a widening array of research on topics as varied as the relationship between location affordability and Housing Choice Vouchers (Bieri and Dawkins, 2016); Transit Oriented Development (Zuk and Carlton, 2015; Dawkins and Moeckel, 2016; Renne et al., 2016); rental housing with expiring subsidies (Lens and Reina, 2016); the post-move outcomes of public housing residents displaced by a HOPE VI redevelopment (Nguyen et al., 2016); and in Rustbelt (Tighe and Ganning, 2016) and Canadian cities (Revington and Townsend, 2016).

Criteria that seek to steer the siting of subsidized rental housing developments to areas with amenities that result in household-level transportation cost savings are already embedded in some of the programs that allocate existing funding streams. For instance, as of 2014, 27 of the 50 states awarded additional points to applicants seeking LIHTCs who proposed projects near transit stations, and 24 awarded points to projects within walking distance of neighborhood amenities such as banks and schools (Zuk and Carlton, 2015).

However, calls for a more explicit link between evaluation criteria for the allocation of affordable housing subsidies and location affordability are beginning to emerge. For instance, Tremoulet, Dann, and Adkins (2016) recommended that Oregon add location affordability to its Qualified Allocation Plan (QAP) governing the disbursement of LIHTCs. Similarly, Hamidi, Ewing, and Renne (2016) presented empirical results that support apportioning HUD subsidies to location-affordable neighborhoods, which they argued is of greatest importance within auto-dependent regions. They argued that their results also support an equivalent argument applied to other funding streams, particularly the LIHTC. Because one recent study found that LIHTC developments are more location-affordable than housing in general, but still have considerable room for improvement (Adkins, Sanderford, and Pivo, 2017), it stands to reason that explicit location affordability requirements implemented as part of state QAPs would alter their locational patterns. However, might there be a risk of a conflict with Fair Housing Act arguments?

Fair Housing Act: a longstanding but contested tradition

Goetz (2015) traces the Fair Housing Act movement in the United States back to the 1950s. He argues that it has encompassed two prongs. The first is a fight to contest discrimination in the sale or rental of housing, wherever it occurs, which is an aspatial strategy and relatively uncontroversial among those generally in support of greater housing options for the poor. The second is to achieve racially and ethnically integrated communities, which is an inherently spatially-focused approach. This is where internal tensions have arisen within the Fair Housing Act community (Goetz, 2015).

What might be termed the "integration" objective itself focuses on three subsidiary goals. These are, in order of an increasing level of governmental intervention required, the "opening up" of predominantly White (usually suburban) communities to affordable housing; ending governmental actions that preserve or create racialized enclaves; and public and private action to eliminate already existing racialized enclaves (Goetz, 2015). The concerns we raise in this article relate primarily—although not exclusively—to the second and are informed by past efforts by Fair Housing Act advocates to contest the construction of new subsidized rental housing developments in predominantly Black or Hispanic neighborhoods.

Underlying the internal tensions among those generally sympathetic to the Fair Housing Act movement and legal tradition is, at base, a fundamental disagreement between those who prioritize aggressive action to introduce affordable housing into high-opportunity areas and those who advocate above all for community development in existing disadvantaged neighborhoods (Goetz and Chapple, 2010). As we discuss in the following, the rise to prominence of location affordability may be opening a new front in the long-running schism within the Fair Housing Act movement.

Emerging critiques of location affordability invoking the Fair Housing Act

Although much of the emergent location affordability literature summarized earlier does not examine geographical patterns by race, studies that have done so recently have found some disquieting patterns. For instance, Koschinsky and Talen (2016) found that, although some

of the nation's 3.8 million HUD-assisted tenants have greater opportunities to access walkable neighborhoods—generally those neighborhoods with lower transportation costs—than they would in the absence of those subsidies, disadvantaged tenants benefit less. Specifically, those Hispanic and Black tenants living within walkable neighborhoods and receiving Project-Based Section 8 subsidies or Housing Choice Vouchers, or living in public housing, tend to live in racially isolated and high-poverty areas. Similarly, in an examination of single-parent, low-income renter families with children in the 100 largest metros, another study found that a one-quintile increase in a child opportunity index resulted in a 2.5-point increase in the "H" (housing) component of the LAI but also a 0.6-point increase in "T" (transportation; Acevedo-Garcia et al., 2016). The clear implication: "Policies that rely on a definition of affordability that combines housing and transportation costs alone, such as the LAI, risk directing low-income families to low-opportunity neighborhoods, which may eventually result in poorer child outcomes" (Acevedo-Garcia et al., 2016: 624).

Thus, incorporating location affordability into siting decisions for subsidized housing is risky: it could make an already bad situation worse, because newly-constructed affordable housing has largely failed to further the integration goals of the Fair Housing Act agenda. For instance, 71 percent of LIHTC units within New York City and seven surrounding counties in New York state opened between 1998 and 2007 are in areas of high or extreme poverty, and fully 77 percent are in neighborhoods with a majority minority population (Kawitzky et al., 2013). Relatedly, LIHTC-funded developments have tended to locate in submarkets within metropolitan areas with little or no overall shortage of housing (McClure, 2010), even if they have been more likely to be built in the suburbs than developments funded by earlier direct assistance programs (McClure, 2006).

However, if the current record of LIHTC-funded developments in fostering integration is middling, nationally-prominent Fair Housing Act activists are now raising concerns that incorporating location affordability into siting decisions could make it worse (Tegeler and Chouest, 2010; see also Tegeler's argument against Bernstein in Tegeler and Bernstein, 2013). These concerns are amplified still further by two recent developments that make successful Fair Housing Act challenges to LIHTC developments sited in disadvantaged neighborhoods more likely than before.

The first is the U.S. Supreme Court's 2015 ruling in the case of *Texas Department of Housing & Community Affairs v. Inclusive Communities Project, Inc.* The court accepted the Dallas-based plaintiffs' use of the broad "disparate impact" legal theory. The plaintiffs used this theory to challenge the State of Texas' LIHTC allocation procedures, which had resulted in LIHTC developments in Dallas being overwhelmingly sited in low-income, predominantly Black and Hispanic neighborhoods. This decision sets a far-reaching precedent for future challenges (Epstein et al., 2015). Consequently, the State of Texas completely overhauled its QAP, which now heavily emphasizes location within low-poverty neighborhoods and high-performing school districts, criteria that in Texas metropolitan areas almost always lead towards neighborhoods that are *not* "low T," that is, places where residents have few transportation choices other than automobiles.[1]

1 To cite one admittedly anecdotal but striking example, three of the four 9-percent LIHTC awards allocated to the Austin metropolitan area in 2016 were given to developments located along a 2-mile stretch of road in suburban, overwhelmingly auto-dominated Georgetown (TDHCA, 2016).

The other major recent development in fair housing was HUD's unveiling of the Affirmatively Furthering Fair Housing (AFFH) standard for local governments and other governmental entities that accept HUD funding (HUD, 2015). This standard has since been deferred under the Trump administration. Although the long-term probability of this mandate existing and the level of impact it will have if reinstated are still uncertain, many observers have interpreted it as a portend of sharpened federal scrutiny of local and state actions that hurt efforts to overcome historic patterns of segregation.

Even considering these developments, it is a complex legal question whether the likelihood of success is heightened for a legal challenge that established that incorporating location affordability criteria into siting decisions for LIHTC developments would tend to steer them even more strongly towards Black and Hispanic-majority neighborhoods than at present. However, even aside from possible future legal issues, the basic empirical question is whether this intensified steering would be the likely outcome, to which we now turn.

Description of data sets and methods

The primary goal of this article is to explore variation in transportation costs across regions and identify what this means for Fair Housing Act goals. This article uses three primary data sources to explore this question. First, it uses U.S. Census data from the 2000 and 2010 decennial censuses along with the 2012–2016 American Community Survey to identify demographics, and changes in demographics, over time. Second, it uses the Center for Neighborhood Technology's H+T Affordability Index to identify tract-level housing and transportation costs. This affordability index divides estimated average housing and transportation costs in a census tract by metropolitan median income to predict what share of income a typical household would likely spend on housing and transportation (Center for Neighborhood Technology, 2017). Finally, the article uses the National Housing Preservation Database to identify the location of all LIHTC properties. These three data sets, used in combination, allow us to look at how tract-level racial composition relates to housing and transportation costs and the location of units developed through the LIHTC program.

The nature of this analysis is associative rather than causal. In taking this approach, we follow the type of evidence often presented in Fair Housing Act jurisprudence, which emphasizes correlations between key variables rather than causal relationships. If a relevant association exists—in this case, between the presence of LIHTC developments, location affordability, and the percentage of Black and Hispanic residents at the tract level—then an action that further reinforces it is likely to be problematic from a Fair Housing Act standpoint. Two dominant theories explain why minority households are likely to concentrate in tracts with low transportation costs. The first, and most significant, is that contemporary and historical racial and socioeconomic discrimination in zoning and housing policy and practices prevented minority households from moving to suburban, and higher opportunity, neighborhoods and accessing mortgages (Kain 1992; Massey and Denton, 1993; Levine, 2010; Rothstein, 2017). The second is that low-income households and minority households concentrate in cities specifically to take advantage of lower transportation costs (Glaeser, Kahn, and Rappaport, 2008). For a subset of Hispanic households, another plausible but

partial explanation may relate to immigrants' higher likelihood of using transit, walking, biking, and carpooling relative to the native-born (Chatman and Klein, 2009).

We begin by providing a series of descriptive tables that show housing and transportation costs across the country. We then use several linear regressions to further explore the relationship between race and housing costs, race and transportation costs, subsidized housing and race, subsidized housing and housing costs, and subsidized housing and transportation costs within and across metropolitan areas. To account for variation within metropolitan areas and the metropolitan nature of housing and transportation markets, we include fixed effects for each metropolitan area.

Analysis

Across the United States, Black and Hispanic households are disproportionately concentrated in neighborhoods that rank well in terms of transportation affordability. Across the 66,256 census tracts for which housing and transportation cost data is available, clear differences in transportation costs by race emerge (exhibit 1). In general, minority households tend to live in census tracts with lower transportation costs, whereas White households[2] tend to live in higher transportation cost tracts.

Exhibit 1

Transportation Costs at Tract Level by Quintile and Race (1 of 2)

Race	Transportation Cost Quintile	Region		Percentage Point Change 2000-2016 for USA	Percentage Point Change 2000-2016 for Top 25 MSAs
		USA (Overall Sample)	Top 25 MSAs		
Share non-Hispanic White alone	1	12.6%	13.0%	– 2.0%	0.6%
	2	17.5%	14.1%	– 3.5%	– 2.6%
	3	21.1%	17.9%	– 0.5%	– 3.2%
	4	24.5%	24.9%	3.4%	– 0.4%
	5	24.2%	30.1%	2.6%	5.6%
	Total for Whites	100.0%	100.0%		
Share non-Hispanic Black alone	1	27.3%	27.3%	– 4.0%	– 5.7%
	2	20.5%	24.7%	– 1.2%	– 1.4%
	3	20.7%	22.6%	2.5%	0.4%
	4	16.8%	15.5%	2.6%	3.4%
	5	14.5%	9.7%	0.1%	3.4%
	Total for Blacks	100.0%	100.0%		

2 In the rest of this article we follow the standard convention and use the term "White" to refer to people who identify solely as White non-Hispanic. "Black" refers to those who identify solely as Black as well as non-Hispanic. "Hispanic" refers to all who identify as "Hispanic" or "Latino" regardless of racial identification.

Exhibit 1

Transportation Costs at Tract Level by Quintile and Race (2 of 2)

Race	Transportation Cost Quintile	Region		Percentage Point Change 2000-2016 for USA	Percentage Point Change 2000-2016 for Top 25 MSAs
		USA (Overall Sample)	Top 25 MSAs		
Share Hispanic	1	26.5%	22.3%	– 5.6%	– 5.4%
	2	22.7%	23.9%	– 1.3%	– 2.1%
	3	20.7%	21.9%	2.5%	0.5%
	4	15.6%	18.3%	3.6%	3.0%
	5	14.3%	13.5%	0.9%	4.1%
	Total for Hispanics	100.0%	100.0%		

The same relationship holds true when looking at only the largest 25 MSAs in the country, a subset of metros that we repeatedly examine in the remainder of the article to focus analysis on the places where non-car transportation is generally most viable. In the top 25 MSAs, only 13 percent of Whites live in tracts in the lowest quintile of transportation costs, compared to 27 percent of Blacks and 22 percent of Hispanics.[3]

Across the 25 largest MSAs, we can see considerable differences in the distribution of transportation costs by race.[4] For example, only 16 percent of Black residents live in tracts in the lowest quintile of transportation costs in the Seattle MSA, whereas 48 percent in the San Francisco MSA live in such tracts (appendix A). In addition, just over 2 percent of Blacks in Chicago live in the highest quintile of transportation costs, whereas 20 percent do in Boston. Regardless of the variation, across all of the major MSAs in the country, the general reality is that lower transportation cost areas tend to be exceedingly Black and Hispanic.

As seen in exhibit 1, there appears to be a general movement of all races away from lower transportation quartiles, but this movement is roughly within the error term of the data and should therefore be interpreted cautiously. However, it is important to note that movement of households across metropolitan areas varies (appendix B). For example, between 2000 and 2016, the share of Black households who were in the lowest quintile of transportation costs in Philadelphia decreased 32 percentage points, whereas in San Francisco, it increased 26 percentage points. During this time, the share of Hispanic households in the lowest quintile of transportation costs in Boston decreased 27 percentage points, whereas again in San Francisco, it increased almost 19 percentage points. Several realities could explain these trends. In many metropolitan areas, a demographic "inversion" has occurred, with higher income households moving to the center of cities where transportation costs are often lower, and lower income households moving further from the

3 Quintiles were calculated at the metropolitan level and represent the relative distribution of rents, transportation costs, location of LIHTC units, and race of the head of household within each metropolitan area.

4 Even though the Census makes a distinction between respondents' race (White vs. Black vs. Asian vs. American Indian vs. more than one race, and so on) and ethnicity (Hispanic or non-Hispanic), in the rest of this article we use the term "race" as shorthand for a distinction between White non-Hispanics, Black non-Hispanics, and Hispanics. We focus our analysis on these three groups, since together they comprise a supermajority (93%) of the U.S. population and receive the most attention in fair housing jurisprudence, advocacy, and scholarship.

center city to areas where transportation costs are higher (Ehrenhalt, 2012; Edlund, Machado, and Sviatschi, 2015). In addition, population growth has been greater in these higher cost transportation areas, as urban core neighborhoods gain little population and as outward greenfield urbanization continues much as it has for decades (Landis, 2017).

To examine the strength and statistical significance of these relationships within and across metropolitan areas, we predict transportation costs as a function of race using linear regression. As seen in exhibit 2, a 1-percentage point increase in the share of Black households in a tract is associated with a 5.5-percentage point decrease in transportation costs. For Hispanics, the corresponding drop is 5.9 percentage points. The magnitude remains roughly the same even when controlling for differences across MSAs and restricting the sample to the largest MSAs in the country (exhibit 2).

Exhibit 2

Linear Regression of Transportation Costs at Tract Level on Race

		Base Model	With MSA Fixed Effect	Top 25 MSAs w/ MSA Fixed Effect
Intercept	Estimate	25.423***	32.592***	25.328***
	Standard Error	0.034	0.043	0.113
Percent non-Hispanic Black alone	Estimate	– 5.544***	– 4.499***	– 5.079***
	Standard Error	0.107	0.067	0.095
Percent Hispanic	Estimate	– 5.874***	– 4.667***	– 4.662***
	Standard Error	0.109	0.082	0.102
	Sample Size	66,256	66,256	27,517
	R2	0.070	0.714	0.597

***p<0.01, **p<0.05, *p<0.1

Next, we can see variation in housing costs by race (exhibit 3). On the whole, minority households tend to live in tracts with lower housing costs. We know that the levels of services and amenities in a neighborhood are often capitalized into housing costs, which means that these lower costs likely reflect lower opportunity neighborhoods. Again, similar to transportation costs, housing costs by race across regions vary significantly. For example, as seen in appendix C, more than 52 percent of Black households in the Philadelphia MSA live in tracts in the lowest quintile of housing costs, whereas only 19 percent do in San Antonio. On the other end of the cost spectrum, just over 5 percent of Blacks in Baltimore live in the highest housing cost quintile of their MSA, whereas nearly 20 percent do in the Riverside-San Bernardino MSA. Although the distribution of Blacks and Hispanics across the housing cost spectrum is similar in many ways, some notable differences exist. For example, more than 50 percent of Hispanics in the Boston MSA live in the lowest housing cost quintile, whereas only 38 percent of Blacks live in such tracts. Again, the linear regression confirms these relationships (exhibit 4), but it also highlights the considerably higher housing costs for Blacks and Hispanics in the top 25 MSAs relative to the rest of the country. Interestingly, the share Black or Hispanic in a tract explains nearly 43 percent of the variation in housing costs in the top 25 MSAs. This reality shows the distinct Fair Housing Act challenges in the major urban areas of the United States.

Exhibit 3

Housing Costs at Tract Level by Quintile and Race

Race	Housing Cost Quintile	Region	
		USA (Overall Sample)	Top 25 MSAs
Share non-Hispanic White alone	1	11.5%	9.0%
	2	18.2%	15.4%
	3	22.0%	20.3%
	4	24.1%	25.5%
	5	24.1%	29.8%
Share non-Hispanic Black alone	1	33.2%	33.9%
	2	23.7%	24.1%
	3	18.4%	18.8%
	4	14.6%	14.8%
	5	9.8%	8.1%
Share Hispanic	1	23.0%	29.1%
	2	21.6%	24.8%
	3	20.1%	20.5%
	4	18.4%	15.5%
	5	16.7%	10.0%

Exhibit 4

Linear Regression of Housing Costs on Race, by Tract

		Base Model	With MSA Fixed Effect	Top 25 MSAs w/ MSA Fixed Effect
Intercept	Estimate	34.143***	32.028***	39.407***
	Standard Error	0.055	0.103	0.314
Percent non-Hispanic Black alone	Estimate	– 15.718***	– 18.506***	– 20.093***
	Standard Error	0.172	0.160	0.263
Percent Hispanic	Estimate	– 8.421***	– 24.781***	– 27.238***
	Standard Error	0.175	0.196	0.284
	Sample Size	66,256	66,256	27,517
	R2	0.129	0.401	0.427

***p<0.01, **p<0.05, *p<0.1

As seen in exhibit 5, nationally, a 1-percentage point increase in the share of Black households in a census tract is associated with 87 more LIHTC units in a tract, and 106 more units in the top 25 MSAs. Similarly, nationally, a 1-percentage point increase in the share Hispanic is associated with nearly 45 more units in a tract, and 62 in the largest 25 metro areas. On the one hand, these patterns raise concerns about LIHTC units being disproportionately located in areas with a high share of Black and/or Hispanic households. Conversely, as seen in exhibit 6, LIHTC units tend to be in tracts with lower transportation costs, particularly in the top 25 MSAs. In fact, as seen in exhibit 7, more than 46 percent of existing LIHTC units are in tracts with the lowest transportation costs, and this number is as high as 61 percent in the New York MSA (appendix D). Similarly, few MSAs have LIHTC units

located in the highest transportation cost tracts. For example, fewer than 2 percent of LIHTC units are in tracts in the highest quintile of transportation costs in the Seattle MSA.

Exhibit 5

Linear Regression of LIHTC Units and Race, by Tract

		Base Model	With MSA Fixed Effect	Top 25 MSAs w/ MSA Fixed Effect
Intercept	Estimate	13.288***	11.482***	23.316***
	Standard Error	0.538	1.201	4.059
Percent non-Hispanic Black alone	Estimate	87.380***	97.332***	105.928***
	Standard Error	1.683	1.868	3.397
Percent Hispanic	Estimate	44.845***	60.471***	61.988***
	Standard Error	1.716	0.196	0.284
	Sample Size	66,256	66,256	27,517
	R2	0.045	0.065	0.054

***p<0.01, **p<0.05, *p<0.1

Exhibit 6

Linear Regression of LIHTC Units and Transportation Costs, by Tract

		Base Model	With MSA Fixed Effect	Top 25 MSAs w/ MSA Fixed Effect
Intercept	Estimate	86.732***	200.361***	238.078***
	Standard Error	1.460	3.510	6.072
Transportation Cost	Estimate	– 2.268***	– 5.524***	– 7.447***
	Standard Error	0.060	0.104	0.202
	Sample Size	66,256	66,256	27,517
	R2	0.021	0.058	0.058

***p<0.01, **p<0.05, *p<0.1

Exhibit 7

Transportation Costs of LIHTC Units by Quintile and Race

	Transportation Cost Quintile	Region	
		USA (Overall Sample)	Top 25 MSAs
Share of LIHTC Units	1	33.8%	46.1%
	2	22.7%	22.6%
	3	18.1%	15.4%
	4	14.3%	10.4%
	5	11.1%	5.6%

Discussion

With increasing concerns about housing affordability, the idea of including transportation costs in location affordability measures is an important and worthwhile goal. However, the concept of location affordability does not come without tradeoffs. In this article, we show that transportation

and housing costs are strongly associated with race. As a result, policies that aim to decrease housing and transportation costs may steer units into areas with high minority populations, an outcome that runs counter to Fair Housing Act goals.

The LIHTC program is currently the largest affordable housing financing program in the United States, which means it is often viewed as a vessel for addressing some of our broader policy goals. Evidence shows that LIHTC properties increase local property values (Ellen et al., 2007), particularly when located in more distressed areas (Diamond and McQuade, 2016). This highlights an important positive externality of the program, which could support efforts that prioritize LIHTC units in more distressed neighborhoods. However, such siting has a disparate impact of furthering segregation. Incorporating location affordability metrics that aim to reduce transportation costs poses the same risk of increasing segregation as opposed to remedying it.

Several solutions can reconcile the tension between location affordability and fair housing. As discussed in this article, the relationship between location affordability and race varies across regions, which makes the case for using data to better estimate the Fair Housing Act implications of location affordability policies. Policies around location affordability may be less risky when implemented within a given city (that is, as a way of allocating locally generated funds to subsidize affordable housing) than statewide. This is challenging because in many states the Qualified Allocation Plans (QAP) that determine the point structure in the LIHTC program are determined at the state level. New York City and Chicago, which receive their own allocation of LIHTC financing, are well positioned to develop location affordability goals that better align with local Fair Housing Act needs. Statewide QAPs have room to include a requirement for the applicant to show how location affordability affects fair housing in the point structure.

In exhibit 8, we show the number and share of tracts in each metropolitan area that are both 1 standard deviation below the mean transportation cost for the metropolitan area *and* 1 standard deviation above the mean share White for the metropolitan area. This measure is not perfect, but it shows that fewer than 1 percent of tracts meet the 1 standard deviation criteria in San Antonio and more than 60 percent do in Boston. We do the same analysis at a more stringent standard of 1.96 standard deviations from the mean, and naturally the number of tracts goes down, but is still rather large in places like Boston and Minneapolis. Measures like this do not account for existing zoning or neighborhood resistance to housing development, both of which affect the ability to actually build multifamily properties. In addition, metropolitan areas cross city and state lines, which means the LIHTC units in any given metro can be governed by more than one QAP. However, this exercise shows that existing data can, and should, be used when factoring location affordability into decisions about the location of properties that receive LIHTCs or other forms of subsidy.

Exhibit 8

Tracts with Low Transportation Cost and High Share Non-Hispanic White Alone Households (1 of 2)

MSA Name	Tracts at 1 SD	% of Tracts	Tracts at 1.96 SD	% of Tracts
New York-Newark-Jersey City, NY-NJ-PA	1,389	29.9%	911	19.6%
Los Angeles-Long Beach-Anaheim, CA	199	6.8%	106	3.6%
Chicago-Naperville-Elgin, IL-IN-WI	21	20.4%	5	4.9%

Exhibit 8

Tracts with Low Transportation Cost and High Share Non-Hispanic White Alone Households (2 of 2)

MSA Name	Tracts at 1 SD	% of Tracts	Tracts at 1.96 SD	% of Tracts
Dallas-Fort Worth-Arlington, TX	125	9.5%	56	4.2%
Houston-The Woodlands-Sugar Land, TX	54	5.1%	25	2.4%
Washington-Arlington-Alexandria, DC-VA-MD-WV	395	29.5%	292	21.8%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	627	42.8%	412	28.1%
Miami-Fort Lauderdale-West Palm Beach, FL	66	5.5%	23	1.9%
Atlanta-Sandy Springs-Roswell, GA	43	4.7%	30	3.2%
Boston-Cambridge-Newton, MA-NH	662	66.3%	543	54.4%
San Francisco-Oakland-Hayward, CA	186	19.1%	110	11.3%
Phoenix-Mesa-Scottsdale, AZ	76	7.8%	27	2.8%
Riverside-San Bernardino-Ontario, CA	5	0.6%	0	0.0%
Detroit-Warren-Dearborn, MI	123	9.5%	31	2.4%
Seattle-Tacoma-Bellevue, WA	322	45.2%	177	24.9%
Minneapolis-St. Paul-Bloomington, MN-WI	467	59.3%	348	44.2%
San Diego-Carlsbad, CA	113	18.1%	41	6.6%
Tampa-St. Petersburg-Clearwater, FL	59	8.0%	31	4.2%
Denver-Aurora-Lakewood, CO	283	46.3%	184	30.1%
St. Louis, MO-IL	95	15.5%	42	6.8%
Baltimore-Columbia-Towson, MD	263	39.0%	182	27.0%
Charlotte-Concord-Gastonia, NC-SC	23	4.2%	10	1.8%
Portland-Vancouver-Hillsboro, OR-WA	232	47.3%	146	29.7%
Orlando-Kissimmee-Sanford, FL	9	2.3%	1	0.3%

Another policy suggestion is to conduct a state-level Fair Housing Act analysis before implementing any location affordability criteria within QAPs. If racial integration objectives are to be prioritized over siting in "low T" locations, QAPs and other mechanisms could incentivize measures that would offset the transportation costs that come with car-dependent locations. These might include elements as varied as the provision of on-site childcare; partnerships with local efforts to link tenants to low-cost cars or safe car loans; or the provision of an onsite shuttle bus that connects to job clusters, shopping, or transit hubs that are beyond walking distance. Finally, incentives, or programs, that reduce transportation costs in higher opportunity, largely White, neighborhoods should be coupled with mandates that enable low-income minority households to access these areas.

In this article, we highlight an important reality, which is that housing and transportation costs are strongly associated with race. This means that if we establish a policy goal aimed at reducing transportation costs in the siting of subsidized housing, then we are more likely to steer these units toward neighborhoods that already have high concentrations of Black or Hispanic residents, contrary to Fair Housing Act objectives. Given the current concentration of Black and Hispanic households in low transportation cost areas, we need to use the data at our disposal to develop clear and informed policies that reduce segregation and maximize location affordability.

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Does Jobs Proximity Matter in the Housing Choice Voucher Program?

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Abstract

The Housing Choice Voucher Program is the centerpiece of a housing strategy that attempts to influence neighborhood opportunity while making housing more affordable for low-income families. A key neighborhood opportunity is proximity to jobs. This study uses a household-level, longitudinal dataset from the U.S. Department of Housing and Urban Development (HUD) to examine whether households with people in the workforce are more likely to locate closer to jobs than are households without people in the workforce. We then look at whether being closer to jobs is associated with greater likelihood of employment or greater earned incomes. We find no evidence that households attached to the labor force are more likely to locate closer to jobs, and we find no associations between earned income and greater proximity to jobs. We take those findings as evidence that, although locational advantages may be achieved with help from housing vouchers, jobs proximity does not seem to be one of those advantages. Given that jobs proximity is not correlated to higher earned incomes, however, we question the importance of jobs proximity when weighed against other neighborhood opportunities.

Background and Motivation

The Housing Choice Voucher (HCV) program is the primary way that the U.S. government delivers housing subsidies to very low-income renters in the United States. The program serves more than 2 million families per year. The HCV program augments the income of poor households, giving them the buying power to consume rental housing that they would otherwise be unable to afford. The program also gives poor households the freedom to locate in any neighborhood as long as the

housing is reasonably priced and passes a physical inspection, although these families still face acute financial constraints and commonly encounter landlord resistance.

Given the high levels of segregation by income and race in U.S. metropolitan areas, a goal of the voucher program is to improve neighborhood opportunity for participants through the enhanced choice that households are able to make using vouchers on the private rental market. Further, the very low work rates among HCV households (our 2014 data suggest that only 51 percent of households with working-age members that are not disabled or full-time students have earned income) mean it is particularly vital to understand the effect of job proximity on earned income. Once more, policymakers place a high importance on improving employment outcomes for workers in households receiving housing assistance, as emphasized by the Jobs Plus, Welfare to Work Voucher, and Moving to Work demonstration programs.

More recently, HUD's Affirmatively Furthering Fair Housing (AFFH) rule ("Affirmatively Furthering Fair Housing," 2015) is designed to facilitate location in high-amenity neighborhoods for low-income households, with the hopes that it will result in better outcomes for these households, including better employment and schooling. Accordingly, the accompanying data and mapping tool that HUD released includes data on job proximity and the rule mentions the importance of access to employment in several areas (HUD, 2015; "Affirmatively Furthering Fair Housing," 2015).

One existing study (Lens, 2014) looks at the proximity of assisted housing to job opportunities for U.S. low-income rental housing programs, including housing vouchers, public housing, and low-income housing tax credits (LIHTC). The study found that public housing households live in closer proximity to jobs than any type of assisted household and the general population. However, public housing also tends to locate near the competition for such jobs, namely the low-skilled unemployed. Research on the Moving to Opportunity (MTO) demonstration program finds that changing locations based on poverty rates did not have a significant effect on employment or earnings for adult households (Sanbonmatsu et al., 2011), and recent research using MTO data further questions whether enhanced job proximity could have played a vital role in improving those outcomes (Blumenberg and Pierce, 2014; Lens and Gabbe, 2017).

This article focuses in-depth on the HCV population using a special household-level, longitudinal dataset from HUD. These data permit examination of the residential locations of HCV households potentially in and out of the workforce ("work-able")[1] and allow us to identify moves and corresponding changes in income over time. Specifically, we ask the following questions: Do work-able HCV households move more often than other HCV households? When work-able voucher households move, do they move to more job-rich neighborhoods? If they move to more job-rich neighborhoods, do they realize greater employment and earnings from that employment?

We anticipate that work-able HCV households should be more likely than those not in the workforce to make moves to higher employment areas to reduce job search and commuting costs.

1 Note: Throughout the text, we treat the attributes of the household head and the household as the same. Therefore, a "work-able" household is one in which the household has members ages 18 to 65 who do not have disabilities and are not full-time students. An employed household means that at least one member of the household is working. The racial attributes of the household head determine the racial attributes of the household. We do not have data on the rest of the household that would allow us to be more precise.

We also expect that if they do make these moves, we might find sharper increases in rates of employment and earned income for these movers than for those that do not make such moves to more job-rich block groups.

We find little support for these hypotheses. We do find that work-able households are more likely to move to different block groups in a given year than do other households. However, we also find that work-able households that did move were not likely to move to areas with more jobs. We further find that when we do observe moves to more job-rich block groups, increases in job proximity and increases in earnings are not correlated. If anything, those with increases in earned income were less likely to move and more likely to move away from jobs if they did move.

These findings contradict the conventional wisdom on job proximity and low-income households. Work-able HCV households are not using vouchers to move closer to jobs any more often than are households that are not likely to be in the workforce. Further, being housed closer to jobs does not seem to make a difference in employment outcomes. Earned income increases were not found for households that moved closer to jobs. We find that these results hold for several racial/ethnic groups and for households with and without children.

The HCV program is the centerpiece of a housing strategy that attempts to influence neighborhood opportunity while making housing more affordable for low-income families. As we refine these policy tools, weighing neighborhood attributes according to their relative import is essential, and we are reaching the point at which we must reconsider whether job proximity is as crucial as some other attributes. Although work-able households do not disproportionately make moves toward job-rich areas, that finding is perhaps indicative of trade-offs made in residential location decisions. Because those moves do not even correlate to higher earned incomes, job proximity may be potentially oversold as a factor in employment outcomes.

Previous Research

Spatial Mismatch

This article straddles two important areas of research—that on the spatial mismatch between low-income households and employment opportunities, and the literature that assesses location outcomes for assisted households. A full review of each of those areas of research is not appropriate for this article,[2] but some details of the literature are worth summarizing. The literature on spatial mismatch is concerned with evaluating the extent to which low-income and minority households are spatially isolated from employment opportunities and whether that isolation negatively affects employment outcomes. John Kain (1968) developed the spatial mismatch hypothesis at a time when jobs and higher income and White households were fleeing central cities for suburban destinations. One cause of the high levels of joblessness that Kain observed in central cities was that low-income and minority households were increasingly finding themselves isolated in central cities away from job growth in suburban areas. William Julius Wilson, in the highly influential book *The Truly Disadvantaged*, further connected the role of central city job loss to the very high

2 For a full review of the literature on spatial mismatch, see Ihlanfeldt and Sjoquist, 1998; Kain, 1992, 2004.

rates of joblessness among Black males in particular and the wide-reaching social ramifications for low-income communities of color (Wilson, 1987).

In the decades that followed, substantial empirical work has evaluated the strength of the spatial mismatch hypothesis. Although evidence on the extent to which low-income and minority households are spatially isolated from employment is somewhat inconsistent, compelling evidence exists that in many U.S. metropolitan areas, employment growth on the suburban fringe at the expense of the urban core meant that those households were less likely to be near areas of that growth. Scholars have found strong evidence for spatial mismatch in areas such as Los Angeles (Ong and Blumenberg, 1998; Stoll, 1999), Washington, D.C. (Stoll, 2006), the San Francisco Bay Area (Raphael, 1998), and Atlanta, Boston, Los Angeles, and Detroit (Johnson, 2006). That research finds that low-income and minority households generally live farther away from employment opportunities and job destinations than do White and higher income households and in turn, spend more time searching for work over greater geographic space. Further, using strong empirical techniques that tackle the thorny issue of selection bias in terms of spatial location and employable attributes, those authors concluded that spatial proximity matters a great deal in terms of actual employment and earnings outcomes.

Recent research in the planning field has used cutting-edge spatial analysis techniques and come to a somewhat different conclusion. Shen (2001; 1998) found that job accessibility is better among central city households in the Boston Metropolitan Area. Further, Cervero, Sandoval, and Landis (2002) found no relationship between regional job accessibility and employment outcomes for welfare recipients in Alameda County, California. Sanchez, Shen, and Peng (2004) found no effect from increased transit access on employment outcomes for Temporary Assistance to Needy Families (TANF) participants in the Atlanta, Baltimore, Dallas, Denver, Milwaukee, and Portland metropolitan areas. The techniques that Shen pioneered are used in this paper.

Assessing the Neighborhood Characteristics of Subsidized Households

Research on the neighborhood context of subsidized housing has grown substantially in recent years as the HCV program has increasingly been viewed by some policymakers, analysts, and advocates as a potential vehicle for improving neighborhood quality for assisted households. Much of the research has focused on poverty rates as the main indicator of neighborhood quality. General conclusions from that research are that public housing has long been concentrated in high-poverty neighborhoods, and housing vouchers and LIHTCs are in less impoverished areas (although more impoverished than the general population). For voucher households, Pendall (2000) found that neighborhoods with voucher holders had a 1990 poverty rate of 20 percent on average, compared with the nationwide average of 15 percent. In more recent research, McClure (2006) found that in 2002, about 30 percent of LIHTC households and 26 percent of voucher households lived in low-poverty census tracts. In an updated paper, McClure, Schwartz, and Taghavi (2015) found that only about 21 percent of HCV households live in low-poverty census tracts. That figure is much higher in the suburbs (39 percent) and much lower in central cities (10.5 percent).

A growing area of research has looked at neighborhood characteristics other than poverty. Metzger (2014) used data from HUD and the American Community Survey to look at HCV concentration

in low-income and high-minority census tracts. She found that housing voucher households are more concentrated in census tracts with high proportions of non-White persons and households in lower income deciles than is the larger population of very low-income households. Thus, Metzger concludes that the housing voucher program reinforces existing concentrations of poverty and race.

Additional research looks at the exposure of subsidized households to characteristics such as neighborhood crime, school quality, job accessibility, and indicators constructed from several variables. Looking at crime, Lens, Ellen, and O'Regan (2011) found that voucher households occupy much safer neighborhoods than do LIHTC and public housing residents. The findings echo those from the Gautreaux, MTO, and HOPE VI studies, which tells us that participants were in very high-crime areas when living in their original public housing developments and chose to move to lower crime (yet still relatively unsafe) areas after receiving their vouchers (Goering, Kamely, and Richardson, 1997; Keels et al., 2005; Kingsley and Pettit, 2008; Popkin and Cove, 2007; Rubinowitz and Rosenbaum, 2000;).

In the area of school quality, Horn, Ellen, and Schwartz (2014) linked data on housing subsidy recipients to school location and performance data to estimate the extent to which these households live in areas with high-quality schools. The authors found that voucher households with children live in areas near schools with math proficiency rates that are 3 percent higher than they are in schools in public housing households with children. On the other hand, voucher households live near worse-performing schools than do LIHTC, poor renters, all renters, and households in units priced at or below the area fair market rent.

Finally, papers have examined job accessibility specifically as it pertains to assisted households. Bania, Coulton, and Leete (2003) used data on those exiting TANF in Cleveland to compare the employment proximity and commuting outcomes for welfare leavers in public housing, Section 8 housing, and with housing vouchers and certificates. They found that the voucher and certificate TANF leavers were employed closer to their homes, spent less time commuting to work, had better access to public transit, and were more spatially proximate to job openings.

In two papers that study the role of transportation in employment outcomes, Blumenberg and Pierce (2017, 2014) used data on the MTO program to identify the effects of auto ownership and neighborhood transit access on an MTO participant's likelihood of gaining or maintaining employment. Although the authors do not find that spatial proximity to jobs is a factor in gaining or keeping employment, they do find that owning a car or procuring one is such a factor. In addition, they find that better access to transit is tied to keeping employment, although it is not significantly related to gaining employment.

Lens (2014) found contrasting results to Bania et al. (2003) in a paper that used data on a larger set of metropolitan areas (Metropolitan Statistical Areas with 100,000 people or more, as of the 2000 Census). Lens found that public housing households tend to live in census tracts with the greatest proximity to jobs, but they are also very highly concentrated among the competition for jobs—namely the low-skilled (those without a college degree) unemployed. HCV households, on the other hand, were very similar to the overall population of renters—they are spread around metropolitan areas more than in public housing and are therefore not as clustered near central city employment

growth, yet they are not as near the low-skilled unemployed as are those households. In a follow-up work, Lens and Gabbe (2017) used MTO data to measure the extent to which program participants moved to job-rich areas and whether it had an effect on employment outcomes. The authors found that job proximity declined for the treatment and control groups but most dramatically for the two treatment groups. The authors also found, however, that job proximity did not explain the lack of an employment effect for program participants; moving closer to (or farther from) jobs had essentially no effect on earned income or the probability of obtaining work.

Recent research looks at neighborhood quality in a broader way by pulling several features of neighborhoods into a larger index. McClure (2011) and Turner et al. (2011) are early examples of attempts to construct neighborhood opportunity indices that influenced the current AFFH framework. McClure was interested in assessing the capacity in America's metropolitan areas for housing-assisted households to locate to higher opportunity neighborhoods. He defines neighborhood opportunity as a combination of a set of attributes, including employment accessibility, the incidence and level of poverty, educational attainment, employment rates, race, and the presence of other assisted households. Turner et al. (2011) examined the extent to which MTO participants were able to access higher opportunity neighborhoods and included an indicator for high-job-density neighborhoods (tracts with more than 200,000 low-wage jobs within 5 miles). Notably, the authors found that the MTO program did not noticeably increase participants' occupancy in higher opportunity neighborhoods. Although considerable debate remains about how to define and measure neighborhood opportunity, localized estimates of employment prospects are consistently in the conversation, along with school quality, poverty, racial concentration, and crime.

Previous scholarship is ambiguous about the importance of spatial mismatch on employment outcomes, yet it is a key feature of measurements and evaluations of neighborhood opportunity, particularly when considering the housing voucher program. It is unclear, however, whether those job accessibility indices are strongly associated with employment outcomes. For those reasons, we look specifically at job proximity locations and employment outcomes of housing voucher recipients in and out of the workforce.

Data and Methods

The goal of this article is to determine whether work-able HCV households move closer to jobs, and if they do, whether those moves are associated with gains in earned income. To do that, we linked longitudinal data on HCV households to block group-level job accessibility estimates and estimated changes in job proximity for work-able and non-work-able HCV households. This exercise offers an implicit test for whether employed HCV households use their vouchers to locate closer to jobs and whether that proximity allows them more success in the labor market. Longitudinal, household-level data on HCV households that HUD provided included information on employment and earnings, the presence of children, block group of residence, and race and gender of the householder.[3] The

3 We acknowledge that these data may be imperfect. Particularly with respect to the employment and earnings data, households may have an incentive to underreport if they think it will help protect their subsidy value. Note, however, that HUD uses the Enterprise Income Verification system to verify income.

block group-level employment data were from the U.S. Census Longitudinal Employer-Household Dynamics (LEHD) database (U.S. Census Bureau, 2013), which includes data on jobs and workers per block group. The LEHD data identify the number of jobs with workers who have not earned a bachelor's degree. We used LEHD counts of workers without bachelor's degrees and jobs not currently held by an incumbent with a bachelor's degree from 2009 to 2014.

Exhibit 1 displays descriptive statistics for the key variables in years 2009 and 2014 for the HCV household data. More than 2 million HCV households were in the sample, and we considered about 1.2 million of those to be work-able, defined as households with at least one member between 18 and 65 years old who is not listed as disabled or as a full-time student. We acknowledge that many individuals with disabilities or who are in school can and do work, but this is the closest we could come to isolating a sample of those HCV households potentially in the workforce. Work-able households constitute 55 to 57 percent of the total number of HCV households.

Exhibit 1

Descriptive Statistics in 2009 and 2014

	2009		2014	
All HCV Households	2,072,425		2,152,219	
Not work-able	883,821	(42.6%)	975,691	(45.3%)
Work-able	1,188,604	(57.4%)	1,176,528	(54.7%)
Asian	48,926	(2.4%)	49,370	(2.3%)
Black	888,928	(42.9%)	970,664	(45.1%)
Hawaiian/Pacific Islander	6,240	(0.3%)	7,550	(0.4%)
Hispanic	355,671	(16.2%)	323,270	(15.0%)
Native American	14,926	(0.7%)	15,036	(0.7%)
White	711,958	(34.4%)	716,200	(33.3%)
Households without children	1,052,982	(50.8%)	1,215,135	(56.5%)
Households with children	1,019,443	(49.2%)	937,084	(43.5%)
No earned income	1,366,643	(65.9%)	1,417,497	(65.9%)
Earned income	640,097	(30.9%)	666,027	(30.9%)

Sources: Inventory Management System (IMS)/ Public and Indian Housing (PIH) Information Center (PIC) data 2009 and 2014.

The racial and ethnic composition of the HCV population is majority non-White. Between 2009 and 2014, the proportion of households who self-identify as Black rose from 44 to 47 percent, but the second most common racial/ethnic group among households was White (roughly 34 percent), followed by Hispanics (which declined from 17 to 16 percent). The biggest change between 2009 and 2014 was an increase of nearly 200,000 in the number of households without children. Roughly one-half of the sample were households with children, and about 31 percent of households in the sample reported earned income in each year.

In each block group in a Core-Based Statistical Area (CBSA),[4] and for each year, we calculated employment accessibility estimates using a distance-decay function that weights jobs inversely according to their distance from the home block group. We used the same method HUD used in its

4 We treat all counties not in CBSAs in the state as pseudo-CBSAs for calculation purposes.

AFFH data and mapping tool, which builds on work by Shen (2001; 1998). To begin, we drew a straight line between the centroid of each block group and the centroid of every other block group within a CBSA and measured the distance (d) of that line. We then assumed that job proximity decays according to the inverse of distance.[5] We then aggregated the jobs for each block group, weighted by the decay function, thus creating a distance-weighted job index for each block group. We limited the jobs to those that were currently held by incumbents with educational attainment lower than a bachelor's degree, to capture the relatively low-skilled jobs that HCV holders are more likely to seek and hold.

Because job seekers have competition, we also controlled for other potential job seekers near their residential block group. We did so by constructing a denominator for our jobs index that was a distance-decayed estimate of the number of low-skilled job incumbents that were located near each block group. Thus, as with jobs, we used a distance-decay function that measured not only how many residents in the labor force may be in the same block group as various types of HCV households but also those who are in surrounding block groups. The farther those households were from the residential locations of interest, the less weight they carried in the job index denominator. The equation for that measure is as follows:

$$A_i = \frac{\sum_{j=1}^{N} \frac{E_j}{d_{ij}}}{\sum_{j=1}^{N} \frac{W_j}{d_{ij}}}$$

where E_j is the number of jobs in block group j, W_j is the number of workers in block group j. $d_{,i,j}$ is the distance between block groups i and j; where distances less than 1 mile are set to 1 mile; and where A_j is the job index calculated for block group i. To account for job market differences between CBSAs, we percentile-rank-order each block group jobs index within CBSAs. The jobs index captures both cross-sectional and temporal variation in jobs proximity within CBSAs.

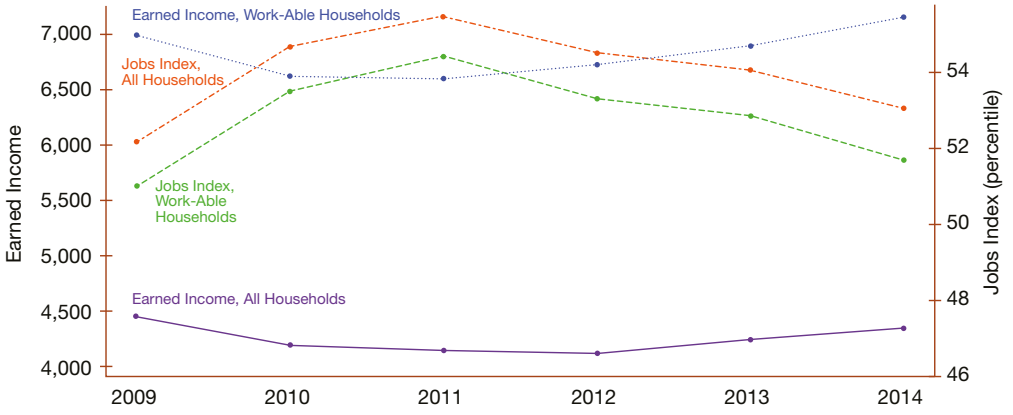
Results

In exhibits 2, 3, and 4, we describe basic annual trends and changes in inflation-adjusted earned income (measured in 2014 dollars) and jobs proximity. We report trends for all households and for work-able households. Exhibit 2 illustrates that earned income slowly rose for work-able households starting in 2012 after declining through the tail end of the Great Recession, but jobs proximity declined through 2014 after increasing in 2010 and 2011. Important to recall is that in all the job proximity analyses, those measures include a denominator that controls for competition for those jobs by other workers. This approach can wash out annual trends, which is why the results did not vary with the strong job growth through 2014. Although earned income for work-able households was much higher than for all households, the jobs index for work-able households was virtually identical to that for all other households.

5 Note that the analysis was also performed using a job proximity decay function of the inverse of distance squared; the results were no different and were not sensitive to the form of the decay function. We also analyzed a tract-level jobs index using unemployed workers without bachelor's degrees in the denominator, with similar results.

Exhibit 2

Annual Mean Earned Income and Jobs Proximity Over Time



Sources: IMS/PIC data 2009–2014; LEHD data 2009–2014.

Exhibit 3

Percent of Households that Changed Block Group in Past Year

Group	Percent
All HCV Households	14.4
Not work-able	11.3
Work-able	16.7
Asian	8.7
Black	17.3
Hawaiian/Pacific Islander	10.2
Hispanic	12.6
Native American	14.6
White	11.4
Households without children	10.6
Households with children	18.6

Sources: IMS/PIC data 2009–2014.

Exhibit 4

Annual Changes in Jobs Index and Earned Income

	Annual Changes in Jobs Index				
	N	**Mean**	**StdDev**	**Min**	**Max**
All HCV Households	8,581,534	– 0.035	12.283	– 99	99
Not work-able	3,723,300	0.012	11.381	– 99	99
Work-able	4,858,234	– 0.071	12.931	– 99	99
Asian	222,561	0.056	8.921	– 98	97
Black	3,980,459	– 0.035	12.420	– 99	99
Hawaiian/Pacific Islander	20,948	0.073	11.876	– 97	93
Hispanic	1,299,919	– 0.144	12.511	– 99	99
Native American	59,917	0.374	12.902	– 95	98
White	2,988,158	0.005	12.208	– 99	99
Households without children	4,523,321	0.021	10.983	– 99	99
Households with children	4,058,213	– 0.097	13.585	– 99	99
	Annual Changes in Earned Income				
	N	**Mean**	**StdDev**	**Min**	**Max**
All HCV Households	9,012,747	140.2	3585.4	– 15,000	15,000
Not work-able	3,881,022	15.2	1531.8	– 14,999.1	15,000
Work-able	5,131,725	234.8	4558.7	– 15,000	15,000
Asian	227,893	69.7	3395.2	– 14,999.8	15,000
Black	4,103,111	184.2	3996.9	– 15,000	15,000
Hawaiian/Pacific Islander	31,020	207.4	4228.5	– 14,991.7	14,995.85
Hispanic	1,445,983	158.5	3642.1	– 15,000	15,000
Native American	62,750	119.9	3482.9	– 14,998.1	14,996.1
White	3,117,003	66.9	2929.6	– 15,000	15,000
Households without children	4,731,708	17.4	2542.8	– 14,999.9	15,000
Households with children	4,281,039	276.0	4459.0	– 15,000	15,000

Notes: Max = maximum. Min = minimum. N = number. StdDev = standard deviation.
Sources: IMS/PIC data 2009–2014; LEHD data 2009–2014.

In exhibit 3, we provide context for the changes in jobs proximity and earnings that we report in exhibit 4. Exhibit 3 shows that work-able households (16.7 percent) were more likely than not-work-able households (11.3 percent) to change block groups in the past year. Black households and households with children were the other two groups with somewhat larger mobility rates than other households. Whereas about 14 percent of households changed block groups each year, roughly 17 percent of Black households and 18.6 percent of households with children moved to different block-groups in a given year.

In exhibit 4, we report annual changes in the jobs proximity index and in inflation-adjusted earned income for work-able and not work-able households, and we also split those by race/ethnicity and for households with and without children. Given that the typical household does not move in a year (as seen in exhibit 3), annual job index changes are small—all those index changes hover close to zero. Perhaps more surprising is that work-able households were less likely to experience

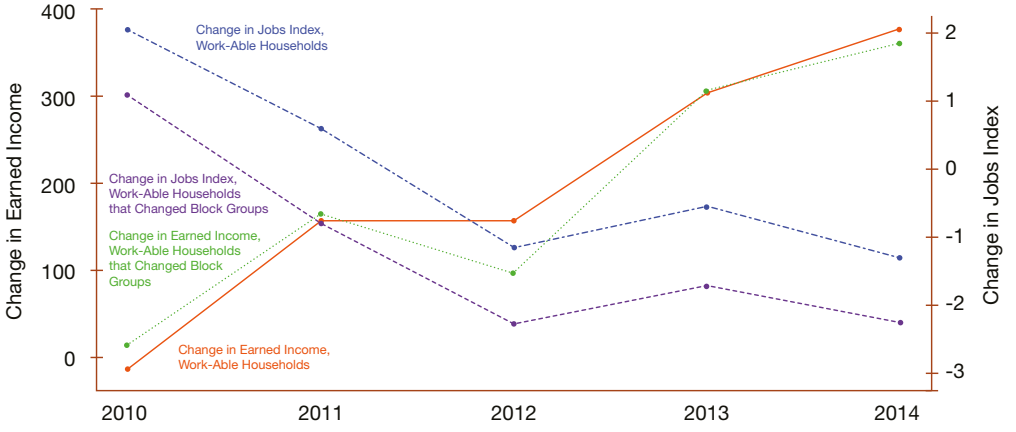
increases in jobs proximity than not work-able households. The differences between the two groups were small—much less than a standard deviation. On average, work-able households had a small negative change in jobs proximity, whereas not work-able households had a small positive change; work-able HCV households moved away from jobs, whereas not work-able households moved toward jobs, but those movements and the differences between the two groups are very small. Looking at demographic groups, households without children and Asian and White households experienced small increases in jobs proximity, whereas Hispanic and Black households, and households with children experienced small decreases.

For changes in earned income, those results are essentially flipped. The average household saw an annual increase in inflation-adjusted earned income of roughly $140, measured in 2014 dollars. Although mean earned income changes from year to year were all positive, they were larger for work-able households, Black households, Hispanic households, and households with children.

In exhibit 5, we more closely examine the changes for the minority of households that changed block groups. The exhibit reports four trend lines: annual mean within-household changes in real earned income and the jobs index for all work-able households and for work-able households that changed block groups in the past year. In general, the trend lines are identical for the two types of households—those that did and did not change block groups. In other words, those that changed block groups experienced the same trends in jobs proximity and earned income changes. Annual changes in earned income are virtually identical between the two types of households. For changes in the jobs index, households that changed block groups saw larger declines in their localized job index than the entire sample of work-able households in each year. In other words, work-able households were more likely to make moves that lowered their jobs index.

Exhibit 5

Annual Changes in Earned Income and Jobs Proximity for Work-Able Households and Work-able Households that Changed Block Groups



Sources: IMS/PIC data 2009–2014; LEHD data 2009–2014.

Over time, work-able households experienced a small negative change in earned income in 2010, followed by increases of about $157 in both 2011 and 2012. During those years, mean within-household changes in jobs proximity for work-able households were steadily decreasing, from 2.04 in 2010 to -1.15 in 2012 (to put those numbers in context, the standard deviation of within-household changes in jobs proximity is 12.93). Mean changes in earned income for work-able households were more than $300 in both 2013 and 2014, whereas mean changes in jobs proximity were negative in both years.

We can conclude from the analyses mentioned earlier that moving from one block group to another is rare, but that such moves by work-able households have more typically accompanied lower jobs proximity but without observed effects on earned income. Thus, we would expect that the basic correlation between the jobs proximity index and earned income for work-able households would be relatively low. We provide these correlations in exhibit 6, with breakdowns by race/ethnicity and presence of children. These are baseline correlations that are just as likely to capture the effect of income on jobs proximity as vice versa, but for that reason in particular, the lack of correlation between jobs proximity and earned income is quite remarkable. In the first column of correlations, we report the biserial correlation (biserial correlations are more appropriate when one variable is dichotomous) between jobs proximity and receipt or nonreceipt of earned income in that year. Here, the correlation is -0.01 for all work-able households. The P values for many of the correlations in this exhibit are very small, indicating statistical significance, but that is largely due to the very large sample sizes. The correlations are still substantively very close to zero. As a practical matter, the findings suggest that work-able HCV households that locate in neighborhoods with better access to jobs are not experiencing measurable increases in earned income. The largest positive correlation is 0.02 for work-able Hawaiian/Pacific Islander households, which is a relatively small group. No correlation is larger, in absolute value terms, than 0.05. The correlations were calculated again for total earned income in real, inflation-adjusted terms. For real earned income, the Pearson correlations are very similar to the correlations with the binary measure of earned income. Again, not a single group of work-able households has a correlation higher than 0.05 in absolute value terms, and most of the correlations are negative.

Exhibit 6

Correlations Between Jobs Index and Earned Income

		Variable = Any earned income		Variable = Real earned income	
Sample	N	Biserial Correlation	P value*	Pearson Correlation	P value
All work-able households	6,857,462	– 0.013	0.000	– 0.020	0.000
Asian	150,192	– 0.036	0.000	– 0.010	0.000
Black	3,801,631	0.003	0.000	– 0.011	0.000
Hawaiian/Pacific Islander	19,616	0.016	0.072	0.005	0.461
Hispanic	1,092,161	– 0.042	0.000	– 0.035	0.000
Native American	53,190	– 0.033	0.000	– 0.033	0.000
White	1,740,339	– 0.011	0.000	– 0.023	0.000
Households without children	1,894,132	– 0.044	0.000	– 0.045	0.000
Households with children	4,963,330	0.001	0.032	– 0.007	0.000

**Although many of these P values are very small, indicating statistical significance, the correlations are typically still very close to zero.*
Sources: IMS/PIC data 2009–2014; LEHD data 2009–2014.

Again, because the entire sample moves infrequently from year to year (14 percent for all HCV households), we replicated those same correlations for the households within each category that moved within the past year, displayed in exhibit 7. In the first set of columns, we display the polyserial correlations between numerical changes in the jobs index and changes in earned income, which can occur in three ways: the variable has a value of 1 if the household went from no earned income to some earned income; 0 if they had no earned income in both years or had some earned income in both years; and -1 if they went from having some earned income to having none. The polyserial correlations are appropriate here because only three discrete options exist for changes in earned income. The second set of columns provides Pearson correlations between changes in the jobs index and changes in real earned income. Again, the correlations are very close to zero regardless of how we measure. The polyserial correlation is -0.001 for all work-able households that change block groups, and the largest correlation in absolute value is -0.016 for work-able households without children that changed block groups.

Exhibit 7

Correlations Between Jobs Index and Earned Income

		Variable = change in any earned income		Variable = change in real earned income	
Sample	**N**	**Polyserial Correlation**	**P value***	**Pearson Correlation**	**P value**
All work-able households that changed block-groups	733,613	– 0.001	0.578	0.000	0.975
Asian	9,955	0.010	0.488	0.011	0.289
Black	462,016	– 0.001	0.716	0.000	0.921
Hawaiian/Pacific Islander	1,747	– 0.013	0.671	– 0.023	0.329
Hispanic	104,348	– 0.003	0.415	0.000	0.933
Native American	5,014	0.016	0.383	0.007	0.612
White	150,504	0.000	0.960	– 0.001	0.675
Households without children	138,464	– 0.016	0.000	– 0.007	0.014
Households with children	595,149	0.003	0.118	0.002	0.242

Sources: IMS/PIC data 2009–2014; LEHD data 2009–2014.

In exhibit 8, we isolate the population that not only changed block groups in the past year but also increased inflation-adjusted earned income. Our purpose is to see if we can detect positive changes in jobs proximity for this group. We list average changes in earned income and jobs proximity and also provide those measures for households in the top quartile of changes in jobs proximity. We also provide the percentage of households in the upper quartile of change in jobs proximity for those that changed block groups and increased earned income. Average increases in earned income were substantial, ranging from $4,826 to $5,818; however, the average change in jobs proximity was small and negative: -1.259, or about 5 percent of 1 standard deviation for all work-able households that changed block groups and increased income. Further, the percentage of households in the upper quartile of change in jobs proximity is less than 25 percent for all groups other than Native Americans. In other words, households that have an increase in earned income are less likely to have had large improvements in job proximity in that year. Further, the average increase in income for those in the upper quartile of change in jobs proximity is virtually identical

to those that are not in the upper quartile of change in jobs proximity. Regardless of how we slice the data, jobs proximity does not seem to matter for baseline levels of earned income or changes in earned income.

Exhibit 8

Changes in Earned Income and Jobs Proximity for Work-able HCV Households Who Changed Block Groups and Increased Earned Income

	N	Mean increase in earned income ($)	Mean change in jobs proximity	Percentage of households in upper quartile of change in jobs proximity	Mean increase in income for households in upper quartile of change in jobs proximity ($)	Mean change in jobs proximity for households in upper quartile of change in jobs proximity
All work-able households that changed block-groups and increased income	213,431	5,562.6	– 1.259	21.7	5,686.6	31.9
Asian	3,321	4,826.5	– 1.609	20.2	5,079.9	29.9
Black	133,957	5,694.1	– 1.408	22.1	5,797.3	31.6
Hawaiian/Pacific Islander	679	5,590.8	– 2.465	18.0	5,593.3	32.2
Hispanic	31,821	5,331.5	– 1.009	20.4	5,417.2	33.0
Native American	1,294	5,818.9	0.081	25.6	5,965.2	33.5
White	42,355	5,370.1	– 0.961	21.5	5,556.5	32.2
Households without children	34,624	5,220.2	– 0.840	20.0	5,341.5	31.6
Households with children	178,807	5,628.9	– 1.337	22.0	5,747.3	32.0

HCV = housing choice voucher.

Summary

In this article, we observe that work-able housing choice voucher households in the United States are not likely to be any closer to jobs than are not work-able HCV households, which suggests that being near job centers is not a high priority when HCV households in the workforce consider where to locate. Further, we do not find any evidence that an increase in earned income results when HCV households use their vouchers to locate closer to job centers. Although those bivariate estimates are surely biased, the most likely bias would occur if higher earned incomes enabled households to locate closer to jobs. That bias would make us more likely to observe findings that simply do not materialize. These results clearly indicate that earned incomes and job proximity are not strongly related for voucher households.

The findings suggest that job proximity is perhaps an overrated concern in policy and research on neighborhood opportunity. Housing policymakers commonly evaluate and try to influence neighborhood opportunity through such mechanisms as the Affirmatively Furthering Fair Housing process. At present, job proximity is very much emphasized in policies designed to address

locational outcomes and fair housing, but the evidence here and elsewhere calls into question whether that emphasis is warranted.

Given that enhanced jobs proximity is not likely to actively hinder employment outcomes, we conclude that these findings are indicative of the several tradeoffs that households make when trying to obtain housing. Those tradeoffs are particularly difficult to navigate for HCV households that are acutely income constrained and often subject to landlord discrimination. HCV households with more earned income (or greater increases in earned income each year) could be moving away from job-rich areas but into more traditionally residential areas, potentially with lower crime and poverty rates, higher quality schools, and better housing options. We have also not accounted for auto ownership, which is known to be key to employment outcomes, particularly for HCV participants and other low-income households (Blumenberg and Pierce, 2014). Households with access to automobiles may be more likely to both earn income and live far away from job clusters.

Ultimately, we think that the rational policy response to these findings should be to keep the importance of job proximity in perspective. Evidence of the importance of job proximity for HCV households is simply not sufficient to warrant that it be as high a priority as are safe neighborhoods and access to high-quality schools. HCV households are a diverse group, however, and for households in the workforce and without access to reliable transportation, proximity to jobs is worth paying attention to without allowing it to override concerns that evidence suggests may be more important.

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A Constant Quartile Mismatch Indicator of Changing Rental Affordability in U.S. Metropolitan Areas, 2000 to 2016

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Abstract

This article proposes a new measure of rental affordability to estimate the growing mismatch between changes in rent and income. Quartiles defined in 2000 for each area are updated for inflation and then used to describe rent and income distributions in 2016, comparing the 50 largest metropolitan areas with census and American Community Survey (ACS) data. The features and advantages of this constant quartile mismatch (CQM) indicator are compared with alternative indicators of affordability, including excessive rent burden and low-income housing supply gap. Unlike the other indicators, rent and income changes are separately identified, which explains the curious anomaly that the San Francisco or Washington, D.C., areas have been measured more affordable than the national average. The mismatch indicator in contrast measures growing stress on renters at both the high and low ends of the distribution. Strong upward shifts in rents are unmatched by increases in incomes in the top quartile, whereas losses of rentals in the bottom quartile leave low-income renters with much less opportunity than they had before. The new method thus conveys how the affordability problems in the lower end of the housing market are linked to shifts in the upper quartile and directly to losses in the bottom quartile. This broader characterization of affordability could help build broader based support for solving housing problems.

List of Exhibits

Introduction

The housing affordability crisis in the United States has drawn widespread attention for its severity since the onset of the Great Recession. Although the affordability problem has been mounting since the 1970s, in recent years it reached its greatest intensity, only slightly moderated since 2011. More than 38 million U.S. households, including homeowners and renters, paid more than 30 percent of their income for housing in 2016 (JCHS, 2018). This means that nearly one-third of all U.S. households live in housing they cannot afford. The affordability problem is especially severe among renters. The Census Bureau's 2016 American Community Survey (Ruggles et al., 2018) finds that nearly one-half (47.5 percent) of all renters were cost burdened, paying 30 percent or more of their income on rent.

Lack of housing affordability has serious consequences for households and their communities, placing greater stress on family budgets and leading to reduced retail spending in the community (Gabriel and Painter, 2018). This is a problem that many urban residents complain about, including renters and homeowners. A recent study based on Fannie Mae's National Housing Survey[1] shows that about one-half of housing consumers, both homeowners and renters, say that housing in their area has become less affordable—renters more so than homeowners (Fannie Mae, 2018). Among renters with incomes above the median for their area, 61 percent feel that housing has become less affordable in their area in the last few years, compared to 50 percent of renters with lower income (Fannie Mae, 2018: 17). In fact, the Joint Center for Housing Studies (JCHS) of Harvard University shows how the percent of renters paying more than 30 percent of income for rent is greatest for lower income groups, but that incidence of excessive rent burden has been steadily climbing upward in moderate- and middle-income groups (see figure 28 in JCHS, 2017).

The traditional means of measuring housing affordability is the ratio of housing expenses to household income, as used in relation to the 30-percent criterion threshold for defining excess cost burden.[2] This concept of individual-based housing affordability is generalized to entire market areas by averaging the ratios of local residents; however, that indicator is not wholly adequate for a number of reasons to be discussed. As a result, at least three alternative indicators have been proposed previously, each of which has value for illuminating a different facet of the housing affordability problem. Those include indicators of low-income *supply gap*, actual *availability* of low-cost housing for low-income tenants (after subtracting moderate- and higher income occupants), and the *shelter poverty* measurement (computing housing cost burdens relative to residual income after budget allocations for food and other necessities).

The authors propose an additional indicator for evaluating housing affordability that meets measurement needs not addressed by the others. The *constant quartile mismatch* indicator compares changes in the rent and income distributions since a baseline year to describe growing affordability problems in both high- and low-price brackets. The features of this mismatch indicator are compared with the other affordability indicators and its advantages discussed. It does not replace

1 Fannie Mae launched the National Housing Survey (NHS) in 2010 to generate new information about consumer attitudes, intentions, and financial conditions that pertain to housing and mortgage markets (Fannie Mae, 2018). The NHS is the only large, national, monthly survey of consumers focused primarily on housing. The responses of the nationally representative sample of 1,000 consumers to about 100 questions provide information on a wide range of housing-related topics.

2 Small technical differences exist in how the 30-percent threshold is applied. Although the HUD definition of *excess cost burden* is "greater than" 30 percent of income spent on housing, the published data by the Census Bureau reports data that are "at or above" 30 percent. Analysis based on the "greater than" standard yields a slightly *lower* incidence of rent burden than that derived from the published Census data. A second difference concerns how to handle the category of renters for which complete data are not available. The most common approach ignores households with missing data and calculates the share of renters paying excessive rent among cases with complete data only. By contrast, the Harvard JCHS allocates the cases with missing data into two different rent burden groups. Units paying no cash rent (roughly one-third of the "not computed" subgroup) are assigned to the no-burden group, whereas zero-or-negative-income units (roughly two-thirds of the "not computed" subgroup) are assigned to the 50-percent+ burden group. This inclusive approach has the advantage of using available data to count all renters in the nation. That has the effect of slightly *raising* the incidence of rent burden compared with when the not-computed cases are excluded. Throughout this article, we follow the Harvard JCHS's approach to using the "not computed" subgroup and also the "greater than" treatment of the 30-percent and 50-percent thresholds, both of which differ from common analysis with the Census Bureau data.

any of the other indicators, but it may work particularly well in combination with the traditional rent burden indicator, whose faults it at least partly redresses.

In brief, the proposed mismatch indicator separately tracks trends in renters' incomes and rents paid, calling attention to which quartiles of the rent distribution have greater changes than the corresponding changes in income quartiles, using a constant, inflation-adjusted set of quartiles established for the base year, which is 2000 for this analysis. Those shifts are grounded in each metropolitan area's distribution of rents and incomes, corresponding to local residents' market experiences and distinguishing affordability problems caused by falling incomes from those caused by rising rents. The results from the proposed method are easily graphed and are intuitively understandable to local residents, so the results of the new indicator may help to support better public understanding of the magnitude of the affordability problem in different localities.

This article begins with a brief review of the literature on alternative measures of access to affordable housing. We start with a review of the current findings from the traditional rent burden indicator of affordability, which is by far the one most commonly used because of its simplicity but which has a number of deficiencies or limitations. Every indicator has strengths and limitations, and we compare the alternatives on several features.

The constant quartile mismatch indicator is compared with the alternatives and its method is explained, both quantitatively and graphically. We summarize results of this mismatch indicator for the nation and the 50 largest metropolitan areas, examining several more closely. Following that, we discuss how a metropolitan planning organization (MPO) might choose to use this rental affordability indicator and what added practical value it might bring to local deliberations.

The Traditional Rent Burden Indicator

The most intuitive concept about housing affordability is that renters cannot afford to pay more than a certain share of their income for housing. Once, a rule of thumb of 25 percent was commonly used, based on a 19th-century practice in factory housing of charging a week's pay for a month's rent (Feins and Saunders Lane, 1981). Since 1981, standard practice of the Federal, state, and local governments is to judge housing affordable if the household pays no more than 30 percent of its income for gross housing expenses (including rent, utilities, and applicable taxes) (HUD, 2014). Households paying more than 30 percent are judged to have an excessive rent burden, whereas households paying more than 50 percent have severe rent burden.

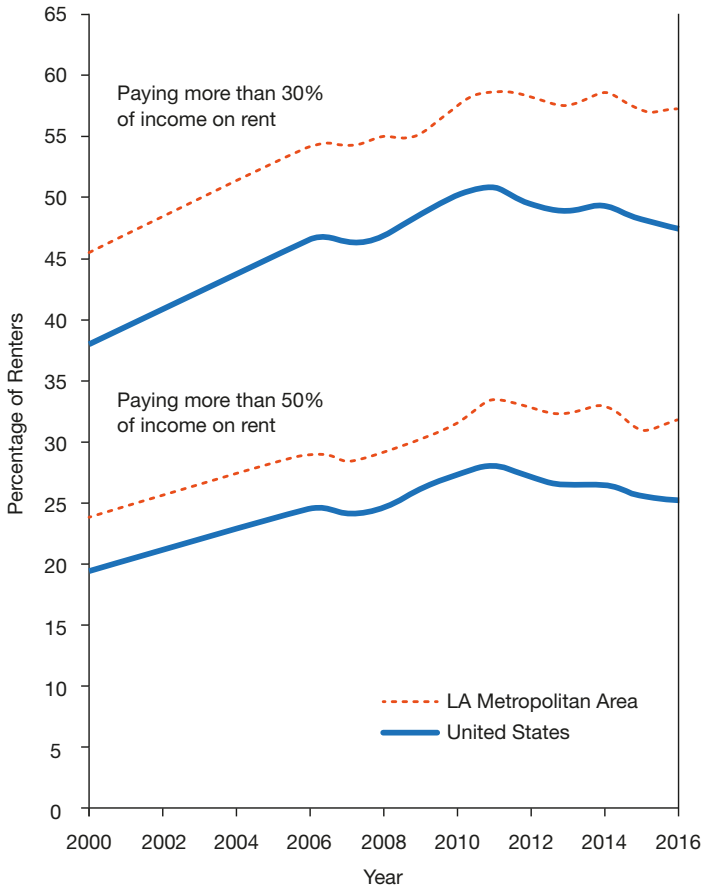
Aggregated across all rental households in an area, this traditional measure of housing affordability is the one most commonly used to describe the affordability of cities and metropolitan areas. Most of what is known about the depth of the problem and its extent across the country is based on the traditional indicator of rent burden (Collinson, 2011; HUD, 2017a; JCHS, 2018; Quigley and Raphael, 2004). In fact, virtually every study of housing affordability uses the traditional rent burden indicator for at least part of its analysis.

The Trend Over Time

The rent burden indicator of affordability problems for a jurisdiction is the share of local renters that pay more than 30 percent of income on housing expenses. As shown for the nation in exhibit 1, that indicator describes growing affordability problems since 2000, which rose to a plateau immediately after the Great Recession and moderated slightly thereafter.[3] Also shown is

Exhibit 1

Trend of Rent Burden, 2000 to 2016, United States and Los Angeles Metropolitan Area



Sources: 2000 Decennial Census; Census Bureau, 2006 to 2016 American Community Survey, *Integrated Public Use Microdata (IPUMS) Series, Microdata files (Ruggles et al., 2018).*

3 The total incidence of rent burden (more than 30 percent of income) in the nation was 47.5 percent in 2016 compared with 38.0 percent in 2000, an increase of 9.5 percentage points. The incidence of rent burden peaked in the nation at 50.7 percent in 2011 but sustained an even higher plateau of about 58.5 percent through 2014 in the Los Angeles metropolitan area. Colburn and Allen (2018) found a similar national trend in rent burden before and after the Great Recession using the U.S. Census Bureau's Survey of Income and Program Participation data. The prevalence of rent burden in their study had already peaked in 2009 (2 years earlier than in the ACS-based trend) and moderated slightly by 2011, but it remained at elevated levels relative to the prerecession period.

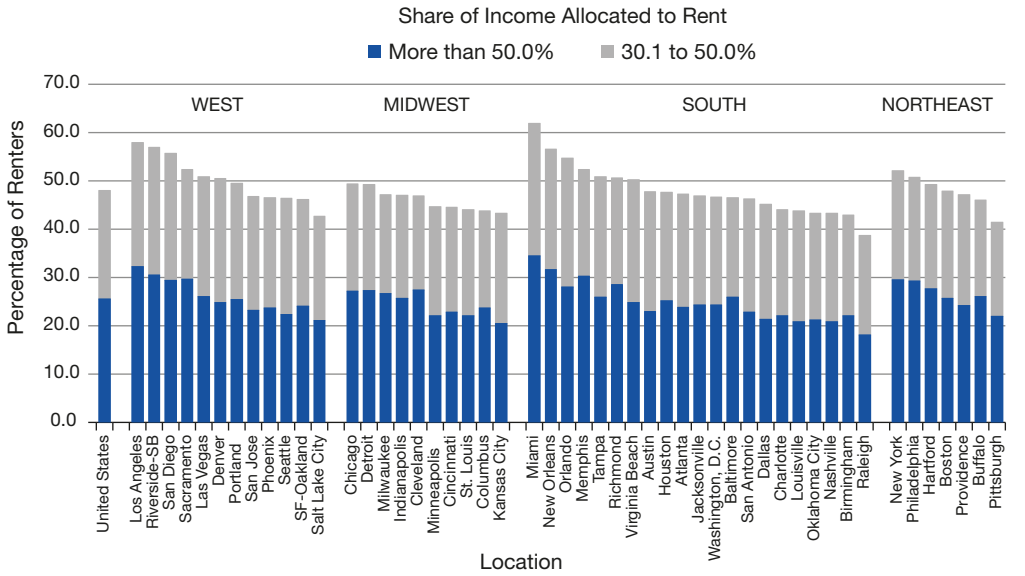
the indicator value for the Los Angeles metropolitan area,[4] which frequently is cited as one of the highest in the nation (JCHS, 2018; NLIHC, 2018a; NYU Furman Center, 2017; Urban Institute, 2017). Increases in Los Angeles track closely with the national trend. The share of renters with severe affordability problems is nearly one-half of all cost-burdened renters in both the nation and Los Angeles, and it rises in parallel with overall affordability problems.[5]

Comparing Metros on Incidence of Rent Burden

Viewed across metropolitan areas, the rent burden indicator is surprisingly invariant, with fairly similar problem incidence in the great majority of metropolitan areas (exhibit 2). In all but 5 metropolitan areas, the incidence of excessive rent burden deviates no more than 8 percentage points from the national average. Also, the share of total excess rent burden that is severe (more

Exhibit 2

Share of Renter Households Who Are Cost Burdened, United States and Largest 50 Metropolitan Areas, 2016



Source: 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

4 We adopt the Los Angeles metropolitan area as a frequent illustration in this study because of its exceptionally large affordability problems. The research used in this study is from a project supported by the Los Angeles-based Haynes Foundation. We compared data for other large metropolitan areas to make better sense of the data for Los Angeles.

5 Similarly, the incidence of severe rent burden is proportionally higher in the nation in 2016 than it was in 2000, 25.2 percent compared with 19.6 percent, an increase of 5.6 percentage points. Overall, the incidence of severe rent burden is almost exactly one-half of total rent burden, 51.6 percent and 53.0 percent in 2000 and 2016, respectively, as is the change in severe burden compared with the change in total burden. Incidence of severe rent burden (more than 50 percent of income) also peaked in the nation and Los Angeles in 2011 and then began to taper downward. Severe rent burden is a subset of total rent burden, and in 2016 that remained a problem in the United States for 25.2 percent of renters, almost exactly one-half of the 53.0 percent of renters who were paying more than 30 percent of income for rent. In the Los Angeles metropolitan area, the incidence of extreme rent burden was slightly greater than one-half of total renter burden, 31.8 compared with 57.3 percent.

than 50 percent of income) is remarkably similar—roughly one-half—in every metropolitan area in 2016 (as it was in 2000, not shown). One might assume that the nation's housing affordability problems would be more extremely measured in certain metropolitan areas than they seem to be on this indicator.

Not only is there great similarity across metropolitan areas, but some very high-cost areas have unusually low affordability problems, according to this indicator. A major puzzle is how the rent burden indicator in the San Francisco-Oakland metro, as well as San Jose and Seattle metropolitan areas, could be actually lower, more favorable, than the national average and even lower than many of the larger Midwestern, Northeastern, or Southern metropolitan areas. That defies the public image that the San Francisco area is among the least affordable in the nation. The explanation for this anomaly, as also noted in previous studies (JCHS, 2018; NLIHC, 2018a; NYU Furman Center, 2017; Urban Institute, 2017), is very likely that higher incomes prevailing in the growing high-tech metropolitan areas helped to offset their higher rents.[6]

This finding of surprisingly "affordable" tech metropolitan areas illustrates the general limitation of the rent burden indicator: that it does not distinguish between rent and income effects. We cannot tell if housing is made unaffordable by rising rents or falling incomes; hence, based on this indicator, we cannot identify what is the problem or the solution. The further drawback, as discussed, is that the rent burden indicator reveals so little variation across locations, which makes it less appropriate to use for prioritizing areas with higher or lower affordability problems.

Finally, this indicator is an average across renters of all income levels that, although useful as a summary, could well disguise unique variations in the problems facing each metropolitan area. Other indicators, discussed next, are designed to shed light on the affordability problem in different ways.

Alternative Measures of Rental Affordability

Rental affordability problems can be measured in different ways, and those ways are reviewed here briefly as necessary background for appreciating the contribution of the proposed new indicator. Housing problems are greatest for households with the lowest incomes, but those problems include more than just costs. A significant biannual report to Congress by HUD (2017b) summarizes "worst case" housing needs as afflicting 8.2 million very low-income renters (earning at or below 50 percent of area median income, hereafter AMI) in 2015. Those households are defined as very low-income renters who do not receive government housing assistance and who pay more than one-half of their income for rent, live in severely inadequate conditions, or both (HUD, 2017b). High rents in proportion to renter incomes remain a prominent factor among households with worst case needs, leaving those renters with a substantial, unmet need for affordable housing.

6 Median rent in 2016, as reported by the ACS, was $1,750 in San Francisco-Oakland and $2,076 in San Jose, compared with only $1,410 in the Los Angeles metropolitan area. Even though median rent had increased more rapidly in Los Angeles since 2000 (36.7 percent) than in the Bay Area (35.0 percent and 27.6 percent in San Francisco-Oakland and San Jose, respectively), Los Angeles' median income for renters increased only by 5.6 percent, compared with gains of 19.0 percent and 11.3 percent in San Francisco-Oakland and San Jose, respectively. Those Bay Area income trends cushioned the effects of rising rents and held down the growth in rent burden better than occurred in Los Angeles.

A number of widely accessible indicator systems have been developed to focus specifically on the number of renters with affordability needs, excluding issues of housing quality. In addition to the traditional rent burden indicator discussed previously, four more are surveyed here. This review is not exhaustive, but it includes the best-known alternatives.[7]

Review of Alternative Indicators

To incorporate the supply side in explaining rent burden, studies also have noted the gap between affordable supply and lower income demand (JCHS, 2018; Lens, 2018; NYU Furman Center, 2017). The "affordable supply gap" is measured by matching the volume of the affordable supply to that of demand from lower income renters. For example, in the case of extremely low-income renters (earning 30 percent or less of AMI), the gap is defined as the ratio of the number of extremely low-income renters to the number of rental housing units that would be affordable to those renters. Nationwide, for every 100 extremely low-income renter households, roughly 67 affordable rental housing units exist (NLIHC, 2018a). The advantage of the supply gap measure in describing rent burden is that it directly shows the shortage of the affordable supply relative to demand of a chosen group (Lens, 2018). The measure allows researchers to observe the full menu of options available to lower income groups rather than only the choices they actually make (Lens, 2018). That way, researchers can identify what the market is providing rather than calculate rent burden for households living in more expensive units when affordable units were occupied by others and not taken by the lowest income renters. This "supply gap" approach is very useful for targeting the needs of the poorest renters in the market area, but its findings can be distorted by the incursion of more advantaged renters into the most affordable supply.

Accordingly, this supply gap measure entails the use of optimal sorting, a conceptual construct that assumes that the lowest cost rental units are filled with the lowest income renters. Instead, it may fail to capture the nuances of the actual housing options for lower income households (Joice, 2014). Moreover, in large metropolitan areas, spatial distance may separate low-income renters from locations where the lowest cost units can be found. An extremely low-rent unit in a rural section of the Los Angeles metropolitan area is not a reasonable housing option for an extremely low-income household working in downtown Los Angeles. Furthermore, the measure of affordable supply gap may understate the severity of rental affordability because units are classified as affordable if they have gross rents that are affordable *at the top* of each income range (Collinson, 2011). In addition, in the competition for desirable affordable units, higher income households

7 Three additional candidates not discussed in-depth are of note. In 2016, HUD developed a new *Rental Affordability Index*, which measures whether the median renter household has sufficient income to qualify to lease a median-priced rental unit at the national level (HUD, 2016, 2018b). The index was designed to parallel the National Association of Home Builders' index of home purchase affordability. Although the new HUD index is available for every quarter since 2000, it is not included here because it pertains only to the nation as a whole. Since the early 1990s, HUD and the U.S. Census Bureau have been producing Comprehensive Housing Affordability Strategy (CHAS) data, which grantees receiving Community Development Block Grant and HOME program funds use to decide how to use the funds (HUD, 2015, 2018a). The CHAS relies primarily on ACS 5-year estimates to have the largest sample size and allow for the analysis of smaller geographies, such as city and township. Despite geographic fineness of the CHAS data, it is excluded here because main geographic area of our interest is metropolitan areas. Also useful but not included is the National Low Income Housing Coalition (NLIHC)'s *Housing Wage* indicator, which is an estimate of the hourly wage a full-time worker must earn to afford a rental unit at HUD's fair market rent without excessive rent burden (NLIHC, 2018b). NLIHC's indicator is excluded because it includes data only about renters who are full-time workers.

are more likely to be selected over lower income tenants, so affordable units actually occupied by higher income households may not be truly available to lower income households (Collinson, 2011; Joice, 2014).

Addressing that fault, several studies measured the availability of affordable rental housing to lower income households, with *available* defined as vacant or actually occupied by a household that is at or below the income threshold (Collinson, 2011; JCHS, 2018; Joice, 2014; NLIHC, 2018a). This actual availability of affordable housing is measured as the ratio per 100 of the number of lower income renters to the number of rental housing units that are both affordable and actually occupied by the group. When this availability dimension is applied, what was estimated as 67 affordable rental housing units per 100 extremely low-income renters is reduced to only 35 that are affordable and available (NLIHC, 2018a). Thus, the available supply of housing is much more limited than would be expected based only on price, and the affordability limitations are twice as great.

Rental affordability also has been measured in terms of balancing between housing cost itself and non-housing expenditures, such as food, transportation, health care, tax, and other necessities, within the constraints of household income (Stone, 2012). This "shelter poverty" approach improves rental affordability measures by showing tradeoffs between housing cost and other necessities. In this indicator, a household is considered "shelter poor" when the household has less "residual income" after allocating household income to housing expenses and thus has insufficient income remaining for necessary nonhousing expenditures. Risk of being shelter poor, therefore, largely depends on having low total income and on the size and composition of the household that determine nonhousing expenditure. As an example, in the Los Angeles metropolitan area in 2015, 67 percent of households with children were shelter poor, whereas, in the same place and time, only one-half of single-person households were shelter poor (Herbert, Hermann, and McCue, 2018).

Those specialized indicators of housing affordability provide useful insights, but they also require greater data detail than is commonly available. Moreover, they focus narrowly on the bottom rung of the housing market while neglecting the bulk of the rental market. Even though the problems of low-income renters deserve the greatest attention, the struggles of middle-income renters may produce competition that then brings added difficulties to lower tiers as would-be tenants scramble for more affordable options.

Comparison of Five Affordability Indicators

Exhibit 3 offers a systematic comparison of the distinguishing features of five alternative indicators of housing affordability: traditional rent-burden, supply gap, availability, shelter poverty, and the new constant quartile mismatch indicator.

Proportion Rent-Burdened. The traditional indicator is most widely used for reasons highlighted in the exhibit. It alone provides a single-number average of all renters' experience. It also has the easiest calculation and offers a very intuitive interpretation. This indicator, however, does not distinguish between rent and income causes of affordability problems, and it does not suggest how moderate- and higher income groups impinge on lower income renters. No solutions are suggested by the indicator's findings because so many factors are averaged together.

Exhibit 3

Conceptual Comparison of Alternative Indicators of Rental Housing Affordability

	Proportion Rent-Burdened	Affordable Supply Gap	Affordable Availability	Shelter Poverty	Constant Quartile Mismatch
Averages All Income and Rent Groups	Yes	No	No	No	No
Focused on Lower Income Renters	No	Yes	Yes	Yes	No
Links Across Income Groups	No	No	Yes	No	Yes
Distinguish between Rent and Income Effects	No	No	No	No	Yes
Time Emphasis	Present	Present	Present	Present	Change Since Baseline
Clarity of Graphic or Tabular Summary	Simple	Moderate	Moderate	Complex	Simple
Ease of Data Analysis	Simple	Complex	Complex	Very Complex	Moderate
Intuitive Understanding	Very Simple	Moderate	Moderate	Moderate	Simple
Problems Spotlighted	Average proportion of HH budget allocated to housing in an area	Shortages of low-income housing units needed to match number of low-income HHs	Shortages of low-income units greater when affordable units taken by mid- and higher income HHs	Deeper problems of the poor after rent payments deplete HH income	Growing mismatch between rent and income distribution in an area

Notes: HH = household. Highlighting signifies relative distinction of indicators. In the standard of "Focused on Lower Income Renters," two indicators marked "No" can still focus on a certain lower income group; however, general usage of the indicators is not focused on lower income groups, whereas that is always true for affordable supply gap and affordable availability indicators. Similar data sources (Census and ACS microdata files) are used for all indicators; the shelter poverty indicator requires additional data on nonhousing expenditures.

Affordable Supply Gap. This indicator has the benefit of focusing on the needs of lower income renters, matching the number of suitably priced rentals to their incomes. Its analysis is more complex, and public understanding is moderately intuitive. The spotlighted solution would be increased production of low-income housing.

Affordable Availability. Building on the supply gap measurement, this indicator adds the distinction of linking supply affordable to low-income renters to renters from competing income groups who could siphon off supply. Analysis is more complex, but the results are moderately intuitive. The spotlighted solution would be either producing a greater supply of affordable middle-income housing to lessen competition or increasing the supply of income-restricted housing aimed at very low-income renters.

Shelter Poverty. This indicator can be applied to all income groups, but its distinction is to show how rising housing costs make low-income renters, especially those with children, even poorer because their low incomes leave so little for other essentials. The spotlighted solution would be income assistance conditioned on household composition.

Constant Quartile Mismatch. This indicator, to be described fully in the next section makes implicit linkages across income groups because the quartiles sum to 100 percent. Another distinguishing feature is that it separately identifies rental cost shifts and income shifts, then combines them. Also distinctive is that the indicator is designed to measure changes over time, not single points in time as do the others, so it directly measures the changing affordability problem at four income levels. Analysis is moderately less complex than some of the others, and it features a more intuitive graphical display to enhance public understanding.

Method for Preparing the Constant Quartile Mismatch of Changing Affordability

The preceding review of alternative affordability indicators highlighted some limitations that could be addressed. The traditional measure of rent burden only expresses an average outcome for each geographic area. One problem is that we cannot tell whether rising affordability problems are concentrated at the bottom of the market or spreading into the middle. Another problem is the inability to determine whether rising rent burden is the result of higher rents, falling incomes, or both. Yet a third drawback of rent burden and other alternatives is that they tend to leave moderate- and higher income renters out of the picture. Residents who are voters and policymakers need to see their experiences reflected in measurements of housing affordability problems. Changes in the overall average or of only lower income renters do not allow most people to place themselves in the data picture. Some additional descriptive measurement could be helpful, particularly if it could be summarized in a simple and intuitive indicator.

Definition of Constant Quartiles

Given that complaints are not about the average but about the shifting distribution and relative access to rentals in different brackets, how might that be usefully summarized in a way that is easily comprehended? We propose a *constant quartile mismatch* (CQM) method for measuring the net results of this dynamic process of rent escalation over a number of years. If rents and incomes are broken into quartiles in a base year, we can use that metric to compare the distribution in a later year. Why quartiles and not quantiles with more numerous brackets, such as quintiles or deciles? Simplicity and intuitive understanding are a goal in this indicator design, and we wish to build on the familiar idea of the median rent. In addition, there are data considerations. For one, the American Community Survey, reported online through the Census Bureau's American FactFinder, reports upper (75 percent) and lower (25 percent) quartiles of housing expenditures in addition to the median (50 percent) but not quintiles or deciles. In addition, some dollar categories have very large entries that would require subdividing, creating unevenness, especially in smaller geographic areas. Quartiles have advantages for all those reasons.

Typically, the median rent and quartiles are redefined every year, but the twist in the new method is to hold those base year calculations constant, adjusting only for national inflation in the value of a dollar over time (exhibit 4). Every constant quartile break is assumed, therefore, to advance by the same percentage growth. For comparison, the final column shows the percentage change from 2000 to 2016 for the quartiles currently defined in 2016. In the case of income, that growth is higher for the top quartile, but all quartile increases are relatively similar to the pace of inflation. In the case of rents, however, the *current* quartiles have increased much more rapidly than has the pace of inflation that is used to define constant quartiles.

Exhibit 4

Quartile Breaks of Monthly Gross Rent and Annual Renter Household Income, Under Current and Inflation-Adjusted Constant Definitions, United States, 2000 and 2016

	2000	2016			
(a) Monthly Gross Rent					
	(a) Current Quartile	(b) Inflation-Adjusted Constant Quartile	((b - a) / a) x 100	(c) Current Quartile	((c - a) / a) x 100
	(2000$)	(2016$)	(% Growth)	(2016$)	(% Growth)
Break between Q3 and Q4	800	1,115	39.4	1,383	72.9
Break between Q2 and Q3	600	836	39.4	980	63.3
Break between Q1 and Q2	433	604	39.4	704	62.6
(b) Annual Renter Household Income					
	2000	2016			
	(a) Current Quartile	(b) Inflation-Adjusted Constant Quartile	((b - a) / a) x 100	(c) Current Quartile	((c - a) / a) x 100
	(2000$)	(2016$)	(% Growth)	(2016$)	(% Growth)
Break between Q3 and Q4	47,000	65,507	39.4	67,300	43.2
Break between Q2 and Q3	27,600	38,468	39.4	37,500	35.9
Break between Q1 and Q2	13,600	18,955	39.4	18,200	33.8

Notes: This study uses the U.S. Bureau of Labor Statistics (BLS) national annual consumer price index (CPI), which was 1.000 in 2000 and 1.394 in 2016, in relative terms. Universe is renter householders who pay cash rent, excluding renters paying no cash rent, approximately 5 percent of all renters. We use renter household income instead of household income to maintain the same universe for income and rent. Despite the large sample size of Census/ACS microdata, renters (or occupied rental units) were not evenly allocated into four quartile brackets in current quartile columns mainly because a large group of cases may be concentrated on a specific income (or rent) value, and its lump-sum allocation into a quartile bracket may result in slightly uneven distribution with adjacent quartiles.

Source: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Against this backdrop of inflation-adjusted, constant quartile breaks, the rental distribution in future years is sorted into the 2000-defined constant quartile categories. That shows, for example, how the number of units in 2016 in the bottom quartile are falling short of 25 percent, whereas those in higher quartiles may be exceeding their original 25-percent shares (exhibit 5). Identical calculations are carried out for renters' incomes so that the shift in incomes can be compared with

the shift in rents in the same metropolitan area. In our analysis, we use 2000 as the base year, representing the beginning of the new century and preceding the 2000s' economic boom, housing bubble, Great Recession, and struggling recovery. The decennial census data for 2000 are used to calculate the base year quartiles, and the most recent American Community Survey data are used to calculate the current distribution. (Inflation adjustment is carried out using the CPI.)

Exhibit 5

Quartile Income and Rent Distributions of Renter Households, Under Current and Inflation-Adjusted Constant Definitions, United States, 2000 and 2016

(a) Monthly Gross Rent								
	2000		2016					
	Under Current Quartile		Under Constant Quartile			Under Current Quartile		
	(a) Count	%	(b) Count	%	(b / a) %	(c) Count	%	(c / a) %
Highest Q4	8,356,389	24.8	16,266,421	39.1	94.7	10,375,113	25.0	24.2
Q3	8,327,994	24.7	9,972,394	24.0	19.7	10,261,485	24.7	23.2
Q2	8,565,453	25.4	8,206,528	19.7	– 4.2	10,527,036	25.3	22.9
Bottom Q1	8,416,777	25.0	7,108,692	17.1	– 5.5	10,390,401	25.0	23.4
Total	33,666,613	100.0	41,554,035	100.0		41,554,035	100.0	
(b) Annual Renter Household Income								
	2000		2016					
	Under Current Quartile		Under Constant Quartile			Under Current Quartile		
	(a) Count	%	(b) Count	%	(b / a) %	(c) Count	%	(c / a) %
Highest Q4	8,416,396	25.0	10,755,183	25.9	27.8	10,387,203	25.0	23.4
Q3	8,391,946	24.9	9,601,910	23.1	14.4	10,368,752	25.0	23.6
Q2	8,413,127	25.0	10,534,632	25.4	25.2	10,406,656	25.0	23.7
Bottom Q1	8,445,144	25.1	10,662,310	25.7	26.3	10,391,464	25.0	23.0
Total	33,666,613	100.0	41,554,035	100.0		41,554,035	100.0	

Notes: This study uses the national annual CPI, which was 1.000 in 2000 and 1.394 in 2016, in relative terms. Universe is renter householders who pay cash rent, excluding renters paying no cash rent, approximately 5 percent of all renters. We use renter household income instead of household income to maintain the same universe for income and rent. Despite the large sample size of Census/ACS microdata, renters (or occupied rental units) were not evenly allocated into four quartile brackets in current quartile columns mainly because a large group of cases may be concentrated on a specific income (or rent) value, and its lump-sum allocation into a quartile bracket may result in slightly uneven distribution with adjacent quartiles. Due to this lump-sum allocation and rounding at the second decimal place, percentages may not add to 100.0.

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Sensitivity Tests

The CQM method is especially sensitive to the choice of baseline year from which changes are measured. The year 2000 is convenient because it marks the beginning of the new century and also the decennial census year, but it also has practical significance. Sensitivity tests reported in appendix A indicate very different trends if 2006, near the peak of the boom and housing bubble, is selected for the base year. Rents had already begun climbing during the boom years, but incomes had declined among renters. That is likely a result of the boom in homeownership, which reached a record high of 69 percent in 2005, because many higher income renters were drawn into owning. Subsequently, after the financial crisis, when homeownership plunged, many would-be homeowners returned to renting, which raised the income levels again. That can be plainly seen in

exhibit A-1 in the appendix. Such volatility of boom and bust does not provide a stable context on which to place our baseline; using 2000 seems preferable.

A second matter of choice is which inflation factor to use for expressing the quartiles in constant dollars. One option is to use the most common choice, the CPI-U all items for urban consumers, which is based on the consumer choices of urban residents. A second option, suggested by a reviewer, is to consider the CPI "all items less shelter" costs. The two series track very closely until 2014, when there is a sharp departure (exhibit A-1). Although the CPI for "all items less shelter" has merit for measuring inflation of dollar values yet excluding rising housing costs, which is the subject of our analysis, the same deflator should also be used for incomes. Overall our sensitivity tests suggest that this alternative has a small effect of exaggerating the shift of rents into the top quartile (see exhibit A-2). The upward shift results from the abrupt decline in CPI for "all items less shelter" after 2014 so that the thresholds for upper quartiles are not raised as high as they are under adjustment by CPI for all items. Adjusting by CPI for "all items less shelter" creates lower thresholds, hence a greater upward shift in U.S. rentals into the top quartile, by 2 percentage points, whereas incomes similarly shift upward by 1 percentage point. We elect to retain the CPI for all items deflator because it produces more conservative estimates of change with the new constant quartile indicator.

Evidence from the Mismatch Indicator for Selected Metropolitan Areas

United States and Los Angeles

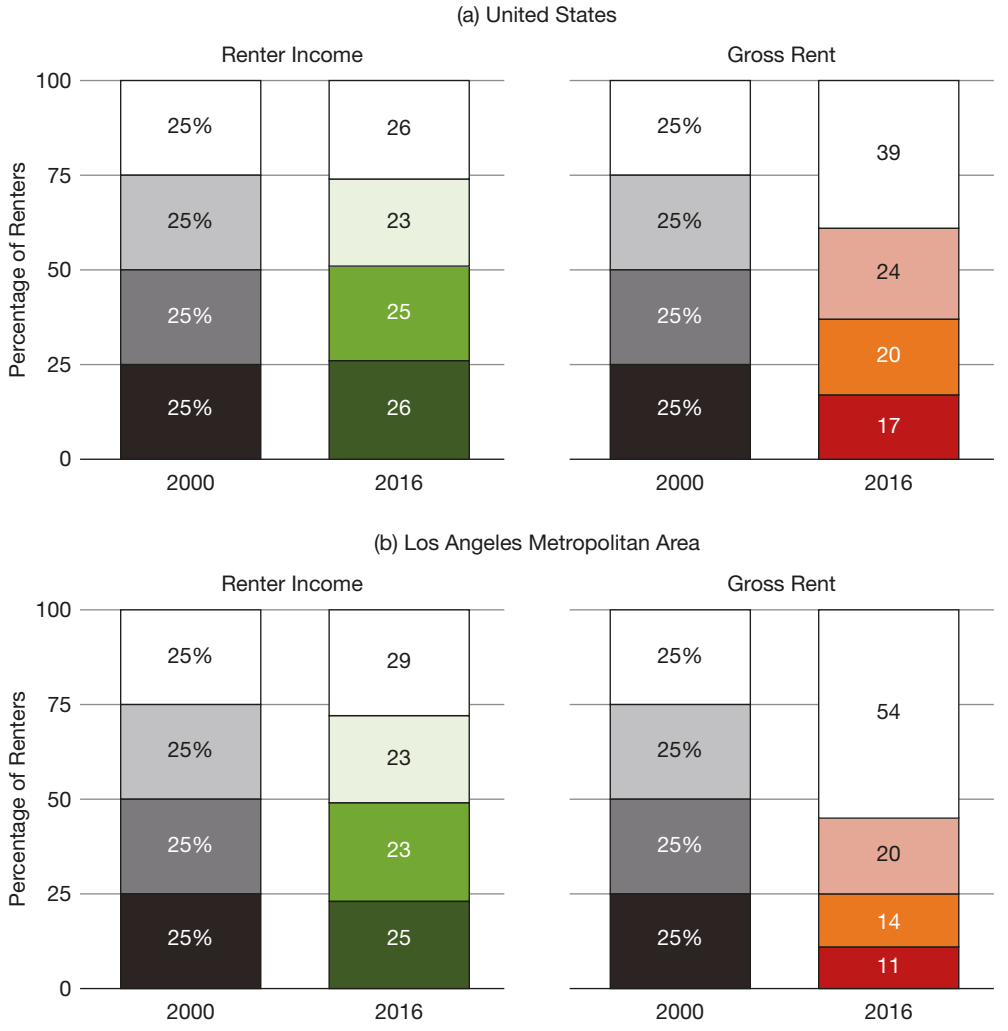
The results of the constant quartile calculations are demonstrated first for the United States as a whole and the Los Angeles metropolitan area, which illustrates an extreme case (exhibit 6). Rents have shifted upward in the United States, with 39 percent of renters paying rents in 2016 that were formerly in the 25 percent top bracket (Q4). Conversely, the share with bottom bracket rents has declined from 25 percent to 17 percent (Q1). On the income side, very little change has occurred, with one extra percentage-point share of renters in both the top and bottom income brackets. Rents have clearly increased relative to incomes of renters in the nation.

Greater changes are observed In Los Angeles, as expected. More than one-half the renters (54 percent) are now paying rents in the traditional top bracket, which was formerly occupied by only 25 percent. Conversely, the shares paying rents in the traditional bottom brackets (below the median) have fallen to 11 percent (Q1) and 14 percent (Q2).

The severe upward shift in rents in Los Angeles might not be a problem if the income distribution of renters also shifted upward. As also shown in exhibit 6, however, the share of renters in the two bottom brackets remains virtually the same as before. Meanwhile, the share in the traditional highest income bracket for Los Angeles metropolitan area renters has expanded moderately to 29 percent, an increase of 4 percentage points, not enough to keep up with the extremely large increase in the share now paying top-level rents. This reflects a slight income polarization in Los Angeles, where the share in the middle two income quartiles declined by a total of 4 percentage points.

Exhibit 6

Quartile Distribution of Renter Households by Income and Rent, Under Inflation-Adjusted Constant Quartile Breaks, 2000 and 2016, United States and Los Angeles Metropolitan Area (unit: percentage share)



Note: Percentages may not add to 100 due to rounding at the first decimal place.

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Metropolitan Areas with Rising Incomes

The anomaly of more affordable housing in the San Francisco Bay Area was addressed earlier with regard to the rent burden indicator. Higher incomes were believed to be the cause, even though rents were substantially higher. Here we compare the constant quartile mismatch results for San Francisco, San Jose (Silicon Valley), and the Washington, D.C., area, the seventh largest region in

the United States, which also is experiencing rising incomes. All areas with rising renter incomes also have rising rents, some more so than others.

The separate effects on housing affordability of rental price increase and income growth are well represented by the constant quartile indicator of housing affordability. Exhibit 7, panel (a), displays the changes recorded between 2000 and 2016 in the selected economically thriving metropolitan areas, San Francisco-Oakland, San Jose, and Washington, D.C. Rents shifted upward in all three, swelling the share paying rents in the traditional top quartile to 49 percent, 49 percent, and 58 percent, respectively. In the same time frame, incomes also rose in these growing metropolises, with the share of renters in the traditional top income quartile rising to 34 percent, 32 percent, and 31 percent, respectively. Thus, some of the upward skew in rents is offset by an upward shift in incomes. The Washington metropolitan area's 33 percentage-point shift of rentals into the top quartile, less the 6 percentage-point shift of incomes into the top quartile, exceeds all others of the 50 largest metropolitan areas.

In addition, all three of these metropolitan areas display signs of a hollowing out of the two middle-income quartiles, whereas the bottom quartile retains close to its original share in San Francisco-Oakland but swells in size to 27 percent in Washington and 29 percent in San Jose. A sign of stress in the lower income bracket is that the share of rentals available in the bottom price bracket has decreased far below the income share in the bottom bracket. In San Francisco-Oakland, the rental share of 16 percent is 8 percentage points lower than the income share of 24 percent, whereas in San Jose the gap widens to 12 percentage points. In Washington, the shortfall between the rental and income share in the bottom quartile reaches 15 percentage points.[8]

Metropolitan Areas with Stable Incomes and Rising Rents

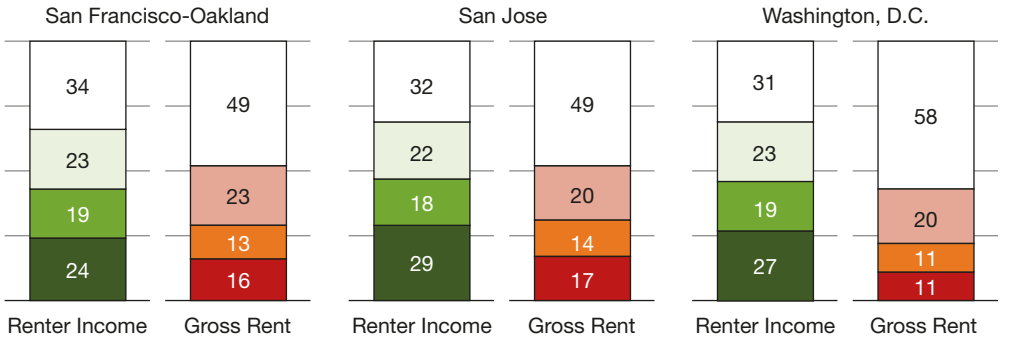
Most metropolitan areas do not have the upward income shifts of the areas just discussed. More representative may be Buffalo, Pittsburgh, and Miami, where the share in the top income quartile held steady, similar to the national average, at about 25 percent in 2016, showing no change since 2000 (exhibit 7, panel [b]). What varies among these three is the changing share in the *bottom* income quartile, ranging from a growing low-income share in Buffalo (27 percent) to a falling share in Pittsburgh (23 percent) and Miami (22 percent).

8 Appendix B of this article reports the exact differences.

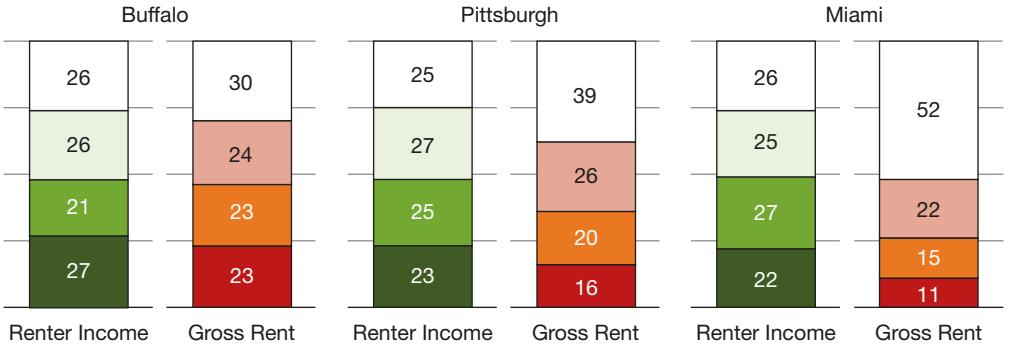
Exhibit 7

Comparisons of Quartile Distribution of Renter Households by Income and Rent, Under Inflation-Adjusted Constant Quartile Breaks, Selected Metropolitan Areas, 2016 (unit: percentage share)

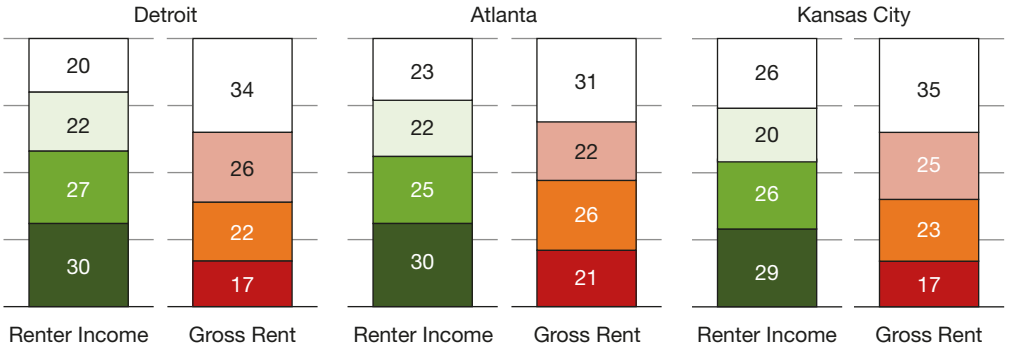
(a) Metropolitan areas where incomes are growing, while rents are growing even faster



(b) Metropolitan areas where incomes are stable, while rents are rising



(c) Metropolitan areas where incomes are falling, but rents are rising



Notes: Reference quartile distribution of 2000 was omitted for simplicity. Percentages may not add to 100 due to rounding at the first decimal place.

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Affordability problems are suggested by the upward shift in rents relative to income gains. Buffalo reveals only a slight upward shift, whereas Pittsburgh and Miami experienced sharp upward shifts into the top rental bracket. The gap between the rental and income shares in the top quartile in Buffalo is only 4 percentage points, whereas in Pittsburgh it is 14 points and in Miami 26 points (exhibit 7, panel [b]). The extreme rental shift in Miami, unaccompanied by income rise, is indicated also in the bottom two quartiles, where rentals below the former median accommodate only 26 percent of renters, while at the same time, in terms of income, 49 percent of renters remain below the former median. This extreme shift of rentals versus incomes in Miami is what has led to the Miami metropolitan area having the highest incidence of excessive rent burden of any large metropolitan area in the United States (61.2 percent with excessive rent burden and 34.0 percent with severe rent burden; see also exhibit 2 and appendix B).

Metropolitan Areas with Declining Incomes and Rising Rents

The final set of metropolitan areas compared is characterized by declining incomes at the same time as the metropolitan area is experiencing rising rents, a combination that potentially could lead to even greater affordability problems (exhibit 7, panel [c]). Here we compare Detroit and Atlanta, in each of which the income share declined in both of the two highest quartiles whereas the income share increased in the bottom quartile. Kansas City, which has more stable income—although less so than Buffalo, previously compared—also experienced declines in the middle and growth at the bottom. Against this shift in incomes, we compare the upward shift in rents, which grew more in the top rental bracket than did the top income quartile, a gap of 8 points in Atlanta and 9 points in Kansas City, and a gaping 14 points in Detroit. In all three of these metropolitan areas, a smaller share of rentals remained available in the bottom quartile than the share of renters whose incomes were in the bottom quartile. Again, the greatest disparity is found in Detroit, where the share of rentals that are low priced is 13 percentage points smaller than—practically one-half—the share of low-income renters. Kansas City also has a 12-point disparity in the bottom quartile to offset its rent and income growth in the top quartile.

It bears mentioning that severe racial geographic segregation within the metropolitan region, exemplified by the Detroit case, might lead to growth of high-end rentals in suburban areas at the same time as the overall rental population shrinks in the top income quartile and grows in the bottom, especially in central cities. A similar pattern of spatially polarized rental markets, although likely less extreme, could be at work in other metropolitan areas, but that subject is beyond the scope of the present work.

These case examples of changing rents and incomes provide a richer description than is revealed by the simple average incidence of rising rent burden. Here we see how the shifts in incomes and rents have not worked in tandem, with different patterns of stress and strain emerging in each of our case examples. Using the constant quartile mismatch indicator produces a distinct profile of affordability change for each city. Complete details for every metropolitan area are supplied in appendix B.

Correlations of Quartile Changes with Growing Rent Burden

The preceding profiles provide more detailed insights for each metropolitan area, but how well do they correspond to the overall incidence of excessive rent burden—the traditional measure of housing affordability? A one-to-one correspondence might imply no need for an indicator different from the traditional rent burden. On the other hand, any indicator that does not generally increase with average rent burden would have a difficult task to establish its credibility. Ideally a new indicator would convey information about affordability that is akin to rent burden affordability but sufficiently novel in its details and perspective added.

The correlation between the two measures can be compared in different ways (exhibit 8). The previous discussion emphasized disparities in the top quartile of rents and incomes. Growth in that quartile indicates an upward shift that corresponds to declines in lower quartiles. The larger the gap between the growing rent and income shares in the top quartile, the greater the increase in incidence of excessive rent burden averaged across all renters ($r = 0.62$). Alternatively, the gap in the bottom quartile between changing rent and income distributions might be more meaningful for the affordability experience of low-income renters. In fact, this bottom quartile gap in each metropolitan area correlates even more strongly with the increase in average incidence of rent burden when compared across the metropolitan areas ($r = -0.73$).

Exhibit 8

Correlations between Rising Incidence of Excessive Rent Burden and Changes in Alternative Constant Quartiles, 2000 to 2016

	Net Increase in Total Rent Burden (30%+)	Net Increase in Severe Rent Burden (50%+)
(a) Rent Q4	0.38	0.39
(b) Rent Q4 - Income Q4	0.62	0.56
(c) Rent Q1	– 0.49	– 0.42
(d) Rent Q1 - Income Q1	– 0.73	– 0.70
(e) Rent (Q1 + Q2)	– 0.43	– 0.40
(f) Rent (Q1 + Q2) - Income (Q1 + Q2)	– 0.76	– 0.67

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

When only rental quartiles are correlated, without comparing income changes, a much weaker fit is found with the incidence of rent burden (exhibit 8). For example, the correlation with shifts of rentals into the top rent quartile has a much lower correlation ($r = 0.38$) with overall incidence of rent burden than when the income shift is subtracted ($r = 0.62$), for reasons previously discussed. Without adjustment for rising incomes, we would expect a much higher incidence of excessive rent burden in San Jose, for example, than is observed.

Among all the correlations compared in exhibit 8, there is little difference between correlations with total excessive rent burden or, alternatively, incidence of severe burden. As noted earlier, in discussion of exhibit 2, severe burden generally increases proportionally with total burden, so it sustains the same correlation.

In general, this analysis shows that the constant quartile indicator bears a close relation to the traditional indicator of excessive rent burden. Depending on the degree of income change and rent increases, the bottom quartile could prove a more useful measure of local changes than does the top quartile. For the most part, however, the top quartile is the one that is growing for rentals and sometimes incomes, and this expanding high-rent segment is the focus of concerns about rising rents, gentrification, and neglect of opportunities for lower income renters. Nonetheless, a closer comparison is warranted between the top and bottom quartiles in each metropolitan area.

Affordability Mismatch at the High or Low End

Affordability can worsen in a metropolitan area because of either a growing mismatch at the top of the rental market, with more rentals added in the top bracket than renters are added to the top income quartile, or a growing mismatch at the bottom, with more rentals lost from the traditional lowest quartile price bracket than renters are lost from the lowest income bracket. Some metropolitan areas may suffer growing mismatches at both ends, whereas others have little change at either the top or bottom. In this section, we assess those differences and rank the metropolitan areas according to their degree of affordability mismatch at different price levels. All those assessments are made relative to the metropolitan area's historical balance of rents and incomes, as reflected in the constant quartiles calculated for 2000 and then carried forward to compare changes in housing opportunities observed in 2016.

Given that the shares of rentals in the four quartiles are designed to sum to 100 percent, any redistribution to the top quartile must come out of the lower quartiles. In principle, gains at the high end should be directly correlated with losses below, and vice-versa. Changes in the two middle quartiles are ambiguous, however; they can come from exchanges either above or below. In fact, the middle quartiles serve as a buffer between changes at the high or low end. For that reason, we judge only the affordability mismatch at the two extremes, the top and bottom quartiles. The assumption is that any mismatch in the bottom (or top) quartile is accommodated by drawing rentals or renter households from the middle two quartiles.

In fact, the mismatches at the top and bottom ends of the rental market are not tightly correlated ($r = 0.48$). Some metropolitan areas have distinct shortages of rentals in the bottom rent quartile compared with their share of renters in the bottom income quartile. Other metropolitan areas have large surpluses in the top rental quartile relative to their share of renters in the top income quartile. Still other metropolitan areas have greater depletion from the two middle quartiles to feed the growth at the high or low end, thus the high and low gains or losses are not directly connected, even if partially correlated.

A summary of the least affordable and most affordable metropolitan areas is compiled on the basis of mismatches observed at the high or low end of the rental distribution, or both (exhibit 9). This produces three different lists. First is the high-end mismatch formed of an excess of high-cost rentals relative to high-income renters. Three of the 10 worst mismatches are in the regional vicinity of Washington, D.C., (D.C. metro, Virginia Beach, and Baltimore). Another three are in southern California (Los Angeles, San Bernardino-Riverside, and San Diego). The remaining metropolitan areas are New Orleans, Miami, New York, and Denver.

Exhibit 9

Constant Quartile Affordability Mismatch at High and Low End of Rental Housing Markets in the 50 Largest Metropolitan Areas, Changes from 2000 to 2016 (unit: percentage point changes)

IN ORDER OF HIGH-END MISMATCH			IN ORDER OF LOW-END MISMATCH			IN ORDER OF TOTAL MISMATCH		
Pop Size Rank	Metro Name	(a) High-end Mismatch	Pop Size Rank	Metro Name	(b) Low-end Mismatch	Pop Size Rank	Metro Name	(c = a + b) Sum of Mismatch
10 Least Affordable Metropolitan Areas (Highest Score)								
7	Washington, D.C.	26.9	43	Richmond	15.3	7	Washington, D.C.	42.1
13	Riverside-SB	26.5	41	Memphis	15.2	17	San Diego	39.8
46	New Orleans	25.9	7	Washington, D.C.	15.2	36	Virginia Beach	38.9
17	San Diego	25.6	5	Houston	15.2	2	Los Angeles	38.6
8	Miami	25.2	36	Virginia Beach	14.5	13	Riverside-SB	36.6
2	Los Angeles	25.2	40	Jacksonville	14.3	46	New Orleans	36.4
36	Virginia Beach	24.4	17	San Diego	14.3	8	Miami	36.3
20	Baltimore	24.0	25	Sacramento	14.0	21	Denver	35.8
1	New York	23.6	39	Milwaukee	13.8	5	Houston	34.3
21	Denver	23.0	2	Los Angeles	13.5	25	Sacramento	33.6
10 Most Affordable Metropolitan Areas (Lowest Score)								
29	Kansas City	9.7	37	Providence	7.7	44	Oklahoma City	20.5
14	Phoenix	9.5	49	Salt Lake City	7.3	49	Salt Lake City	20.0
30	Las Vegas	9.5	10	Boston	7.1	32	Columbus	19.4
32	Columbus	9.2	42	Louisville	7.0	27	Cincinnati	17.9
27	Cincinnati	8.8	22	Pittsburgh	7.0	14	Phoenix	17.9
9	Atlanta	8.3	50	Birmingham	6.8	9	Atlanta	17.2
39	Milwaukee	6.8	30	Las Vegas	5.5	30	Las Vegas	15.0
28	Cleveland	4.7	44	Oklahoma City	5.4	28	Cleveland	12.5
47	Raleigh	3.7	48	Buffalo	4.7	48	Buffalo	8.3
48	Buffalo	3.6	47	Raleigh	3.0	47	Raleigh	6.6
	Total United States	13.3		Total United States	8.6		Total United States	21.8
	50 Metro Average	16.2		50 Metro Average	10.5		50 Metro Average	26.7
	Standard Deviation	6.2		Standard Deviation	3.1		Standard Deviation	8.1

Notes: Pop = population; metro = metropolitan area; SB = San Bernardino; high-end mismatch measured as the share of rentals added in top quartile less share of renter incomes added in top quartile; low-end mismatch measured as the share of rentals lost in bottom quartile less share of renter incomes lost in bottom quartile.

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

The second list contains the mismatch formed of a shortage of low-priced rentals relative to their numbers of low-income renters. The least affordable metropolitan areas on the low-end mismatch have some overlap with the high-end mismatch but also include Richmond, Memphis, Houston, Jacksonville, Sacramento, and Milwaukee. Finally, summing the low and high-end mismatches, the third list reports a combined score that summarizes the overall *least affordable* metropolitan areas, with Washington, D.C., the clear leader (exhibit 9 and appendix B). Los Angeles is fourth worst, and Miami, the metropolitan area with the highest average incidence of rent burden (exhibit 2), was only seventh worst.

Conversely, at the bottom of exhibit 9 is a listing of the *most affordable* metropolitan areas, those with the least mismatch between rents and incomes. Buffalo and Raleigh are the clear leaders. In the remainder of the 10 most affordable at the high end, midwestern metros dominate: Cleveland, Milwaukee, Cincinnati, Columbus, and Kansas City. Filling out the list are Atlanta, Las Vegas, and Phoenix. Milwaukee is notable for the highly polarized outcome of making the list of most affordable metropolitan areas at the high end while simultaneously entering the top 10 for *least* affordable when assessed at the low end. Its burgeoning low-income population is simply not matched by an adequate supply of rentals in the bottom quartile.

In fact, none of the midwestern metropolitan areas make the list of most affordable when judged with respect to mismatches in the bottom bracket. Instead, four southern cities are most prominent (Raleigh, Oklahoma City, Birmingham, and Louisville), accompanied by four in the northeast (Buffalo, Pittsburgh, Boston, and Providence). Salt Lake City and Las Vegas complete the list. Las Vegas is most notable because its share of rentals in the bottom quartile held steady; it was the only metropolitan area among the 50 largest that avoided shrinkage in supply in the bottom price bracket (see appendix B).

When the housing demand and supply mismatches at the high and low end are summed, the most affordable metropolitan areas overall are led by Raleigh and Buffalo, followed by Cleveland, Las Vegas, Atlanta, and Phoenix. Next on the list are two more Ohio cities, Cincinnati and Columbus, followed by Salt Lake City and Oklahoma City (exhibit 9).

The Use of Affordability Indicators

Housing affordability must be measured by multiple indicators because each has a different emphasis in what it measures. It is a truism that there is no national housing market, because all housing markets are local, where workers and other residents shop for housing. Local differences among cities and neighborhoods provide a diversity of opportunities, but those are bound together by substitutability of local housing units within a metropolitan region, or rural and small-town commuting area, as consumers comparison shop for the best home in the best neighborhood at the best price, subject to income constraints and their particular preferences. Certainly affordability indicators should be applied to subareas within regions, but overall differences in affordability are expressed at the metropolitan scale.

Regional planning directors, working through metropolitan planning organizations (MPOs), may have the most complete view of providing housing to meet the needs of workers and the rest of the

Exhibit 10

Summary of Constant Quartile Mismatch and Other Rental Affordability Measurements Available in 2016, United States and Selected Metropolitan Areas

	United States	West		Midwest		South		Northeast	
		Los Angeles	SF -Oakland	Detroit	Kansas City	Atlanta	Washington, D.C.	Pittsburgh	New York
Proportion Rent-Burdened (2016)									
% Excessive Rent Burden (30%+)	47	57	46	49	43	47	46	41	51
% Severe Rent Burden (50%+)	25	32	24	27	20	23	24	22	29
Affordable per 100 Renters (2016)									
Very Low-income (<50% of AMI)	72	39	73	70	92	56	67	97	57
Affordable/Available per 100 Renters (2016)									
Very Low-income (<50% of AMI)	47	28	51	47	58	36	45	60	41
Constant Quartile Mismatch (2000 to 2016)									
Top Quartile									
(a) Rent Increase *	14	29	24	9	10	6	33	14	26
(b) Income Increase *	1	4	9	– 5	1	– 2	6	0	2
(c = a - b) Difference	13	25	15	14	10	8	27	14	24
Bottom Quartile									
(d) Rent Increase	– 8	– 14	– 9	– 8	– 8	– 4	– 14	– 9	– 9
(e) Income Increase	1	0	– 1	5	4	5	2	– 2	– 1
(f = d - e) Difference	– 9	– 13	– 8	– 12	– 11	– 9	– 15	– 7	– 8
Top and Bottom									
(g = c - f) Difference Combined **	22	39	23	26	21	17	42	21	32

*Notes: * "Increase" is calculated as the quartile share in 2016 less the initial 25 percent share in 2000. ** "Combined" is calculated as top quartile difference minus bottom quartile difference. AMI = area median income. SF = San Francisco. Percentages may not match due to rounding at the first decimal place. For the purpose of comparison, we calculated indicators of affordable supply gap and availability of low-cost rentals with a focus on very low-income renter households (less than 50 percent of AMI) because they are the primary target population of major federal rental assistance programs. Household and housing unit size adjustments and physical adequacy of units were omitted in calculating indicators of affordable supply gap and availability both for simplicity and to maintain comparability with constant quartile mismatch and rent burden indicators. Shelter poverty indicator was not included in this comparison because of the complexity of its calculation, as previously discussed in exhibit 3.*

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

growing population in metropolitan areas. That will of course require gaining the cooperation of a host of constituent city and county jurisdictions and the local citizens. How might metropolitan-level analysis with different indicators of housing affordability assist a hypothetical set of MPO directors as part of their planning toolkit?

To illustrate the set of choices and implications, we have assembled a set of data findings collected through the alternative indicators surveyed earlier in the article. Exhibit 10 summarizes the menu of indicator results available to MPO directors, reporting current data for eight example metropolitan areas, two from each of the four major census regions.

To begin, the *rent burden* indicator shows that in every metropolitan area, nearly one-half of renters carry excessive rent burden and one-fourth carry severe burden, with all metropolitan areas reasonably close to the national average. That might lead any metropolitan area planning director to believe that affordability is a national problem and not due to any particular circumstances in his or her region. Looking more closely, however, Kansas City and Pittsburgh seem to be substantially more affordable, whereas Los Angeles stands out as having a very high incidence (57 percent) of excess rent burden. The credibility of measurements in other metropolitan areas, however, may be undermined when local citizens see their region listed as slightly more affordable than the U.S. average. Residents in San Francisco-Oakland or Washington, D.C., might find their regions' 46-percent rent burden incidence curiously deceptive relative to the nation's 47 percent. As discussed previously, failure to distinguish income and rent effects in this indicator is what distorts the appearance of affordability. Also, as previously reviewed, the overall average given by the rent burden indicator may not describe the experience of specific income groups.

MPO planning directors should view information targeted to very low-income renters (earning less than one-half of their area median income) because that group often is the most vulnerable and deserves close attention. The *supply gap* indicator measures the ratio between the number of low-income renters and the number of units affordable to renters of that income. Tracking that supply gap indicator would be very worthwhile. Not all that supposed "low-income" supply is available for occupancy by low-income renters, however. Much of it may be occupied by renters of somewhat higher income who are paying lower shares of their income in more affordable homes. The *supply availability* indicator measures the ratio of low-income units available for low-income occupancy after subtracting any higher income tenants. Among the metropolitan areas summarized in exhibit 10, Los Angeles fares far below the national average in low-income supply (only 39 units per 100 very low-income renters) and availability (28), compared with U.S. figures of 72 and 47, respectively. In contrast, low-income renters in Kansas City and Pittsburgh have much more available supply. Again, however, San Francisco-Oakland seems remarkably average, whereas the Washington, D.C., metropolitan area is only slightly below average. A surprising metropolitan area on this indicator is Atlanta. Despite its incidence of rent burden matching the national average, the Atlanta metropolitan area's supply availability is only 36 per 100 very low-income renters, which may be better than Los Angeles but not better than the rest of the selected metropolitan areas, including New York. A hypothetical MPO director in Atlanta should see this indicator as evidence for high-priority attention to the lowest income renters.

Turning now to the insights derived from the *constant quartile mismatch* indicator, the MPO directors will want to learn how well supply has kept up with needs in the market as a whole, including broad price brackets. Any shortfalls, particularly at the low end, could be the root of very low supply availability and high incidence of excessive rent burden in the metropolitan area. Changes in the top quartile, however, also are crucial to monitor because they spotlight metropolitan area-wide affordability problems that are created when more renters are forced into the traditional highest rental bracket. The shift of rentals into the top bracket puts pressure on the rest of the pyramid of rentals, both as tenants search downward for more affordable deals and as landlords look upward at rising rents as a signal for increases in lower brackets as well. Ill effects ripple downward from growth in the top quartile, as shortages of housing affordable to moderate- and middle-income renters may cause them to scavenge downward into housing submarkets formerly occupied by very low-income renters. That search is a factor that drives down the actual low-income availability indicator below what is estimated by the indicator of low-income supply gap. It also is a prime driver of gentrification.

Exhibit 10 provides more details for the constant quartile mismatch indicator because it holds information about rents and income trends (and graphic displays of data for specific metropolitan areas can be seen in exhibits 6 and 7). Different sources of the rental affordability problem are revealed by the CQM method in different metropolitan areas. In the case of Detroit—and to a lesser extent, Atlanta—the share of renters in the top income quartile is declining, whereas that in the bottom is growing. Despite that income decline, the share of rentals in the top price quartile has increased, whereas rentals in the bottom quartile have decreased. It is the combination of income declines and opposing trends of rents that generates Detroit's rental affordability problem. Atlanta resembles the polarized Detroit changes, but only to about one-half the degree. Solutions will have to include economic development programs to boost incomes and seek to improve supply in the middle and lower quartiles.

Conversely, the San Francisco-Oakland metropolitan area demonstrates another route to exacerbating affordability problems, witnessed also in Washington, D.C., and Los Angeles. San Francisco has experienced a very large increase (9 percentage points) in the income share in the top quartile, with little change in the bottom. Similar change is witnessed in Washington (+6 points) and Los Angeles (+4 points). Those income gains partially offset the very large shift of rentals into the top price bracket. The upward shift in the Washington metropolitan area is most extraordinary (+33 points, more than doubling the share of renters in the top quartile, from 25 percent to 58 percent), followed by Los Angeles (+29 points) and San Francisco (+24 points). Such rapid increases in rents, far in excess of the upward shift in income, suggests that the MPO directors should evaluate their regions' rate of supply increase relative to the rate of demand growth. Given the cumulative deficits of construction that cause supply to lag so far behind housing needs, MPOs should deliberate whether it is possible to accommodate greater economic growth in the future without drafting some kind of catchup plan. In that light, it seems essential for housing programs to coordinate with economic development programs.

These insights about housing shortage amid prosperity are not visible through the other affordability indicators. Los Angeles might seem to be a lone, harsh anomaly, with its high average

rent burden that does not represent a pattern followed by others outside southern California, save for Miami. Before we accept that the San Francisco and Washington metropolitan areas are actually more affordable than average for the nation, however, the CQM findings on the growing mismatch of rents and incomes bear consideration. The combined mismatch of incomes and rents, summing the shifts into the top and out of the bottom quartile,[9] is 42 percent for the Washington area, edging past Los Angeles at 39 percent and far surpassing Kansas City and Pittsburgh with 21 percent, which closely resemble the national average of 22. Taking the bottom quartile separately, the greater outflow of rentals than low-income households measures stress at the bottom of the rental market. On this, Washington and Los Angeles still lead in exhibit 10, and they are well above the national average. In contrast, the strong shift of rentals into the top quartile reflects stress at the top of the rental market, particularly for the former occupants of the middle quartiles who now must pay traditional top quartile rents. Again, we find that Washington and Los Angeles are major leaders in affordability stress, even after subtracting the smaller upward shift in incomes.

A final observation for the MPO directors is the potential organizational use of the CQM indicator findings. Those findings broaden the scope of housing affordability to reflect stresses also afflicting moderate- and middle-income renters, not solely the very low-income renters. Sharing that indicator with the public and with leaders of member jurisdictions also helps illustrate how all segments are linked together as rent distributions shift over time. As a whole, the constant quartile mismatch indicator underscores that the problem of shortage and reduced affordability afflicts all renters in the region, much more so in some regions than in others. The graphic display that accompanies the indicator (as in exhibits 6 and 7) may assist MPO directors in improving public understanding about the breadth of the affordable housing crisis and thereby help build the public will to support greater construction to meet growing housing needs.

Conclusion

Housing affordability has been growing as a problem, only recovering slightly from setbacks during the bubble and after the recession. Solutions will require local-level acceptance of the need for more construction and greater subsidies targeted to very low-income renters (Schwartz, 2015). Indicators of housing affordability are useful for measuring the growing problems and for comparing places. Although the indicators do not substitute for detailed market studies or technical causal models, they are simplified constructs that are essential for directing attention and assisting popular communication about the extent of the affordability problem. In this simplified use, the crucial criterion is that indicators must not be misleading. That quality is best judged through comparisons of multiple metropolitan areas so that users can better understand the implications of different indicators.

The traditional rent burden indicator, which is the most commonly used indicator of rental affordability, finds that nearly one-half (47.5 percent) of renters in America are spending more than 30 percent of income on rent. The great majority of large metropolitan areas (45 of 50) fall within

9 As noted previously, this is not a double counting of shifts, under the assumption that the middle two quartiles form a buffer that absorbs the exits from the bottom quartile and serves as the origin of shifts into the top quartile. The end results at the two quartiles at the extremes reveal how the effects of mismatch register.

8 percentage points, plus or minus, of this national average prevalence of excessive rent burden. On this indicator, few seem substantially more affordable than average. In addition, because this indicator is an average of all renters in the area, it may not highlight well the experience of renters at either the low or high end of the housing market. In addition, the inability of the traditional indicator to distinguish between rent and income effects can be misleading about the sources of affordability problems. That leads to anomalous findings that the San Francisco Bay Area or the Washington, D.C., metropolitan area is more affordable than the national average. Other less popularly used indicators, such as the low-income supply gap or shelter poverty indicators, are much more successful in highlighting low-income housing affordability problems. Those indicators, however, are more complex, and they also neglect the middle and higher ranges of the rental market.

The CQM indicator proposed here offers an alternative view on rental affordability, emphasizing middle-income as much as very low-income renters and recording the cumulative changes over time. The indicator measures shifts in rent and income from their traditional distribution prevailing in 2000, preceding disruptions of the housing bubble and bust, the Great Recession, and the prolonged recovery. With this indicator we explain the San Francisco and Washington anomalies of low rent burden by virtue of income gains that partially offset the effects of the upward rent shifts. Under the CQM formulation, even with income adjustment, both metropolitan areas are found to have affordability problems that are greater than the national average. In fact, Washington, D.C., which has suffered an acute loss of rentals from the bottom quartile and has more than doubled its rentals in the traditional highest rent quartile, tops the mismatch list of least affordable large metropolitan areas.

Each area has its own profile of affordability under the CQM indicator, as shown in the CQM graphic display (as in exhibits 6 and 7) that parallels changes in rent and income distributions side by side, anchoring both at the beginning of the new century. Dividing the distribution into quartiles allows residents to place themselves in this picture of change. Metropolitan areas with more acute affordability pressures feel strain at all levels of the distribution. Representing that graphically and with specific summary figures may help the public and elected leaders grasp the comprehensive scope of growing affordability strains and how broad-based must be the solutions.

Further research is possible with the constant quartile mismatch indicator of affordability, which can easily be adapted for analysis of smaller areas, such as counties, cities, and neighborhoods. Researching the conditions that cause the CQM indicator to take on higher or lower values would also be valuable. It is not known how large an increase in rental supply is needed to move the index downward in a short time or what difference it makes if new housing is added in the middle of the market in place of the bottom. Conversely, it would also be useful to learn how big an effect a large employment increase, without commensurate new housing additions, would have on the CQM and other rental affordability indicators. In general, much can be gained by using the indicator to highlight answers to practical questions that are of importance to local decision makers or the public.

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Appendix A. Sensitivity Analysis of Constant Quartile Mismatch Indicator

Our constant quartile mismatch measure relies on assumptions that may affect end results. This appendix tests two major factors: choice of Consumer Price Index (CPI) and base year of quartile measurement.

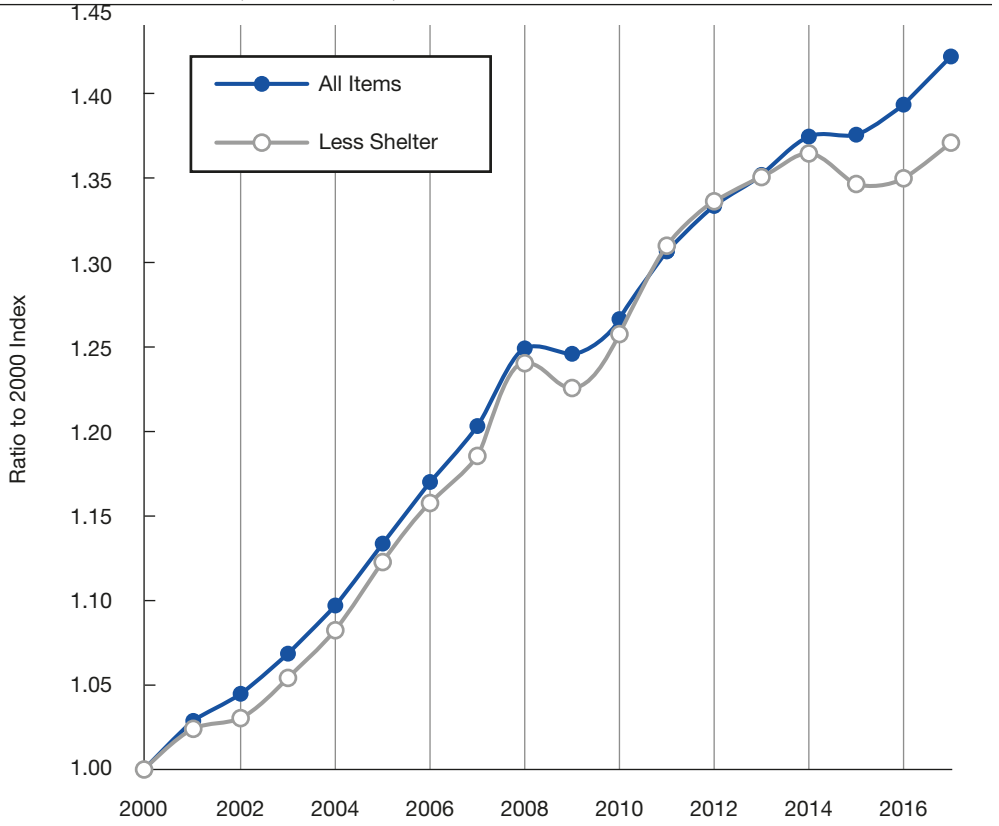
Choice of Consumer Price Index

Constant quartile mismatch measure is based on the broadest and most comprehensive CPI reported in the media, which is officially referred to as the All Items Consumer Price Index for All Urban Consumers (CPI-U) for the U.S. City Average, not seasonally adjusted, 1982–1984=100 (Bureau of Labor Statistics, Consumer Price Index Website). An alternative to be considered is CPI on all items less shelter, which reflects inflation of all item prices except housing cost. The Bureau of Labor Statistics explains the use of alternative CPIs as such: "In addition to the all items index, BLS publishes thousands of other consumer price indexes, such as all items less food and energy. Some users of CPI data use this index because food and energy prices are relatively volatile, and they want to focus on what they perceive to be the 'core' or 'underlying' rate of inflation." In measuring rental affordability, CPI all items less shelter can be a reasonable alternative because rents were very volatile between 2000 and 2016, and we can focus on rate of inflation that is separate from what we are trying to analyze.

Exhibit A-1 shows that the trajectory of CPI on all items less shelter is generally lower since 2000 than that of all items, except the early recovery period (2011 and 2012). In contrast, CPI on all items is much higher than CPI on all items less shelter in the most recent years after 2014. That divergence clearly reflects that housing cost led overall inflation in the most recent years, and it justifies use of CPI on all items less shelter as an alternative in our analysis. What if we use CPI on all items less housing cost instead of CPI on all items?

Exhibit A-1

Bureau of Labor Statistics' Consumer Price Index (CPI) Based on All Urban Consumption Items and All Less Shelter Cost, United States, 2000 to 2017



Source: U.S. Bureau of Labor Statistics, Consumer Price Index Database.

Exhibit A-2 shows that our original measure, based on CPI all items (panel a), results in weaker shifts of renters and rental units toward higher end brackets than CPI all items less shelter (panel b). It is not surprising because CPI all items is higher than CPI all items less shelter in 2016 (as shown in exhibit A-2), which then raises income and rent quartile breaks ($ value) to higher level, and consequently fewer renters in 2016 are allocated into higher income and rent brackets. In sum, our original constant quartile measure based on CPI all items can be seen as more conservative than the alternative measure based on CPI all items less shelter.

Exhibit A-2

Quartile Distribution of Renter Households by Income and Rent, Under Inflation-adjusted Constant Quartile Breaks Based on CPI All Items and CPI All Items Less Shelter, 2016, United States (unit: percentage share)

	(a) CPI All Items		(b) CPI Less Shelter	
	Renter Income	Gross Rent	Renter Income	Gross Rent
Q4 (highest)	26	39	27	41
Q3	23	24	23	24
Q2	25	20	25	19
Q1 (lowest)	26	17	25	16

Notes: CPI = Consumer Price Index; this exhibit is a tabular display of constant quartile mismatch results that were graphically displayed as column graphs in exhibits 6 and 7.
Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Choice of Base Year

Constant quartile mismatch measure gauges the 2016 level of rental affordability compared with the 2000 level because 2000 was the last year before boom, bust, and recovery periods. What if we use a different year as our base year instead of 2000?

Exhibit A-3 shows how constant quartile mismatch measure changes when we choose 2006 (panel b), peak of the housing market, as base year instead of 2000 (panel a). In terms of renter income, a 2006 base year results in a weaker shift of renters into higher end brackets compared with our original 2000 base year; for example, 26 percent in the top quartile based on 2000 base year (panel a) while 29 percent based on 2006 base year (panel b). That is understandable because renters' income actually declined between the alternative base years (2000 and 2006), which then lowered income quartile breaks ($ value) in 2006; consequently, a greater number of renters in 2016 were allocated into higher income brackets.

In contrast, rents increased the two base years (2000 and 2006) and the opposite happened to distribution of rental units. Based on the 2000 base year, 39 percent of rental units in 2016 were allocated to the top quartile (panel a). This is much higher than 32 percent in the top quartile based on a 2006 base year (panel b). In sum, the 2000 base year shows more serious affordability problems compared to a 2006 base year.

Exhibit A-3

Quartile Distribution of Renter Households in 2016, by Income and Rent, Based on Alternative 2000 and 2006 Base Years, Under Inflation-adjusted Constant Quartile Breaks, United States (unit: percentage share)

	(a) 2000 Base Yearr		(b) 2006 Base Year	
	Renter Income	**Gross Rent**	**Renter Income**	**Gross Rent**
Q4 (highest)	26	39	29	32
Q3	23	24	23	24
Q2	25	20	24	23
Q1 (lowest)	26	17	23	21

Note: This exhibit is a tabular display of constant quartile mismatch results that were graphically displayed as column graphs in exhibits 6 and 7.
Sources: 2000 Decennial Census and 2006 and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Using the 2006 base year, when many more people became owners, remaining renters were left with lower incomes; whereas in 2016, the higher income renters are back, swelling the top quartile. The quartile based in 2006 therefore is set artificially low because of the bubble. That suggests keeping 2000 as the baseline because it precedes the volatility of boom, bust, and prolonged recovery.

Appendix B

Rent Burden and Constant Quartile Distribution of Renter Households, 2000 and 2016, United States and Largest 50 Metropolitan Areas, Ordered by 2016 Population (unit: percentage, percentage point changes) (1 of 3)

Rank by 2016 Pop	Metro Name	Rent Burden						Constant Quartile Distribution of Renter Households							
		(a) Total (30%+)			(b) Severe (50%+)			(c) By Renter Income				(d) By Gross Rent			
		2000	2016	2000 to 2016	2000	2016	2000 to 2016	Bottom Q1	Q2	Q3	Highest Q4	Bottom Q1	Q2	Q3	Highest Q4
	United States	38.0	47.5	9.5	19.6	25.2	5.6	25.7	25.4	23.1	25.9	17.1	19.7	24.0	39.1
1	New York	42.1	51.4	9.4	23.9	29.2	5.2	24.0	24.7	23.8	27.5	15.9	13.4	19.6	51.0
2	Los Angeles	45.5	57.3	11.9	23.8	31.8	8.0	24.5	23.2	23.0	29.3	11.0	14.2	20.3	54.4
3	Chicago	38.0	48.8	10.7	20.4	26.8	6.4	28.2	25.8	21.2	24.7	15.9	20.4	24.4	39.3
4	Dallas	34.4	44.6	10.1	15.9	21.0	5.2	28.5	23.5	22.6	25.4	15.1	22.2	24.6	38.2
5	Houston	35.2	47.0	11.9	17.9	24.9	7.0	27.4	24.7	21.7	26.3	12.2	17.7	24.7	45.4
6	Philadelphia	40.5	50.1	9.6	22.3	28.9	6.6	27.4	25.7	21.3	25.7	15.5	18.5	24.1	42.0
7	Washington, D.C.	34.0	46.1	12.1	15.9	24.0	8.1	26.5	19.3	23.0	31.1	11.4	10.6	20.0	58.1
8	Miami	47.9	61.2	13.3	26.1	34.0	8.0	22.2	26.7	24.8	26.4	11.2	15.4	21.9	51.6
9	Atlanta	37.8	46.7	8.9	17.7	23.5	5.7	30.4	24.6	22.5	22.6	21.5	25.9	21.7	30.9
10	Boston	38.3	47.3	9.0	19.7	25.4	5.7	26.9	23.1	21.7	28.3	19.8	14.1	18.2	47.9
11	SF-Oakland	40.0	45.6	5.7	19.8	23.7	3.9	24.0	19.1	23.3	33.6	15.7	12.9	22.8	48.6
12	Detroit	36.4	48.7	12.3	20.0	27.0	7.0	29.9	27.2	22.4	20.5	17.4	22.2	26.0	34.4
13	Riverside-SB	44.4	56.3	11.9	23.0	30.2	7.1	22.3	24.0	24.9	28.8	12.2	12.6	20.0	55.3
14	Phoenix	40.5	46.0	5.5	19.5	23.3	3.9	26.4	23.7	22.6	27.3	18.0	19.7	25.5	36.8
15	Seattle	39.1	45.9	6.7	18.2	22.0	3.7	23.9	20.7	22.3	33.2	13.6	14.8	19.6	51.9
16	Minneapolis	36.7	44.2	7.5	17.1	21.8	4.7	26.2	25.4	23.0	25.4	17.4	19.2	24.1	39.3
17	San Diego	43.3	55.0	11.8	20.9	29.1	8.1	23.3	20.4	23.7	32.6	9.0	12.8	20.0	58.2
18	St. Louis	35.3	43.5	8.3	18.7	21.8	3.1	23.2	28.4	24.2	24.3	14.1	20.6	26.5	38.8
19	Tampa	40.0	50.2	10.2	19.3	25.5	6.3	26.2	23.6	24.2	26.0	13.1	17.5	24.5	44.9
20	Baltimore	36.6	46.0	9.4	18.9	25.6	6.7	23.6	22.4	22.1	31.9	14.2	10.1	19.8	55.9

Appendix B

Rent Burden and Constant Quartile Distribution of Renter Households, 2000 and 2016, United States and Largest 50 Metropolitan Areas, Ordered by 2016 Population (unit: percentage, percentage point changes) (2 of 3)

Rank by 2016 Pop	Metro Name	Rent Burden						Constant Quartile Distribution of Renter Households							
		(a) Total (30%+)			(b) Severe (50%+)			(c) By Renter Income				(d) By Gross Rent			
		2000	2016	2000 to 2016	2000	2016	2000 to 2016	Bottom Q1	Q2	Q3	Highest Q4	Bottom Q1	Q2	Q3	Highest Q4
21	Denver	38.9	49.9	11.0	18.4	24.5	6.2	24.0	22.0	25.2	28.8	11.2	14.9	22.2	51.7
22	Pittsburgh	36.2	40.9	4.7	18.8	21.6	2.9	22.9	25.5	26.9	24.7	15.9	19.6	25.8	38.7
23	Portland	39.3	48.9	9.6	18.9	25.1	6.3	25.1	24.2	23.4	27.3	15.3	12.7	23.5	48.6
24	San Antonio	35.7	45.7	10.0	17.4	22.5	5.1	23.9	24.5	25.4	26.2	13.0	15.8	24.1	47.2
25	Sacramento	42.1	51.7	9.7	21.4	29.2	7.8	27.5	23.6	21.1	27.8	13.5	16.3	22.8	47.4
26	Orlando	41.6	54.1	12.4	19.3	27.7	8.4	27.8	25.5	23.3	23.3	14.5	18.7	24.6	42.2
27	Cincinnati	35.8	44.0	8.2	18.3	22.5	4.2	27.3	26.2	21.6	24.9	18.1	22.2	26.0	33.7
28	Cleveland	38.6	46.4	7.8	20.8	27.0	6.2	30.7	24.4	22.3	22.7	22.9	24.7	25.0	27.4
29	Kansas City	33.2	42.7	9.5	16.2	20.2	4.0	28.6	26.2	19.5	25.6	17.3	22.5	24.9	35.3
30	Las Vegas	41.7	50.2	8.5	19.4	25.7	6.3	31.2	22.3	22.4	24.1	25.8	20.2	20.4	33.6
31	San Jose	38.4	46.2	7.8	17.9	22.9	5.0	28.9	17.7	21.6	31.8	17.0	13.7	20.2	49.1
32	Columbus	35.2	43.3	8.1	18.0	23.3	5.4	28.8	22.8	24.6	23.8	18.6	22.6	25.8	33.0
33	Charlotte	33.3	43.5	10.2	16.3	21.7	5.4	29.6	26.3	21.2	22.9	18.7	22.6	24.1	34.5
34	Indianapolis	34.1	46.4	12.3	16.3	25.4	9.1	30.4	26.4	21.9	21.4	17.7	23.8	26.5	32.0
35	Austin	40.5	47.1	6.6	21.0	22.6	1.7	21.4	23.9	27.8	26.9	12.3	17.6	27.6	42.6
36	Virginia Beach	38.2	49.7	11.5	17.9	24.5	6.6	24.0	22.1	23.4	30.6	9.5	12.3	23.3	54.9
37	Providence	36.9	46.5	9.7	19.2	23.8	4.6	25.8	24.8	22.4	27.0	18.1	12.8	26.3	42.8
38	Nashville	36.1	42.8	6.6	17.4	20.5	3.1	25.4	23.3	23.1	28.3	17.2	18.9	22.6	41.3
39	Milwaukee	35.7	46.6	10.9	18.0	26.4	8.3	32.5	27.2	18.5	21.7	18.8	24.0	28.7	28.5
40	Jacksonville	35.2	46.3	11.1	16.6	23.9	7.4	26.5	25.8	24.3	23.4	12.2	20.4	26.8	40.6

Appendix B

Rent Burden and Constant Quartile Distribution of Renter Households, 2000 and 2016, United States and Largest 50 Metropolitan Areas, Ordered by 2016 Population (unit: percentage, percentage point changes) (3 of 3)

Rank by 2016 Pop	Metro Name	Rent Burden						Constant Quartile Distribution of Renter Households							
		(a) Total (30%+)			(b) Severe (50%+)			(c) By Renter Income				(d) By Gross Rent			
		2000	2016	2000 to 2016	2000	2016	2000 to 2016	Bottom Q1	Q2	Q3	Highest Q4	Bottom Q1	Q2	Q3	Highest Q4
41	Memphis	39.7	51.8	12.1	21.8	29.9	8.1	27.0	26.9	22.8	23.4	11.8	19.0	28.0	41.2
42	Louisville	33.5	43.2	9.7	17.3	20.6	3.3	25.7	29.3	23.1	21.9	18.7	16.1	28.0	37.2
43	Richmond	36.6	50.1	13.4	17.8	28.1	10.3	29.2	23.3	21.1	26.4	13.9	14.9	27.9	43.4
44	Oklahoma City	36.4	42.8	6.4	19.4	20.9	1.5	20.9	27.5	24.8	26.7	15.5	17.4	25.2	41.8
45	Hartford	36.0	48.7	12.7	18.8	27.3	8.5	31.2	25.0	23.3	20.6	18.2	17.0	23.7	41.1
46	New Orleans	42.5	55.9	13.5	24.3	31.2	6.9	23.0	28.0	23.1	25.8	12.5	11.6	24.1	51.8
47	Raleigh	36.8	38.2	1.4	18.2	17.8	-0.4	24.3	24.2	24.2	27.3	21.3	22.6	25.0	31.0
48	Buffalo	43.9	45.5	1.6	24.2	25.7	1.6	27.3	20.6	25.6	26.5	22.6	22.9	24.4	30.0
49	Salt Lake City	37.2	42.2	5.0	17.7	20.8	3.1	25.7	23.3	21.7	29.4	18.4	19.1	20.4	42.1
50	Birmingham	36.6	42.4	5.8	19.9	21.7	1.8	24.0	26.9	23.5	25.6	17.2	16.8	26.0	40.0
50 Metro Average		38.2	47.5	9.3	19.3	24.9	5.6	26.3	24.3	23.0	26.4	15.8	17.8	23.8	42.5
Standard Deviation		3.4	4.5	2.8	2.4	3.5	2.3	2.8	2.5	1.7	3.2	3.6	4.1	2.7	8.2

*Notes: * "Increase" is calculated as the quartile share in 2016 less the initial 25 percent share in 2000. ** "Combined" is calculated as top quartile difference minus bottom quartile difference. AMI = area median income. SF = San Francisco. Percentages may not match due to rounding at the first decimal place. For the purpose of comparison, we calculated indicators of affordable supply gap and availability of low-cost rentals with a focus on very low-income renter households (less than 50 percent of AMI) because they are the primary target population of major federal rental assistance programs. Household and housing unit size adjustments and physical adequacy of units were omitted in calculating indicators of affordable supply gap and availability both for simplicity and to maintain comparability with constant quartile mismatch and rent burden indicators. Shelter poverty indicator was not included in this comparison because of the complexity of its calculation, as previously discussed in exhibit 3.*

Sources: 2000 Decennial Census and 2016 American Community Survey IPUMS Microdata files (Ruggles et al., 2018).

Appendix C. Data and Sample Description

Data

We used the U.S. decennial census 5 percent Public Use Microdata Sample (PUMS) in 2000 from the Integrated Public Use Microdata Series (IPUMS) provided by the Minnesota Population Center (Ruggles et al., 2018). We also retrieved the American Community Survey (ACS) 1 percent Microdata Samples in 2006 through 2016 from the same source.

The primary analysis relies on certain advantages of the Microdata Samples over summary tables that are tabulated and provided by the U.S. Census Bureau through the American FactFinder website. First, the Microdata Samples specify all the detailed demographic and housing data required for the study. The aggregated format of summary tables does not allow us to follow our constant quartile mismatch approach. Second, a metropolitan identifier within microdata permits us to take advantage of consistent and comparable geographic definitions in the 2000 census and multiple ACS years for our constant quartile mismatch analysis. The geographic identifier will be explained in more detail.

A certain limitation to the use of the Microdata Samples should be noted. The smaller the geographic area, the greater the deviation that may occur between the ACS summary table and the result of tabulations from microdata samples. That is the result of the greater sampling error in the public use microdata than that of the data files the Census Bureau uses to produce their summary tables. As an accuracy check on our microdata-based household count, we compared microdata estimates of all renter-occupant households with corresponding American FactFinder's summary tables in the 2000 census and multiyear ACSs. Trends in the two indicators tracked very closely in both the nation as a whole and across the 50 largest metropolitan areas.

Sample

The study is an aggregate-level analysis of metropolitan areas, rather than an individual-household-level analysis. We focus on a sample of the 50 most populous metropolitan areas in 2016 so that we might prevent potential noise from small- and mid-sized areas in measuring rental affordability. According to 2016 ACS data, 177 million people (54.9 percent of the total U.S. population) and 64 million households (54.0 percent of the total U.S. households) lived in those areas in 2016. Simplified names of the largest 50 metropolitan areas were previously listed in appendix B. A metropolitan area is a region consisting of a large urban core together with surrounding communities that have a high degree of economic and social integration with the urban core.

Boundaries for the 50 metropolitan areas are specified in accordance with the geographical definitions used in the 2010 census. The IPUMS database provides a geographic variable, labeled MET2013, which identifies time-invariant and comparable areas of residence using 2013 definitions for metropolitan statistical areas (MSAs) from the U.S. Office of Management and Budget (OMB). The 2013 MSAs are the first to be based on 2010 standards and 2010 census data. Data from the 2000 census and the ACS in 2006 and later were rearranged by the Minnesota Population Center to conform to those 2013 definitions. The 2013 delineations used by MET2013 are entirely county-based, even in New England. The MET2013 variable is available for 2000 and

later years. Use of MET2013 is essential to identify both gross rent of an individual rental unit and income of its current occupant in each metropolitan area.

Quartile Affordability Calculation

This study estimates quartile rental affordability in the nation as a whole and in the 50 largest metropolitan areas. Elaborating on explanation in the text, to compute quartile affordability of metropolitan area *i* in year *j*, we begin by computing three quartile breaks of renter household income in metropolitan area *i* in 2000. By definition, the resulting dollar values split evenly all renter households in metro *i* in 2000 into four 25-percent brackets, summing to 100 percent. Next we adjust those dollar values to year *j* dollar values by adjusting for inflation. Then we count the number of renter households in metro *i* in year *j* that fall inside those updated brackets. Also computed is what share of all renter households in metro *i* in year *j* makes up each updated bracket. Note that the resulting distribution may or may not be split evenly into four 25-percent brackets depending on how the distribution falling into each bracket has expanded or shrunk since 2000. If current year j breaks were applied instead of the updated 2000 breaks, it should result in four even 25-percent brackets in year *j* by definition. At this stage, we can compute how much the share falling into each quartile defined in 2000 has changed by year *j*.

The same logic is applied to gross rents in place of renter household income. We compute three quartile breaks of gross rents in metropolitan area *i* in 2000, and then adjust those dollar values to year *j* dollar values by adjusting for inflation. Based on the updated 2000 brackets, we can count the number and share of renter households in metro *i* in year *j* that fall into those updated brackets. Now we can see that what was distributed evenly inside four 25-percent brackets of rents in metro *i* in 2000 has grown increasingly skewed by year *j*. Using those updated distributions of income and rents, we can represent how rental affordability in metro *i* has changed from 2000 to year *j*. For each metropolitan area *i*, we calculate the updated quartile distribution of income and rents, to make a comparison between metropolitan areas.

Departments

In this issue—

- *Data Shop*
- *Foreign Exchange*
- *Graphic Detail*

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.

Law as Data: Using Policy Surveillance to Advance Housing Studies

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Katie Moran-McCabe
Adrienne Ghorashi
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Abstract

Within the large body of literature evaluating the role of various demographic, geographic, and economic factors in housing-related outcomes, law is often neglected as an influential variable. The growing field of legal epidemiology is popularizing the use of law as data in quantitative analysis. As with any other dataset, it is imperative that legal data are accurate and meet high quality control standards. To that end, a method known as policy surveillance was developed to ensure the reliability and reproducibility of legal data and can be used to evaluate the impact of law. Policy surveillance is a type of scientific legal research that produces robust, scientific data for empirical research by mapping, or tracking, laws and policies and their characteristics across jurisdictions and over time.

Abstract (continued)

This article introduces readers to policy surveillance as a method to create empirical legal datasets, using two examples. The first is a cross-sectional state-level dataset covering fair housing protections in all 50 states and Washington, D.C., as of August 1, 2017. The second is a cross-sectional city-level dataset covering nuisance property ordinances in the 40 most populous cities in the U.S., as of August 1, 2017. These types of empirical legal datasets identify gaps and trends in policy and facilitate evaluation studies exploring the impact of law on housing outcomes.

Introduction

Social scientists have long investigated the variation in housing-related outcomes across time and space. The body of knowledge studying changes in racial segregation, poverty concentration, and displacement effects of gentrification is robust. Although housing studies generally use data from multiple sources to control, estimate, and proxy for various demographic characteristics, social conditions, and economic measures, law has largely been neglected as a causal variable that influences housing-related outcomes. The absence of law as an explanatory variable is peculiar given the abundance of legal regulation governing housing. One reason quantitative researchers omit law from their analyses is the challenge of translating law from text to data. Analysis of housing law remains largely confined to law review literature using legal analysis and qualitative methods.

Conducting a scientific study of law requires legal data that meet the quality standards of scientific peer-reviewed research. To address this need, a method to scope, collect, and code the law was established. The method, known as policy surveillance, allows for the "ongoing, systematic collection, analysis, interpretation and dissemination of information about a given body of public health law and policy" (Chriqui, O'Connor, and Chaloupka, 2011). Since its first use, the method has been revisited and standardized through trial and error, methodological scholarship, and a Delphi process (Presley, Reinstein, Webb-Barr, and Burris, 2015). The placement of studies using policy surveillance in top-tier journals is further evidence supporting the rigor of the method and the data that are produced.

The study of housing and housing-related outcomes is a prime example of a study that can benefit from the use of scientifically created legal data. Housing law is abundant and generally unstudied: a dearth of evaluation of laws such as state and local fair housing protections, impact of landlord-tenant law on housing stability, or the potential adverse effects of housing code enforcement on poor tenants exists (Gutman, Moran-McCabe, and Burris, forthcoming). Scholars at the Policy Surveillance Program at Temple University's Center for Public Health Law Research created three

cross-sectional housing datasets in 2018: (1) state fair housing protections,[1] (2) state landlord-tenant law,[2] and (3) city-level nuisance property ordinances.[3]

In this article, we review two of the three published datasets: state fair housing protections and city nuisance property ordinances. First, we provide an overview of the policy surveillance methodology, including quality control measures, then we provide a summary of the features of fair housing protections and city nuisance property ordinances. We end with the limitations of legal datasets and a call for the use of policy surveillance in the study of housing.

Policy Surveillance: A Scientific Method to Create Legal Data

Policy surveillance, a form of scientific legal mapping, is the ongoing, systematic collection, analysis, and dissemination of policies across jurisdictions and over time (Burris et al., 2016). This approach (exhibit 1) includes establishment of the legal framework and conceptual model, an iterative process of refining coding schemes and procedures, and rigorous quality control (Anderson et al., 2013). Creating a legal dataset requires different skills: legal research, a close understanding of the topic area, and ability to design variables in a way that will be conducive for quantitative analysis. Rarely will one person combine all these capacities; due to this rarity, a transdisciplinary team could be an ideal solution (Burris et al., 2016).[4] The recommended number of team members is three, with at least one member being a lawyer or policy expert.

Although policy surveillance as a method was created with public health research in mind, the methods can be applied to any legal field and not health law per se. For example, a study published in the *American Journal of Public Health* used policy surveillance data on minimum wage laws by state and month from 1980 through 2011. The outcome variable in the study was infant mortality and birth weight, however, any other outcome variable—economic, social, demographic—would have been compatible for analysis with the legal data (Komro et al., 2016). Given the success of policy surveillance in illuminating the role of law in population level health, the time is right for the popularization of the method to other areas of inquiry in which law can be an important causal variable.

1 Policy Surveillance Program. 2017a. *State Fair Housing Protections*. http://lawatlas.org/datasets/state-fair-housing-protections-1498143743

2 Policy Surveillance Program. 2017b. *State Landlord-Tenant Law*. http://lawatlas.org/datasets/state-landlord-tenant-laws-1499878846.

3 Policy Surveillance Program. 2017c. *City Nuisance Property Ordinances*. http://lawatlas.org/datasets/city-nuisance-property-ordinances.

4 A full guide on the policy surveillance method is available at Anderson, E., C. Tremper, S. Thomas, and A. Wagenaar. 2013. "Measuring statutory law and regulations for empirical research." In Public Health Law Research: Theory and Methods, edited by A.C. Wagenaar and S. Burris: 237–260. San Francisco, CA: Jossey-Bass.

Exhibit 1

The Policy Surveillance Process

The policy surveillance process begins with the conceptualization and scoping phase, which involves determining the topic and parameters of your scientific legal mapping study. An important consideration during this phase is whether a cross-sectional or longitudinal dataset is warranted, and if longitudinal, what the meaningful time period is. During the next phase, the team conducts background research and writes memoranda to analyze the legal landscape (that is, the jurisdictional unit of analysis—federal, state, or local law—and the important features of the law—such as prohibited conduct, exemptions, and penalties). Additional memoranda are written that explore the law in detail within a sample of jurisdictions. By studying the sample of jurisdictions researchers may get a sense of the variation in the law and the feasibility of continuing the study. With respect to state fair housing protections, for example, key points of variation included which protected classes were regulated under the law, what types of actions are regulated under the law, and what exemptions exist in the law, among others.

If the initial project scoping and memoranda drafting phase deems the project viable, the researchers then develop search strings and conduct keyword searches using legal research databases (such as Westlaw or LexisNexis) to identify and record citations of relevant statutes, regulations, and ordinances. For example, search terms from the nuisance ordinance dataset included *chronic nuisance*, *abatement*, and *disorderly house*. Using the recorded citations, the researchers collect a sample of relevant legal text from the state legislatures' and local cities' websites.

Based on a review of a sample of relevant laws, a list of important features is developed to fully capture the landscape of the chosen topic based on the project's predetermined scope. These important features, or constructs, are then used to develop coding questions. The questions are constructed in a form that makes them easily translatable to data: binary, multinomial, or numerical. To code the law, the researchers answer the coding questions with the relevant legal text that was collected. Importantly, the goal of coding is to identify the observable features in the law, not to interpret the law.

Quality control is the keystone of the policy surveillance process. To ensure data quality, each step of the research process—identification of laws, inclusion of relevant citations, and coding—is implemented redundantly. Two researchers independently research and code the relevant laws to identify and resolve divergences. Error rates are calculated by comparing all differences in coding among researchers, and divergences are resolved through group consensus. Redundant coding is checked by a research supervisor, and error rates are recorded in a research protocol. As a final quality check, statistical quality control (SQC) is implemented to provide a population parameter estimate for the overall error rate of the datasets. SQC is conducted by taking a random sample of the data for an additional round of redundant coding. Datasets should aim to guarantee with 95 percent confidence that the overall dataset error rate is 5 percent or below.

Using the policy surveillance method, a research team of four lawyers conducted in-depth, cross-sectional legal assessments of state fair housing protections in the 50 U.S. states and Washington, D.C. and city nuisance ordinances in the 40 most populous U.S. cities. We discuss these datasets in the following sections as examples of the opportunity for legal data in housing.[5]

Policy Surveillance and Housing Law: Two Datasets

State Fair Housing Protections

One housing outcome that is especially of interest for social scientists is the distribution of race and income across areas. What are the contributing factors to the persistence of racial segregation and the increase in income segregation in U.S. cities? The historical and qualitative account of the role of law in the creation and maintenance of segregation is compelling (Rothstein, 2017), however, there is almost no quantitative evaluation of the legal mechanism that was put in place to combat housing discrimination—fair housing law. What we do know is that housing discrimination persists one-half of a century after the enactment of the federal Fair Housing Act (FHA) (Gutman, Moran-McCabe, and Burris, forthcoming).

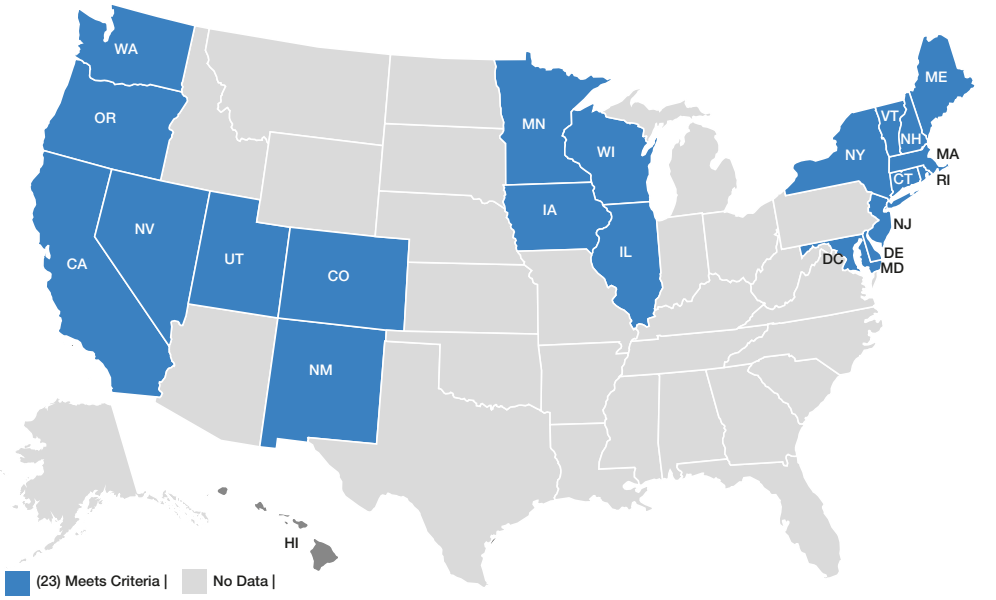
The FHA, signed into law in 1968, prohibits discrimination in housing-related transactions for individuals who are members of a protected class—these include race, color, national origin, religion, sex, familial status, and disability. The FHA provides protections to certain individuals seeking to rent or purchase a home from discriminatory actions such as refusing to rent or sell, discriminatory advertising, and refusal to make or allow reasonable accommodations.

5 Both datasets could be found on LawAtlas.org, a depository of policy surveillance datasets.

The FHA, however, only provides the minimum floor of protection for renters and buyers. Many states have chosen to adopt their own fair housing policies, some of which provide more expansive protections than the federal law. As of August 1, 2017, Mississippi was the only state that did not have a fair housing law.

Exhibit 2

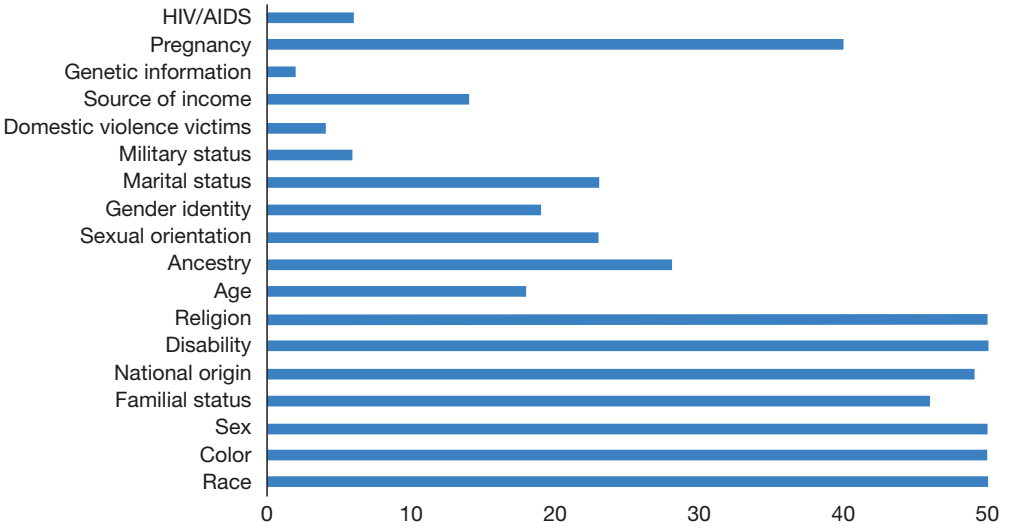
Effective 1 August 2017, 22 states and the District of Columbia included sexual orientation as a protected class in their fair housing law.



State laws vary on which protected classes are included, the types of discriminatory actions that are prohibited, and when discrimination is exempt under the law. For example, some states include sexual orientation (23 jurisdictions—see exhibit 2) and gender identity (19 jurisdictions) as protected categories. Fourteen states include source of income as a protected class, which research suggests could address discrimination against voucher holders (Tighe, Hatch, and Mead, 2016). However, not all those states include housing vouchers under that protection. Eleven states include housing vouchers under the source of income protection, whereas three explicitly exclude housing vouchers. Texas law does not include source of income and furthermore, preempts local jurisdictions within the state from enacting such protections.

Exhibit 3

Count of number of states that include a certain protected class in their law effective 1 August 2017.



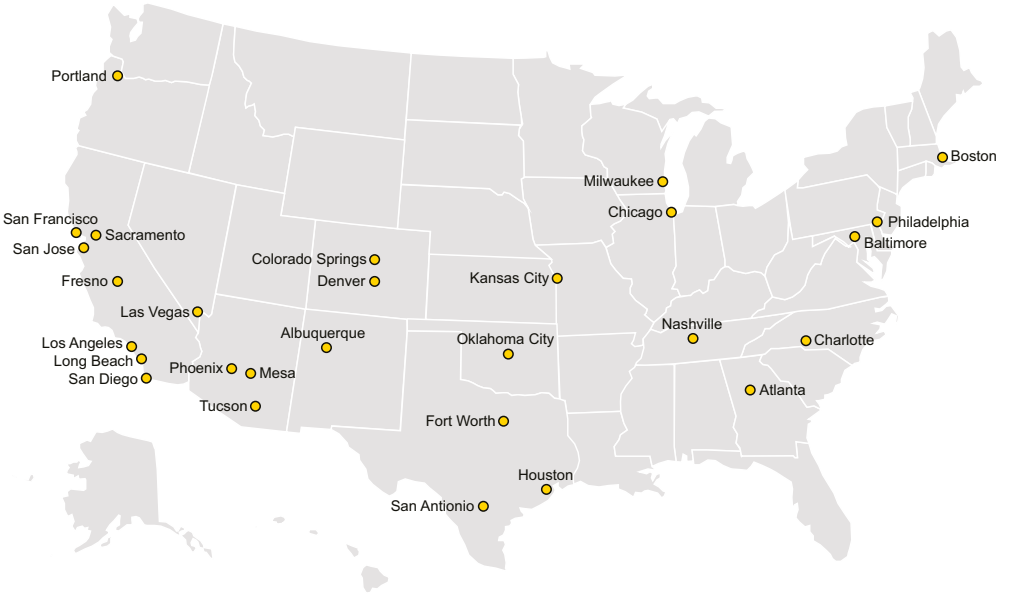
The findings from this dataset (exhibit 3) raise important questions, such as whether adding new categories of protected classes is effective at battling discrimination for covered individuals. Further, the variation in exemptions—the situations in which the fair housing protections do not apply—begs questions that can only be answered with more data on the operation of landlords, such as how many landlords and sellers fall under the different exemptions provided under the law.

City Nuisance Property Ordinances

Eviction is a housing-related outcome that is of growing interest in the literature. One legal mechanism Desmond (2016) exposed that potentially contributes to the epidemic of evictions is city nuisance property ordinances (NPO). NPOs (exhibit 4) require landlords to regulate the conduct of their tenants, sometimes through eviction, and often penalize them when they fail to do so. Although these laws were initially enacted to target drug use, many ordinances now include a wide range of actions that the city deems to be a nuisance (Desmond and Valdez, 2012). NPOs can have consequences with a significant impact on public health. For example, some ordinances consider calls to law enforcement to be nuisance activities, thus discouraging tenants from calling the police when necessary. These laws, which may force tenants to choose between calling the police in an emergency and being threatened with eviction, can have a disproportionate effect on domestic violence survivors and people with disabilities, who may have to call the police for help more often than others (Werth, 2013).

Exhibit 4

Effective 1 August 2017 in 28 of the 40 most populous cities of the U.S. disturbance is considered a nuisance activity.



The main concern about NPOs that arises from the literature is the impact on the housing stability of victims of domestic violence who seek emergency assistance. Indeed, five of the cities studied explicitly consider 911 calls for emergency service as nuisance activities—although exceptions apply. Twenty-eight cities deem a disturbance, breach of peace, disorderly conduct, or similar behavior to be a nuisance. With such a broad concept of nuisance activity, it would not be hard for a tenant, particularly one who is a domestic violence survivor, to be accused of creating a nuisance. Although domestic violence-related incidents are exempt from being considered a nuisance in 6 of the 40 largest cities, 30 of these jurisdictions do not exempt any conduct from their definition of nuisance. In addition, 20 of the cities with NPOs specifically include eviction as a possible way to abate the nuisance, which may contribute to the problems that these ordinances can cause. The most common penalty that may be imposed for failure to abate a nuisance in the cities studied is a fine—which could be capped by law at $100, $200,000, or not capped at all.

Having an empirical legal dataset of NPOs is the first step to evaluate the impact of various elements of the ordinances on eviction and their disparate impact on victims of domestic violence. Such research will allow advocates to call for specific changes to ordinances to ensure that they achieve their intended consequences. Further, by focusing on the 40 most populous cities, the dataset provides a baseline of how these ordinances look on average in the largest U.S. cities.

Legal Data: Limitations and Opportunities

Policy surveillance is a valuable tool for housing researchers. Robust legal data can help both illuminate questions about the law and its impact and provide data for analysis to find answers. However, every legal dataset has at least two limitations.

The first is the gap between law on the books and the enforcement on the ground. Fair housing law is a prime example. Despite the protections provided under federal and state law, research has identified large gaps between the prevalence of discrimination and instances of enforcement (Abedin et al., 2017). Legal data only provides information about the law and not the actual enforcement, compliance, or adherence to it. The second limitation is that datasets do not often cover all the layers of law that operate in a certain geographical area. For example, although Philadelphia's NPO does not include an exemption for victims of domestic violence, Pennsylvania state law preempts the enforcement of any municipal ordinance that penalizes people for contact made for emergency assistance by or on behalf of victims of abuse, victims of crime, or individuals in an emergency (53 PA. CONS. STAT. § 304). To be able to capture exactly the laws that govern the lives of people in a certain jurisdiction, Federal, state, and local law needs to be taken into consideration.

The fact that housing law has been relatively unstudied does not mean that it doesn't have an impact on every aspect of housing—it just means that we do not know the severity, degree, or direction of the impact. Proliferation of housing-related legal data will enrich the literature and offer new and novel avenues of investigation.

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Peas in a Pod? Comparing the U.S. and Danish Mortgage Finance Systems

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Morten Baekmand Nielsen
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Overview

- As it weighs mortgage finance reform, the United States can draw lessons from Denmark, whose system is similar in some key respects to that of the United States but enabled Denmark to better weather the crisis.
- The U.S. and Danish mortgage finance models both rely heavily on capital markets to fund residential mortgages, transferring interest rate and prepayment risk, but not credit risk, to investors. But in Denmark, homeowners can buy back their mortgages or transfer them in a property sale, avoiding the "lock-in" effects present in the U.S. system, and easier refinancing reduces defaults and speeds the transmission of lower interest rates in a downturn. Denmark's tighter underwriting standards and strong creditor protections help limit credit losses, while its higher capital requirements make lenders more stable.

- The Danish example suggests that a stable mortgage finance system is possible with a capital-markets-centric funding model, and without requiring a large role for government.

The way mortgages are designed, financed, and regulated varies strikingly across countries.[1]Although this variation reflects adaptation to international differences in social, economic, and legal conditions, it likely also stems from historical accidents and path dependence. As the United States considers further reform of its mortgage finance system, it is useful to examine what can be learned from the experiences of other countries and whether any international practices could be adapted to improve the institutional design of the U.S. mortgage market.

With that goal in mind, this article compares and contrasts the U.S. system with that of Denmark. The Danish mortgage finance system is a salient reference point because, in several respects, it is the international model most similar to the U.S. system. In particular, Denmark relies very heavily on capital markets for funding residential mortgages, transferring interest rate risk and prepayment risk to fixed-income investors in a way that is similar to U.S. mortgage securitization. Unlike the U.S. system, however, the Danish mortgage finance system remained stable and solvent during the 2007-09 financial crisis and did not require government funding or capital injections, despite experiencing a fall in home prices of similar magnitude to that in the United States during this period.

In the Danish model, mortgages are financed through the issuance of "covered bonds" (bonds collateralized by a cover pool of mortgages or other debt) by a small number of specialized mortgage banks. The system relies on the "balance principle"—the covered bonds match the maturity and cash flows of the underlying pool of mortgages funded by the bond, and payments by mortgage borrowers are passed directly through to covered bond investors. Thus, interest rate risk and prepayment risk are borne by investors rather than by the mortgage bank that issues the covered bond. However, ownership of the mortgages is retained by the mortgage bank throughout its life, and the bank bears any credit losses on the mortgages.

This approach shares many similarities with the structure of the agency mortgage-backed securities (MBS) market in the United States, where mortgage bonds carry a credit guarantee from the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), or the Government National Mortgage Association (Ginnie Mae). As in the Danish system, agency mortgages are funded by capital market investors who bear prepayment risk and interest rate risk but are not exposed to credit risk. Both agency MBS and Danish covered bonds are widely held and traded, and in both countries these bonds remained liquid throughout the 2007-09 crisis period and other market downturns (see section 2 for more details).

This shared funding model explains why Denmark is also, to our knowledge, the only country aside from the United States where long-term (for example, 30-year) prepayable fixed-rate mortgages (FRMs) are widely available to homeowners. Capital market financing is important for the availability of such loans because they embed significant interest rate and prepayment risk, which makes them less well suited for short-term bank deposit finance. Given the popularity and

1 See Campbell (2013), Lea (2010), and Green and Wachter (2005) for surveys and discussion of international variation in mortgage market design.

familiarity of FRMs in the United States, Denmark provides a useful case study because Danish homeowners[2] have historically shared this same preference for FRMs. The Danish model may suggest ways to improve the efficiency of the U.S. mortgage finance system without restricting the types of contracts available to borrowers.

As we will describe, the Danish system includes several features that mitigate frictions in mortgage financing and could potentially be usefully adapted in some form in the United States. Prominent among these is the option for Danish homeowners to repurchase their own mortgages from the covered bond pool at the current market price. Mortgages are also assumable, meaning that a homeowner can transfer his or her mortgage to a buyer as part of a property sale. These features are useful in an environment of rising interest rates, since they reduce the tendency for the homeowner to become "locked in" to a mortgage with a below-market interest rate. Such lock-in can have perverse effects—for instance, it can discourage homeowners from selling their homes and moving (Quigley, 1987; Ferreira, Gyourko, and Tracy, 2010). The Danish system also allows homeowners to refinance easily at par with the same mortgage bank even if their home equity has declined because of a fall in home prices. Historically, this option has generally not been available in the United States, blunting the transmission of lower long-term interest rates to households during the recent recession (Beraja et al., 2017). However, recent policy changes are likely to make the U.S. system more similar to Denmark's in the future.[3]

Although we focus mainly on mortgage funding, we also compare the primary mortgage markets in Denmark and the United States. Here, the two systems are less similar. For instance, mortgages in Denmark generally have much less credit risk, and as a result Denmark experienced only a mild increase in credit losses during the financial crisis despite a sustained fall in home prices. This distinction reflects tighter underwriting standards (for example, minimum down payments of at least 20 percent are required on first-lien mortgages),[4] as well as a creditor-friendly legal system in which foreclosure is uniformly quick and lenders have full recourse against the borrower's assets and future income. In that sense, Danish mortgages embed less implicit insurance than U.S. mortgages, although that approach is partly made possible by the extensive social safety net offered in Denmark.

After comparing the Danish and U.S. systems, we highlight some lessons from the Danish experience that may be of interest in thinking about the future of U.S. housing finance.

Among these: first, the Danish experience suggests that returning to a balance-sheet funding model is not necessary to ensure the stability of the U.S. mortgage finance system; Denmark has a capital-

2 In this article we generally restrict our attention to the residential mortgage market and refer to Danish borrowers as homeowners, even though Danish mortgage banks also finance commercial real estate and farms along the same principles as described here.

3 The Home Affordable Refinancing Program (HARP) was introduced in the United States in the wake of the financial crisis to facilitate refinancing for borrowers with little or no remaining home equity. HARP is scheduled to expire at the end of 2018 but will be replaced by permanent high loan-to-value (LTV) streamlined refinancing programs offered by Fannie Mae and Freddie Mac. See section 3 for a more detailed discussion.

4 Danish commercial banks are willing to finance up to 15 percent of the remaining 20 percent, but this financing takes place outside the covered bond system. By comparison, in the United States, Federal Housing Administration (FHA) loans can have down payments as low as 3.5 percent. Fannie Mae and Freddie Mac also purchase loans with low down payments, although third-party credit enhancement is required for loans with LTV ratios exceeding 80 percent.

markets-centric system that, to date, has been stable and robust, without reliance on government support or bailouts. Second, it is possible within a framework similar to agency securitization to offer innovations that mitigate frictions in mortgage refinancing.

Third, capital adequacy is critical for system stability. A key reason why Danish mortgage banks, unlike Fannie Mae and Freddie Mac, did not require government assistance during the financial crisis is that they were significantly better capitalized relative to the level of risk they assumed.

This article is related to a number of studies that discuss key features of the Danish mortgage finance system (Berg and Nielsen, 2014; Campbell, 2013; Green and Wachter, 2005; Frankel et al., 2004). Aside from some differences in emphasis, our main contribution relative to this previous work is to present an up-to-date comparative analysis of the Danish and U.S. systems, taking into account the experiences of both countries during and since the financial crisis.

Section 1 provides a history and overview of the Danish model of mortgage finance. In section 2, we compare the two systems side-by-side, examining both the way mortgages are funded and the features of the primary mortgage markets. Section 3 discusses possible lessons from the Danish experience for the path of future U.S. housing finance reform. Section 4 presents our conclusions.

1. Overview of the Danish Approach to Mortgage Finance

In Denmark, mortgage lending has long been dominated by specialized mortgage banks. Denmark's first mortgage bank was established in 1797, and Nykredit, the country's largest mortgage bank today, traces its origins to 1851 (Møller and Nielsen, 1997). Originally, these firms were set up as mutual mortgage credit associations with a local focus. But several waves of mergers—some encouraged or even prescribed by their then-regulator[5]—led to the formation of the handful of large mortgage banks that today dominate mortgage lending in Denmark.

Because the original mortgage credit associations were founded by borrowers, lending terms were to a large extent designed to reflect borrowers' objectives and interests. At the same time, the associations needed to build trust among the investors in covered bonds, and this led to a business model aimed at balancing borrower and investor interests (Møller and Nielsen, 1997). Key aspects of this business model included:

- Mortgage lenders could not call for early redemption of a loan unless the borrower became delinquent.
- Investors could not call the covered bonds.
- Homeowners had a right to prepay the mortgage loan at par on any payment day without penalty.
- Homeowners were personally liable for the mortgage debt.

5 Mortgage banks were originally regulated and supervised by the Danish Ministry of Housing. Today, the Ministry of Industry, Business, and Financial Affairs is the mortgage bank regulator, and the Danish Financial Supervisory Authority is the supervisor.

- Homeowners were jointly and severally liable for the covered bonds issued by the mortgage credit association.
- Mortgage margins could be increased for the entire stock of mortgage loans—for example, if needed in order to increase capitalization or cover loan losses.
- Strict lending guidelines were instituted that were regulated by law (maximum LTV ratio, maximum maturity, and so forth).[6]

With the exception of joint and several liability, these principles still apply to mortgage banks today.[7] However, the mid-1990s saw the beginnings of a shift in organizational form from mutual associations to limited liability corporations. The mortgage credit associations were first converted into limited liability companies owned by mutual associations, and later many were merged with banks to form financial conglomerates.[8]

Capital market funding has been a mainstay of the Danish mortgage financing system since the beginning in 1797 (Møller and Nielsen, 1997). Inspired by the German and Austrian models, Denmark enacted its first Mortgage Credit Act in 1850, requiring the specialized mortgage credit associations to issue covered bonds to fund all mortgage lending, and prohibiting them from taking deposits. The ban on deposits stemmed from regulators' desire to eliminate any risk of a run on the lenders, who carried only long-term and illiquid mortgage assets on their balance sheets.

The specialized nature of mortgage bank assets and mortgage banks' reliance on covered bonds rather than deposits remain the key distinguishing features of Danish mortgage banks today. Danish mortgage banks can be viewed as a form of "narrow banking"—they do not engage in maturity transformation, since payments to covered bond investors match the cash flows of the underlying mortgages. Because they do not rely on deposits for funding, mortgage banks do not benefit from any implicit subsidies arising from deposit guarantees and structural subordination of covered bond investors relative to other creditors (the latter could be the case in a situation where deposit-taking banks issue covered bonds).

The covered bond structure provides a funding instrument with very low credit risk to investors, facilitating efficient funding of low-risk financial assets such as residential mortgages. For more background on covered bonds, see box 1.

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6 Specifically, legislation in Denmark titled "Law on Mortgage Lending and Mortgage Bonds" includes restrictions such as an 80 percent maximum LTV, 30-year maximum maturity, full amortization with a maximum initial interest-only period of 10 years, a legal documentation requirement, and specific principles for assessing the value of a property.

7 Although borrowers are no longer personally liable for the covered bonds, mortgage banks can still elect to increase margins on existing borrowers if needed to increase capitalization or cover loan losses. This option to adjust margins arises out of the original mutual structure of the mortgage banks. This feature implies that, contrary to U.S. practice, small interest rate changes are possible even for a fixed-rate mortgage. In practice, raising margins affects the lender's reputation and competitiveness, and since mortgage borrowers can easily move from one bank to another, the scope to raise margins is limited, unless there is a general increase in credit losses or funding costs that affects all banks at the same time. As a result, margins tend to fluctuate little and often remain constant for several years at a time. Over the past 10 years, average mortgage margins have increased from approximately 50 basis points to just over 80 basis points.

8 When Denmark implemented the Capital Requirement Directive in 2007, it also decided to allow deposit-taking banks to issue covered bonds. So far, only one bank has opted to issue covered bonds.

Box 1

The Basics of Covered Bonds

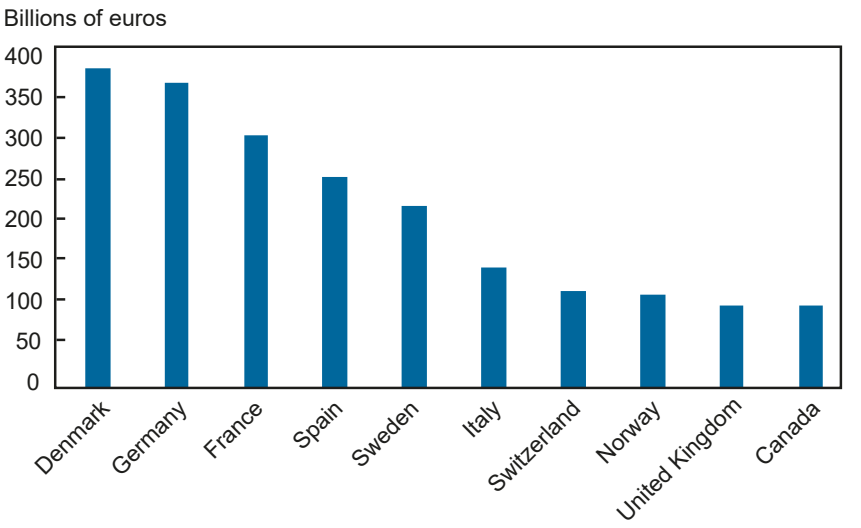
Covered bonds are debt instruments issued by credit institutions financing a pool of segregated, or "ring-fenced" assets. Several different legal models are used for covered bonds in Europe. In Denmark, most covered bonds are issued by specialist mortgage banks that keep the mortgages on their balance sheets. Covered bonds issued in the European Union comply with special legislation from the European Union as well as national covered bond legislation.[a]

Covered bonds primarily fund mortgage lending, but they can also fund other types of assets (for example, public sector lending, ships, and infrastructure). These nonmortgage covered bonds are outside the scope of this article.[a]

Unlike balance-sheet securitization, covered bonds offer the investor double recourse: exclusive recourse to the segregated pool of assets on the issuer's balance sheet, and (nonexclusive) recourse to the overall assets of the issuer. In order to ensure that the "cover pool" (in other words, the assets financed by the covered bonds) is of high quality, mortgage loans in the pool must comply with several requirements regulated by law regarding property types, maximum LTV ratios, substitute assets, and transparency.

The distinguishing feature of Danish covered bonds is that interest rate risk and prepayment risk are fully passed through to capital market investors under the balance principle. In other European Union countries, these risks are at least partially retained by the covered bond issuer.

Outstanding Covered Bonds, 2016



Notes: Statistics in the chart cover all types of covered bonds backed by mortgages or public sector assets, for major European markets and Canada. Data are as of year-end 2016.

Source: ECBC European Covered Bond Fact Book, 2017.

Box 1 ***(Continued)***

The three largest covered bond markets in the world are Denmark, Germany, and France, as shown in the chart below. The United States does not have a significant covered bond market, in part because lenders have access to funding collateralized by mortgages through the Federal Home Loan Bank System (Bernanke, 2009).[b]

Like Fannie Mae and Freddie Mac, the FHLBs are government-sponsored enterprises (GSEs) created by an act of Congress. See Meuli, Nellen, and Nitschka (2017) for a discussion of the Swiss Pfandbrief covered bond instrument, which shares a number of similarities with the FHLB system.

[a] For more information on covered bonds, see European Covered Bond Council, https://hypo.org/ecbc/covered-bonds/#introducing-covered-bonds.

[b] See Ashcraft, Bech, and Frame (2010) for more detail on the structure of the Federal Home Loan Bank (FHLB) System and the role of FHLB advances as a stable source of funding during the 2007-09 financial crisis. Like Fannie Mae and Freddie Mac, the FHLBs are government-sponsored enterprises (GSEs) created by an act of Congress. See Meuli, Nellen, and Nitschka (2017) for a discussion of the Swiss Pfandbrief covered bond instrument, which shares a number of similarities with the FHLB system.

1.1 The Mortgage Origination Process

As in the United States, the traditional mortgage contract in Denmark is a fixed-rate mortgage that fully amortizes over 30 years and may be prepaid at any time without penalty. A number of new types of loans have been introduced in Denmark over the past two decades, the most popular of which are adjustable-rate mortgages (ARMs) and interest-only loans.[1] However, the growth in alternative mortgages has stopped short of the riskiest contract features seen in the United States prior to the financial crisis (for example, there are no negative amortization mortgages or no-documentation loans).

The homeowner's interest rate is directly linked to the lender's cost of funds. Specifically, the rate is equal to the current market yield of the "on-the-run" (in other words, most recently issued) covered bond in the capital market, plus a margin set by the lender. The bank simply acts as an intermediary between the borrower and the capital market. In principle, when a homeowner enters into a new mortgage, the mortgage bank provides her with covered bonds matching the principal amount being borrowed, which the borrower can then sell on the bond market. In practice, the mortgage bank will generally handle the sale of the bonds for a fee, and simply transfer the net proceeds of the bond sale to the homeowner's bank account. The mortgage bank pools thousands of loans with similar coupons and maturities to allow the buildup of large and liquid covered bond issues.

1 Unlike U.S. ARMs, which typically switch to a floating interest rate after an initial fixed-rate period, ARMs in Denmark consist of a number of equally spaced fixed-rate periods, most commonly either 3 years or 5 years. However, the borrower has the option to change the length of the fixed-rate period on each reset date. On each reset date, the new mortgage interest rate is based on bond market yields at the time the rate is fixed, removing any basis risk for the bond issuer. For interest-only mortgages, the initial interest-only period cannot exceed 10 years.

Danish mortgage banks have a vertically integrated business model—the same bank originates and owns the mortgages, funds them in the covered bond market, services the mortgages, and undertakes foreclosure proceedings if needed. In the United States, these different roles are often played by different financial institutions (for example, mortgages are often sold after origination, and many loans are serviced by a third-party servicer).

1.2 Covered Bond Design and the Balance Principle

Covered bonds are issued at coupon rates in 50 basis point increments, and each covered bond security is generally on the run for 3 years. This means that mortgages are progressively added to the cover pool for the bond over a 3-year period, before the pool is closed. Because the market price of the bond fluctuates daily during the 3-year on-the-run period, the homeowner's interest rate is set in a manner similar to the system known in the United States as paying points (see box 2 for more details on the mechanics).

The funds received by the homeowner match the net amount raised from selling the corresponding covered bonds in the capital markets. Furthermore, on a flow basis, the cash flows received by covered bond investors exactly match the cash flows from the underlying pool of mortgages (except for a margin that is retained by the lender). Hence, if a mortgage has a refinancing option, the bond has a similar option. As mentioned earlier, this complete pass-through funding model is known as the balance principle.

The homeowner's quarterly mortgage payment equals the cash flow on the bonds issued to fund her loan plus a fixed margin to the mortgage bank. Thus, there is little market risk to the mortgage bank. However, the mortgage bank lender is exposed to credit risk, since the loan remains on its balance sheet until maturity. If the borrower becomes delinquent, the mortgage bank will use its capital buffers to repay the holders of covered bonds and will start foreclosure proceedings against the homeowner. In practice, however, mortgage credit losses in Denmark have historically been low, even during significant housing market downturns (see section 1.4 for a more detailed discussion).

Unlike an "originate to distribute" approach, the retention of credit risk by the originator creates skin in the game and reduces information asymmetries, which together may contribute to the low mortgage default rates observed in Denmark.[2] The market risk is less subject to asymmetric information and therefore easier to distribute to capital market investors.

This allocation of market and credit risk means that the mortgage bank has an incentive to refinance the loans of existing borrowers. Refinancing a mortgage at par to a lower interest rate reduces credit risk because it lowers the borrower's interest payments; while there is a loss in the market value of the loan because of the refinancing at par, this loss is borne by the covered bond investor owing to the balance principle. Since the original lender is responsible for loan servicing, there is also no disincentive to refinance associated with a loss of servicing fees.

2 In the agency mortgage market in the United States, Fannie Mae and Freddie Mac retain mortgage credit risk in the same way as Danish mortgage banks, but Fannie and Freddie do not originate mortgages. Demiroglu and James (2012) find evidence that securitized mortgage losses in the United States were lower for securities in cases where the issuer was also the mortgage originator. See Willen (2014) for the case against mandatory mortgage risk retention.

Box 2

The Mechanics of Issuing Bonds under the Balance Principle

Mortgage banks keep bond series (each with a specific international securities identification number, or ISIN) on the run for 3 years and tap them on a daily basis to fund new lending. When a new bond series is started, it has 33 years to maturity. This interval allows the bank to fund loans with the maximum legal loan term of 30 years until the bond goes off the run. No loan in the cover pool backing the bond series will have a maturity in excess of 30 years, but since the loan portfolio is constructed over time, the amortization profile of the bond will reflect the gradual buildup of the underlying cover pool. The long 3-year on-the-run period makes it possible to build up large and liquid series of covered bonds.

Under the balance principle, the amount lent to the homeowner exactly matches the net amount raised by selling covered bonds in the capital market. Bond market funding for each loan is obtained on the day the loan is disbursed, thus avoiding any pipeline risk for the bank.

The effective mortgage rate paid by the borrower will reflect the yield on the corresponding covered bond. Since bond prices fluctuate over time, different homeowners may have different yields-to-maturity despite being funded in the same bond series with the same coupon. Mechanically, this variation is achieved by adjusting the principal on the mortgage in a manner analogous to the U.S. practice of paying mortgage points. The following example illustrates the mechanics (for the sake of simplicity we exclude all fees and so forth):

> A homeowner needs 1 million Danish kroner (kr.1 million) to purchase a house. The on-the-run 2 percent 30-year fixed-rate-mortgage bond trades at 99.00. The bank will then make a loan offer with a principal of 1/0.99 = kr.1.01 million. The homeowner is liable for the bond amount issued and will receive the proceeds of kr.1 million. The quarterly interest payment will be 2 percent/4*kr.1.01 million, and hence, the homeowner's effective loan rate will be slightly above the 2 percent coupon of the bond, reflecting the fact that the 2 percent bond is trading at a discount. Another homeowner taking out a loan the following day when the same bond series trades at 99.25 will be liable for a slightly smaller bond principal and pay a marginally lower effective interest rate.

Coupon rates are set at increments of 50 basis points. At the time of this writing, the Danish mortgage banks had bonds open for issuance with final maturity on October 1, 2050, with coupons of 1.5 percent, 2.0 percent, and 2.5 percent. Each homeowner will have her loan funded in the bond trading closest to par, thereby minimizing the number of points paid. If long-term interest rates, for instance, increase, mortgage banks will open new on-the-run bonds with higher coupons and start tapping them instead of the bonds with coupons below market rates. The end-date for the on-the-run period will be the same for all bonds of the same "vintage," irrespective of when in the 3-year period they begin to be on the run.

1.3 Refinancing and Prepayment

Mortgage refinancing is an integrated process in which a borrower simultaneously takes out a new loan and uses the proceeds to repay the old loan. If the interest rate on the new mortgage is below that of the original loan, the repayment of the loan is at par. The homeowner will call the mortgage, and the mortgage bank will call a corresponding amount of the outstanding bonds at par at the same time. The mortgage bank will only call bonds corresponding to the actual mortgages that are being prepaid and thus does not take on any interest rate risk or prepayment risk.

In contrast, if the market interest rate exceeds the original loan rate, it is possible to prepay the loan below par. In this case, the mortgage bank will repurchase, at the current market price, the bonds backed by the homeowner's mortgage in the market, and then retire them. These bonds will be trading at a discount, given that market interest rates have increased since the old mortgage was originated. Thus, when the homeowner refinances, her new mortgage will have a smaller principal (since the old loan was redeemed at below par value) but a higher loan rate. Generally, these two effects will roughly offset each other, implying little net change in the borrower's mortgage payments.[1] Danish mortgages are also assumable, which means it is possible for the homeowner to transfer her mortgage to a buyer as part of a property sale. This, in effect, is an alternative way for homeowners to "buy back" their mortgages.

This ability of Danish borrowers to repurchase their own loans at the market price has potentially important advantages in a rising interest rate environment (as emphasized by Campbell, 2013). In the U.S. system, where FRM prepayment only occurs at par and the mortgage is generally due upon sale of the home, homeowners with a below-market mortgage interest rate face a "lock-in" effect: they have disincentives to move to a new home or change their loan terms (for example, from an FRM to an ARM, or to a loan with a different maturity), because doing so means they will have to retire their below-market-rate mortgage and take out a new loan at the higher current rate. This lock-in effect could generate allocative inefficiencies; for example, it may reduce housing market turnover and limit homeowners' ability to adjust their consumption of housing services in response to changes in economic circumstances. Ferreira, Gyourko, and Tracy (2010) and Quigley (1987) present empirical evidence that mortgage rate lock-in reduces household mobility in the United States. The lock-in effect is not present in Denmark, given that the cost of refinancing to a new, higher interest rate is offset by the capital gain from repurchasing the old mortgage below par.

An additional implication of borrowers' ability to repurchase their loans from the cover pool is that homeowners can act as a source of liquidity in the covered bond market. When interest rates increase and liquidity in the market for existing bonds typically suffers, refinancing activity adds to the demand for bonds for redemption. Homeowners can also act as "buyers of last resort" in situations where covered bond prices become too low relative to fundamentals.

1 For example, if mortgage rates increase by 200 basis points, our homeowner from the example in box 2 will now see the bonds issued to fund her loan trading at, say, 85 cents to the dollar. Assuming that a new mortgage loan with a coupon of 4 percent could be disbursed at par value, the homeowner will need a new mortgage of just over kr.0.85 million to redeem her old loan. The homeowner will thus realize a capital gain of kr.0.15 million. However, her annual mortgage payment, including amortization, will remain broadly unchanged at approximately kr.38,000 after tax (taking into account a 32 percent tax rate deduction for interest payments) because the lower principal will be offset by a higher interest rate on the new loan.

Streamlined mortgage refinancing is available to Danish homeowners who refinance their mortgage with the same lender, as long as the homeowner does not want to extend the term of the loan or extract equity from the home by increasing the mortgage principal amount.[2] A property appraisal is not needed, and the borrower is not required to provide updated documentation of income or assets. Streamlined refinancing is permitted even if home prices have fallen and the homeowner's updated LTV ratio has risen beyond the statutory maximum of 80 percent for purchase mortgages.[3] As noted earlier, the logic behind this "no questions asked" approach is that re-underwriting the loan is not necessary because the lender already bears the credit risk on the mortgage. In fact, allowing the borrower to refinance to a lower market interest rate actually reduces the lender's credit risk exposure because it reduces the homeowner's debt payments.

The availability of streamlined refinancing makes it easier for borrowers to refinance during periods of depressed home prices. This contract feature could have been of significant value in the United States in the wake of the 2008 financial crisis (see section 2.3 for further discussion).

1.4 Credit Risk and Foreclosure

Realized mortgage credit losses in Denmark have been low over a long period of time. Historical credit loss rates on mortgages and other loans back to the early 20th century are plotted in chart 1. Over that period, credit losses for Danish mortgage banks have averaged about 10 basis points per annum and have consistently been much lower and less volatile than losses on nonmortgage loans held by deposit-taking banks. Even during the 2007-09 financial crisis, the mortgage credit loss rate topped out at only around 20 basis points. The peak mortgage credit loss rate for the full period was realized during the Scandinavian banking crisis in the early 1990s, although this peak was driven in part by a change in accounting standards to a more forward-looking method for calculating provisions.

The low credit losses experienced by Danish mortgage banks are not simply the result of a lack of economic volatility. The drop in Danish house prices during the financial crisis was on par with the fall in U.S. house prices (Berg and Nielsen, 2014), and in an International Monetary Fund (2000) study, the Danish housing market was characterized as the most volatile in the western world over the post–Bretton Woods era.[4] Denmark has also experienced significant business cycle fluctuations, as reflected in the high and variable loss rates on nonmortgage loans in chart 1.[5]

2 However, the homeowner is allowed to roll refinancing costs (for example, origination fees) into the refinancing, in which case the new principal will be slightly higher than the old principal.

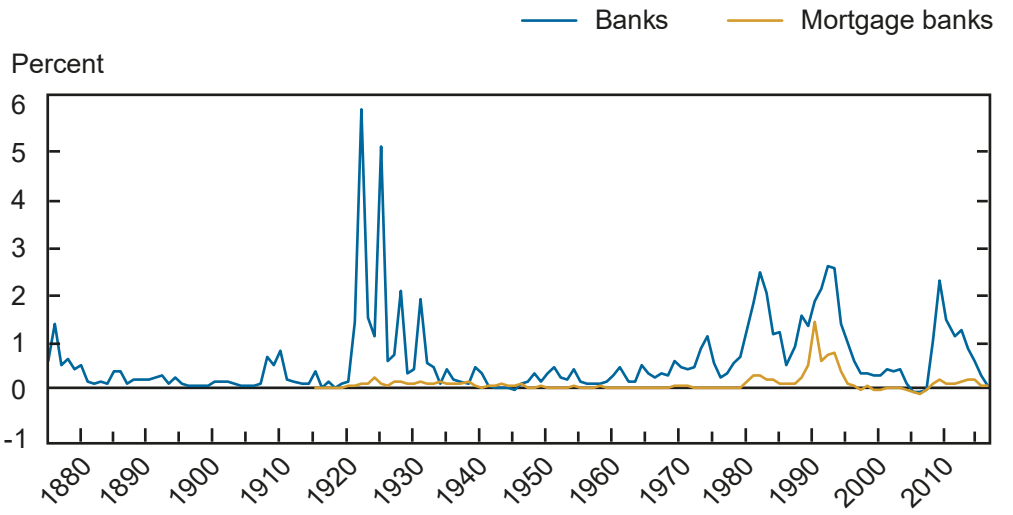
3 The updated LTV is estimated based on an automated valuation of the property, taking into account price appreciation or depreciation in the local geographic area. Homeowners with an updated LTV exceeding 80 percent face some restrictions on taking out an interest-only mortgage. Specifically, the lender must record a credit impairment charge if the borrower refinances to an interest-only loan. For this reason, some lenders will require the homeowner to refinance to an amortizing loan, even if the old mortgage is interest-only.

4 One reason for this volatility is the pegging of the Danish currency to that of Germany and, subsequently, the euro zone. As a result, for the past 30 years, Danish monetary policy has focused on maintaining a fixed exchange rate rather than stabilizing the domestic economy.

5 In recent decades, Denmark has experienced negative or zero annual GDP growth in 1974-75, 1980-81, 1988, 1991, 2008, and 2009.

Chart 1

Credit Loss Rates on Danish Covered Bond Assets and Bank Loans
Loan Impairments as a Percentage of Loans and Guarantees



Note: The chart shows annual credit loss rates for mortgage banks and deposit banks.

Source: Danmarks Nationalbank.

Instead, low mortgage credit loss rates primarily reflect limits on up-front loan-to-value ratios, as well as strong creditor protections in Denmark, as in other countries with a German or Scandinavian legal tradition (Djankov, McLeish, and Shleifer, 2007). Most important among these protections, the homeowner is personally liable for her mortgage loan; thus, the lender is protected both by the value of the collateral and the payment capacity of the homeowner. Control rights are also strongly enforceable; in Denmark, a foreclosure is typically completed 6 to 9 months from the time the homeowner misses a payment. Even after a foreclosure is completed, the borrower remains liable for any debt that remains unpaid. These factors discourage mortgage delinquency and generally ensure that "loss given default"—the amount of money the bank loses when a borrower defaults—is low.

The creditor-friendliness of the Danish system in turn means that relatively more price risk is borne by the homeowner. However, this risk is offset by an extensive social safety net, including a city obligation to provide rental housing to homeowners displaced by foreclosure. In this sense, some features of the Danish mortgage system reflect broader societal choices about social insurance and the role of government. Although these choices differ between Denmark and the United States, there are a number of close parallels in mortgage funding arrangements between the two countries, as we now explain.

2. Comparing the Danish Model to the U.S. Model

Table 1 compares the key features of the Danish mortgage finance system with those of the U.S. system, focusing on secondary mortgage markets. Although nearly all Danish mortgages are

financed through covered bonds, the United States has a more heterogeneous system that makes use of a mix of three main funding sources:

1. Agency securitization, in which the resulting mortgage-backed securities have a credit guarantee from one of the housing government-sponsored enterprises (GSEs) Fannie Mae or Freddie Mac or from the government agency Ginnie Mae.

2. Non-agency securitization, in which MBS are securitized by an investment bank or other private sector firm.

3. Balance-sheet lending, in which the mortgage is kept in portfolio as a whole loan by the originator, or sometimes by another investor (for example, a large bank that purchases the loan from a correspondent lender, or a real estate investment trust). Most balance-sheet loans are owned by commercial banks and funded by a mix of deposits and advances from the FHLB system.

Of these three approaches, agency securitization is the one most similar to the Danish covered bond model. In both cases, mortgages are ultimately financed by the issuance of mortgage bonds that transfer interest rate risk and prepayment risk—but not credit risk—to capital market investors. In Denmark, credit risk is borne by the covered bond issuer, who retains ownership of the mortgages; this guarantee is credible because mortgages themselves have low credit risk and because mortgage banks are well capitalized. In the United States, a credit guarantee is provided to MBS investors by Fannie Mae, Freddie Mac, or Ginnie Mae. These guarantees are credible because Ginnie Mae is a government agency and Fannie Mae and Freddie Mac are viewed as being backed by an implicit federal government guarantee.

Like the Danish mortgage banks, Fannie Mae and Freddie Mac are specialized financial institutions focused on the mortgage market. Unlike Danish mortgage banks, however, Fannie Mae and Freddie Mac are not mortgage lenders; they operate only in the secondary mortgage market, purchasing loans from banks and other mortgage originators and assembling them into MBS pools. Thus, the intermediation chain is at least one step longer in the U.S. agency mortgage market than in Denmark.[6]

The Danish model has less in common with non-agency securitization and balance-sheet lending. Unlike the case with covered bonds or agency MBS, non-agency MBS investors are directly exposed to credit risk. Subordination and other forms of credit enhancement are used to mitigate this risk and redistribute it across investors. The non-agency MBS market is also traditionally less standardized than the agency market, with a much larger number of issuers and greater variation in security design. Non-agency securitization, while very popular in the period before the 2007-09 financial crisis, has not been a major source of mortgage funding since the crisis. Still, non-agency securitization represents the use of capital markets to fund residential mortgages, in common with the Danish model.

6 The U.S. primary mortgage market is much more fragmented than that of Denmark, encompassing thousands of individual small lenders, many of which are nonbanks. In practice, a Danish-style system in which all mortgage bonds are issued by the original lender does not seem possible under the current market structure in the United States.

In the case of balance-sheet lending, however, the lender does not make use of capital markets; instead, the mortgage is retained in the portfolio of a financial intermediary, usually a commercial bank. The marginal source of financing for such loans includes deposits and FHLB advances. This more traditional approach aligns incentives but does not allow for the transfer of any of the major types of risk associated with mortgage lending.

Table 1

Mortgage Funding in Denmark and the United States

		United States		
	Denmark	**Agency Securitization**	**Non-agency Securitization**	**Balance-Sheet Lending**
How are loans funded?	Capital markets	Capital markets	Capital markets	Deposits or FHLB advances
Capital markets instrument	Covered bonds	Agency MBS	Non-agency MBS	N.A.
Originator retains the credit risk?	Yes	No	No	Usually
Borrower can repurchase mortgage from secondary market pool?	Yes	No	No	N.A.
Who bears:				
Interest rate risk?	Investor	Investor	Investor	Bank
Prepayment risk?	Investor	Investor	Investor	Bank
Credit risk?	Mortgage bank	Fannie Mae, Freddie Mac, or U.S. government	Investor	Bank

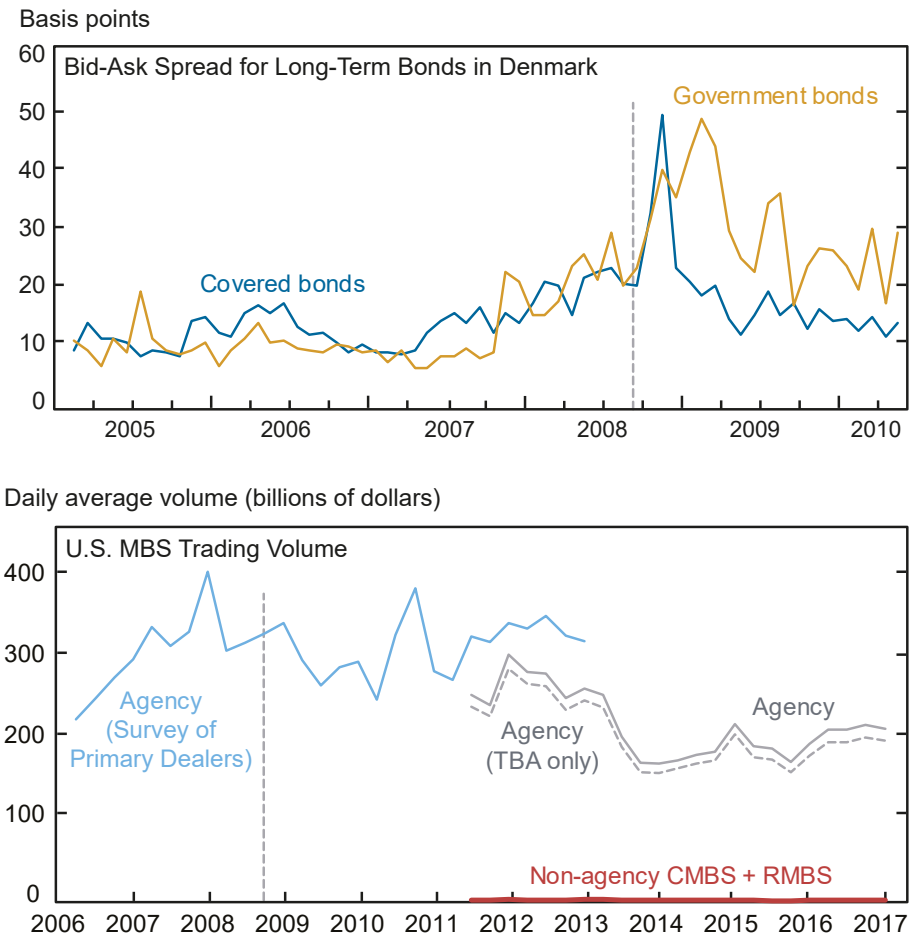
Note: FHLB is Federal Home Loan Bank; MBS is mortgage-backed securities.

2.1 Mortgage Bond Secondary Market Liquidity

As we have noted, a key feature shared by the U.S. agency MBS market and the Danish covered bond market is that mortgage bonds have little or no credit risk to the investor. This feature allowed both markets to remain active throughout the period of the financial crisis and afterward, as illustrated in chart 2. Although spreads on Danish mortgage bonds were elevated during the crisis, the market continued to operate and to intermediate mortgage credit. Similarly, primary market issuance and secondary market trading remained robust for agency MBS, despite the collapse in home prices and the financial distress experienced by Fannie Mae and Freddie Mac. In contrast, the U.S. non-agency MBS market was not robust during the crisis period: Issuance froze in the second half of 2007 and the market was closed as a source of funding for mortgage originators throughout the crisis period.

Chart 2

Mortgage Bond Liquidity during the Crisis



Notes: In the top panel, only bonds with an outstanding nominal amount of at least €1 billion and trades of at least kr.10 million have been included. MBS is mortgage-backed securities; TBA is to-be-announced; CMBS is commercial mortgage-backed securities; RMBS is residential mortgage-backed securities. The vertical dashed lines mark the September 15, 2008, failure of Lehman Brothers.

Sources: Nasdaq OMX; Danish Financial Supervisory Authority; Danmarks NationalBank; Securities Industry and Financial Markets Association (SIFMA). Drawn from SIFMA Trade Reporting and Compliance Engine (TRACE) data, unless otherwise noted.

In our view, the presence of a credible credit guarantee by the issuer is a key reason why both the agency MBS market and the Danish covered bond market remained relatively liquid and functioned relatively well during the crisis. The lack of credit risk on these instruments greatly reduces the adverse selection that arises from asymmetric information about mortgage credit risk, a factor that likely contributed to the freeze in non-agency MBS issuance in 2007. The credit guarantee also helps standardize mortgage bonds and is an important factor underlying the operation of the to-be-announced (TBA) market in the United States, where most secondary market trading of U.S. agency MBS occurs (Vickery and Wright, 2013).

2.2 Mortgage Contract Design

A comparison of mortgage contract design and other aspects of primary mortgage markets is presented in table 2. As Green and Wachter (2005) and others have observed, a notable implication of the U.S. and Danish capital-markets-centric mortgage systems is that in both countries, mortgage intermediaries are willing to originate long-term fixed-rate mortgages (with a fixed rate for as long as 30 years) and to offer borrowers the option to freely prepay such mortgages at par.

Long-term, prepayable FRMs are not generally available outside of Denmark and the United States (Green and Wachter, 2005; Campbell, 2013). This distinction is likely owing, at least in part, to the duration mismatch between these instruments and deposit finance and other shorter-duration liabilities that are the usual sources of bank funding. Capital markets funding allows the interest rate risk and prepayment risk of FRMs to be shared with other types of fixed-income investors that have lower leverage, long investment horizons, or a less concentrated exposure to mortgages (for example, pension funds, life insurance companies, sovereign wealth funds, and other asset managers). Fuster and Vickery (2015) present empirical evidence that the availability of liquid securitization markets facilitates the availability of long-term, prepayable fixed-rate mortgages in the United States.[7]

In both countries, mortgages with variable interest rates are also available. In the United States, the most popular such mortgages are hybrid adjustable-rate mortgages (ARMs), where the rate is fixed for an initial time period (for example, 5 years) and then becomes a floating rate that adjusts periodically based on movements in market interest rates. In Denmark, as we noted in section 1, adjustable-rate mortgages consist of a number of equally spaced, shorter fixed-rate periods (usually either 3 years or 5 years), between which the interest rate resets.

2.3 Prepayment and Refinancing

Although the United States and Denmark both rely heavily on long-term FRMs, some significant differences exist between the two countries in borrowers' ability to easily refinance or repurchase their mortgages. Notably, although both countries allow mortgages to be prepaid freely at par, the United States, unlike Denmark, does not allow homeowners to redeem their mortgages at the current market price by purchasing mortgage bonds and surrendering them to the lender (as described in section 1.3). Furthermore, mortgages in the United States are usually not assumable, meaning that a homeowner cannot "sell" her mortgage to a buyer as part of a property sale.[8] In Denmark, however, mortgages can uniformly be assumed as part of a property sale (on approval of the lender), and the practice is common.

7 Fuster and Vickery (2015) find that the share of FRMs is significantly lower when mortgages are difficult to securitize. Shocks to MBS liquidity and cutoff rules governing which loans are eligible for agency purchase are found to be sources of variation in the ease of securitization.

8 In general, conventional U.S. mortgages have a due-on-sale clause and are not assumable except in the case of the borrower's death. FHA and Veterans Administration (VA) mortgages may be assumed, subject to lender approval (see, for example, Guttentag [2010] for more details).

Table 2

Primary Mortgage Markets in Denmark and the United States

	Denmark United States	United States
Mortgage contract design	Yes	Yes
Long-term fixed-rate mortgages available?		
Maximum fixed-rate term?	30 years	30 years
Mortgages prepayable on demand?	Yes	Yes
Mortgage is assumable in a property sale?	Yes	Usually not
Refinancing requires underwriting?	Not with same lender	Usually
Other mortgage types available?	ARMs, floating-rate, capped floating-rate	Hybrid ARMs, reverse mortgages, HELOCs
Default and underwriting standards		
Recourse in case of default?	Full	Limited
Maximum first-lien mortgage loan-to-value?	80%	97-100%
Role of government		
Government provides mortgage insurance?	No	Yes
Mortgage interest is tax deductible?	Yes	Yes
Market size and structure		
Mortgage debt outstanding (billions of dollars)	470	10,600
Concentration: market share of four largest mortgage lenders	100%	18%

Note: ARM is adjustable-rate mortgage; HELOC is home equity line of credit.

Sources: Data sources for market size and structure: Federal Reserve Board, Financial Accounts of the United States; Bloomberg L.P.; Home Mortgage Disclosure Act data.

As we have detailed, an implication of these features is that, in a rising rate environment,

U.S. fixed-rate mortgage borrowers may find themselves locked into a loan with an interest rate below current market rates. Such borrowers would have a disincentive to sell their home and move, even if their current dwelling no longer best fit their economic circumstances. Borrowers also have a disincentive to refinance to a mortgage with different contract features or a higher principal balance because doing so would require them to prepay their below-market-rate loan and take out a new loan at the higher current rate.

In addition, refinancing an existing mortgage at par has historically been a more streamlined process in Denmark than in the United States. As noted in section 1.3, refinancing with the same mortgage bank in Denmark does not require a new credit check, proof of employment, or home appraisal, and homeowners can still freely refinance even if their home value has fallen and they have little or no remaining equity. A similar structure in the United States would likely have helped stabilize economic conditions during the Great Recession, when falling home prices and tighter underwriting standards meant that many borrowers could not refinance to take advantage of lower interest rates. Beraja et al. (2017) find evidence that these refinancing frictions blunted

the transmission of lower interest rates to the real economy in regions hardest hit by the housing market decline. The Home Affordable Refinancing Program (HARP) was eventually introduced to facilitate refinancing for borrowers with little or no remaining home equity. Researchers have found that HARP significantly increased mortgage refinancing, leading to higher consumption of durable goods and reduced foreclosure rates (Agarwal et al., 2017).

Although HARP is scheduled to expire at the end of 2018, permanent post-crisis changes in refinancing rules should bring the U.S. system significantly closer to Denmark's in facilitating mortgage refinancing during periods of falling home prices. Specifically, Fannie Mae and Freddie Mac have announced that starting in late 2018 they will introduce permanent streamlined refinancing programs that will allow borrowers with high LTVs as a result of falling property prices to refinance using an automated appraisal and with no minimum credit score (Federal Housing Financing Agency, 2017; Freddie Mac, 2017).[9] Some restrictions apply regarding the types of borrowers who will be able to participate.[10] Prior research has noted that limited competition and other frictions reduced the effectiveness of the HARP program to some extent (Agarwal et al., 2017; Amromin and Kearns, 2014). It will be interesting to assess the new streamlined refinancing programs in the wake of any future regional or national housing market downturns to confirm their effectiveness.

2.4 Other Features of Primary Mortgage Markets

Table 2 also highlights several starker differences between the two countries in the structure of primary mortgage markets. As we have noted, Danish mortgage contracts are very creditor-friendly and foreclosure is quick; this is not generally the case in the United States, although creditor rights vary significantly from state to state (Ghent and Kudlyak, 2011). The U.S. mortgage market is much less concentrated, encompassing several thousand originators (compared with only four in Denmark), and it features competition between banks and nonbanks, with nonbanks currently originating about half of new loans. This dynamic of competition between banks and nonbanks may be one reason that U.S. lending standards have fluctuated over time. The United States is also, of course, a much larger market, given its greater population.

3. What Can the United States Learn from the Danish Experience?

The Danish experience offers a number of lessons that may be of interest for U.S. policymakers in considering the path of housing finance reform. We summarize these lessons below.

A capital-markets-centric system doesn't necessarily imply instability. Criticism of the U.S. mortgage finance system often focuses on securitization and the system's reliance on capital markets. But Denmark's experience suggests that a stable and robust mortgage finance system *is* possible even with a capital-markets-centric funding model and without requiring a large role for government.

9 The FHA and VA already offer streamlined refinancing programs that waive the requirement for an appraisal and require less verification of income, assets, or credit when refinancing to a lower interest rate.

10 For example, the homeowner must be performing on her existing mortgage and have no recent delinquencies, the loan must be at least 15 months old, and the LTV must exceed a minimum threshold (95 percent for a single-family owner-occupied home). HARP loans are also ineligible. See Freddie Mac (2017) for more details.

Returning to a bank-deposit-based funding model isn't necessary to achieve stability for the U.S. mortgage finance system. In our view, a significant reduction in systemic risk is possible when capital markets are used to broaden the mortgage investor base and diversify the market risk of long-term fixed-rate mortgages.[11]

Mortgage intermediaries should be well-capitalized. Danish mortgage banks remained solvent throughout the financial crisis in part because they retain relatively little risk (credit risk is low, and Danish mortgage banks transfer essentially all market risk to investors under the balance principle). But Danish banks are also well-capitalized, with a risk-based capital ratio that has not fallen below 10 percent since 2001, and a leverage ratio of about 5 percent (see chart 3). In contrast, Fannie Mae and Freddie Mac retained large portfolios of mortgage assets prior to their conservatorships and held only a thin layer of capital for the mortgages they guaranteed (the required capital ratio for securitized agency mortgages was only 0.45 percent).[12] In any future reform of mortgage finance, limiting the role of implicit government guarantees in the mortgage finance system will only be possible if systemically important private sector mortgage intermediaries are financed with sufficient capital relative to their risks.

Mortgage system design can help facilitate more efficient refinancing. As we have noted, the Danish system includes features that help facilitate efficient mortgage prepayment and refinancing.[13] Danish homeowners are able to repurchase their mortgage out of a covered bond at the prevailing market price and to transfer a mortgage as part of a property sale. These features reduce mortgage lock-in effects during rising rate environments. Danish lenders also offer streamlined refinancing to homeowners even if home prices have fallen and the borrower's equity has declined or disappeared.

The centralized structure of the U.S. agency MBS market may offer opportunities to introduce these features in some form or to introduce other changes that could improve the efficiency of mortgage refinancing and facilitate interest-rate pass-through.[14] Indeed, the permanent high-

11 The savings and loan crisis of the 1980s is a case study of the problems that can arise from funding long-term fixed-rate mortgages using bank deposits. See Kane (1989) and Barth (1991) for a detailed discussion of the crisis.

12 Significant progress has been made since the financial crisis to reduce the risk footprint of the GSEs, for example by shrinking the size of the two firms' retained portfolios of mortgage assets and by using credit risk transfer instruments to hedge mortgage credit risk (see Finkelstein, Strzodka, and Vickery [2018], in this volume, for an overview of the credit risk transfer programs). However, the two GSEs today operate with essentially no equity capital and thus are entirely reliant on government support to cover any losses.

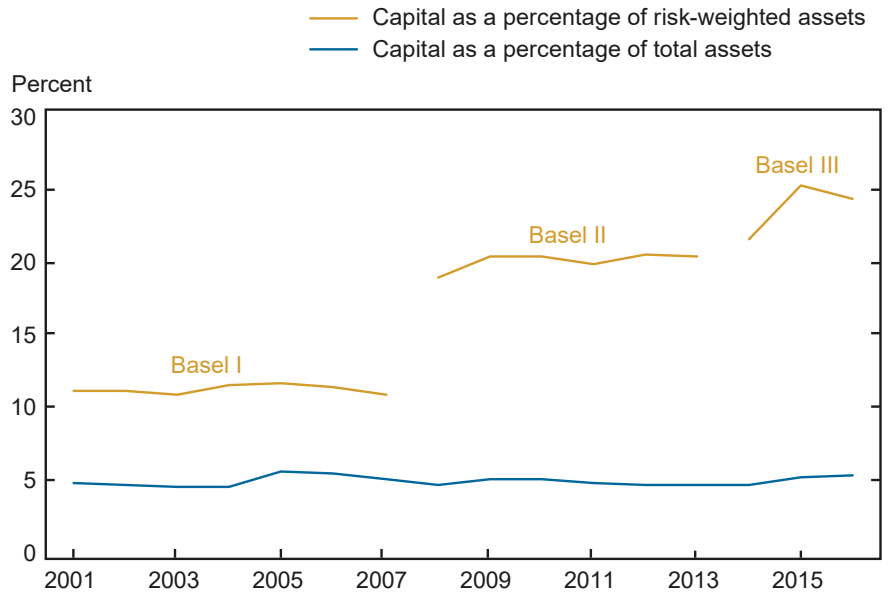
13 It should be noted that such features are not a free lunch, in the sense that facilitating easier refinancing ex post will be "priced in" by MBS investors and therefore affect mortgage interest rates at origination. However, reducing these frictions would likely reduce distortions in other economic decisions (for example, decisions to move by otherwise locked-in borrowers) and could enhance the pass-through of monetary policy.

14 For instance, Eberly and Krishnamurthy (2014) propose an "automatic stabilizer" mortgage that would convert into a lower adjustable interest rate during housing downturns. The GSEs could require that agency-eligible fixed-rate mortgages contain such a feature. More ambitious proposals to reduce refinancing frictions and transaction costs include fixed-rate mortgages with a "ratchet" feature, under which the interest rate adjusts downward automatically if market interest rates fall (Kalotay, 2015). This type of automatic refinancing mortgage would address the fact that many mortgage borrowers do not refinance optimally, as shown by Keys, Pope, and Pope (2016) in the case of the United States, and by Andersen et al. (2017) for Denmark. These issues were discussed in detail in a 2015 conference on "Mortgage Contract Design: Implications for Households, Monetary Policy, and Financial Stability" held at the Federal Reserve Bank of New York. The conference agenda and presentation slides are available at https:// www.newyorkfed.org/research/conference/2015/mortgage_design.html.

LTV refinancing programs being implemented by Fannie Mae and Freddie Mac are a step in this direction. Changes in ex ante mortgage design reduce the need for ex post government programs during periods of stress; such programs are difficult to design and scale up "on the fly" and take time to be implemented.

Chart 3

Capitalization of Danish Mortgage Credit Institutions, 2001-16



Notes: The chart is based on Basel I regulation 2001-07, Basel II regulation 2008-13, and Basel III regulation 2014-. Basel standards are transformed into European regulation and directives (CRR/CRD). Data are reported by institutions at a consolidated level.

Source: Firm filings to the Danish Financial Supervisory Authority.

Credit guarantees on mortgage bonds support market functioning. The Danish covered bond market continued to operate and to intermediate mortgage credit during the 2007-09 financial crisis period, an outcome similar to that seen in the agency MBS market in the United States but unlike that in the U.S. non-agency market, which froze in 2007. The presence of a credible credit guarantee on the mortgage bonds was a key feature supporting market functioning in both the agency MBS and Danish covered bond markets during this period. This guarantee reduced adverse selection stemming from asymmetric information about mortgage credit risk (a factor that likely contributed to the freeze in non-agency MBS issuance in 2007) and helped standardize mortgage bonds, thereby supporting the operation of the TBA market in the United States, where most secondary market MBS trading occurs (Vickery and Wright, 2013). In short, both the Danish and the U.S. experience suggest that a credible credit guarantee on mortgage bonds helps stabilize the supply of mortgage finance over the cycle and supports secondary market liquidity.

Government can play a smaller role. Government plays a much smaller role in the Danish mortgage finance system than in the U.S. system. For instance, Denmark does not have government mortgage

insurance programs or hybrid private-public mortgage entities like the GSEs in the United States. This fact is particularly striking given that Denmark overall has a larger public sector and a greater role for government in economic life. Entanglements between the private and public sectors played a significant role in the instability of the U.S. mortgage market leading up to and during the financial crisis. For example, implicit government guarantees of the liabilities of Fannie Mae and Freddie Mac allowed the two firms to issue debt more cheaply than other private firms, fueling the growth in the GSEs' balance sheets and exacerbating their exposure to the housing downturn (Passmore, 2005; Frame et al., 2015).

Given the size and systemic importance of housing and mortgage markets, the government is always likely to bear some tail risk exposure to the mortgage finance system. Even so, the Danish example shows that a system similar to the U.S. agency MBS market can operate with a significantly smaller role for government than is the case in the United States. A range of GSE reform proposals include ways to reduce the role of government in mortgage finance. For example, the credit risk transfer programs introduced by the GSEs provide a mechanism to shift mortgage credit risk to the private sector.

The five discussion points highlighted above focus on secondary mortgage markets and funding arrangements, the areas where the Danish and U.S. mortgage systems are most similar. Other features of the mortgage markets differ more starkly, in part owing to broader differences in the design of social insurance and the role of government in the two countries. Denmark has a more extensive social safety net than the United States, although debt markets in the United States have more "insurance-like" features that allow non-repayment in response to negative shocks, through personal bankruptcy law and limits on mortgage recourse.[15] An evaluation of the broader trade-offs between these and other forms of private and social insurance is beyond the scope of this article, but the topic is studied in the public economics literature (for example, Hsu, Matsa, and Meltzer, 2017; White, 2007; Brown and Finkelstein, 2008).

4. Conclusion

We have highlighted a number of similarities between the U.S. and Danish mortgage finance systems and offered a number of potential lessons from the Danish experience that may be of interest for U.S. policymakers in charting the course of mortgage finance reform. The Danish example shows that a capital-markets-centric model of mortgage finance does not necessarily imply structural instability or require a large role for government. The Danish model also offers a number of design features that could mitigate refinancing frictions and facilitate monetary policy transmission through the mortgage market during housing downturns.

15 Bankruptcy and limits on recourse for secured debt represent implicit forms of insurance because they provide options for some borrowers to repay less than the outstanding face value of their debt in situations where they have experienced negative shocks to their net wealth. See Livshits, MacGee, and Tertilt (2007), Gross and Notowidigdo (2011), and Feibelman (2005) for further discussion and evidence on the role of bankruptcy as a form of social insurance.

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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 john.c.huggins@hud.gov.

Using Heatmaps to Explore Capital Bikeshare Data

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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 State of Maryland.

Capital Bikeshare is the major bikeshare system for the Washington, D.C. area. The network has more than 4,300 bicycles that serve commuters, tourists, and others who are interested in using a bicycle to travel. In 2017, more than 3.7 million trips were made using the Capital Bikeshare service. With so many observations (trips), the best visualizations are necessary to explore and make sense of the data. In this article, I demonstrate how to use heatmaps to get an overview of the data.

A heatmap is a shaded matrix that displays values via a graduated color scheme. The greater the number of observations binned into each category in the matrix, the greater the display color. By binning the data, some precision is lost but clarity may be made of a large dataset.[1] The heatmap is a visualization that may show clusters or dispersion in the data. Results from exploratory analysis and visualization can answer basic questions about the data or provide insight how to further examine the data.

The heatmaps look at a specific subgroup of riders. To make the heatmaps, I looked at only trips taken by annual members that were less than 30 minutes and did not return to the station that the trip originated from—these are trips that were free except for the cost of the annual membership.[2]

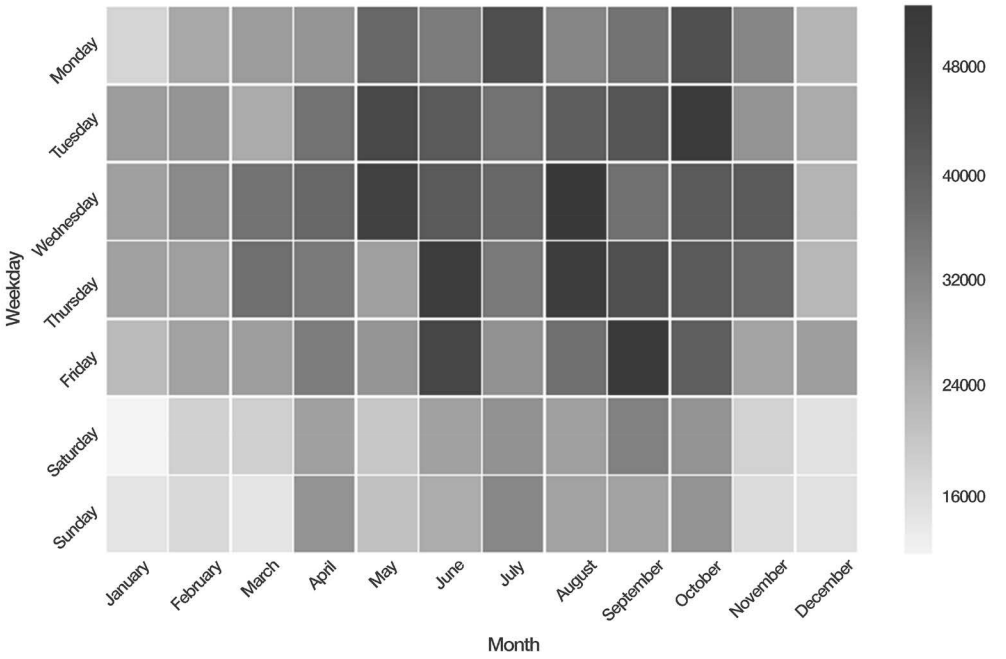
1 An example of a record in the dataset might be that a ride started at 14:23:32 on April 24, 2017, and ended at 14:41:22 on April 24, 2017. Data were re-attributed based on the start time. This example ride would be re-attributed to have occurred during the 2:00 p.m. hour on a Monday in April.

2 Annual members incur time-based costs after 30 minutes: https://www.capitalbikeshare.com/pricing.

The first heatmap categorizes the data into months and days of the week, then displays the counts for each day of the week for each month. Some of the immediately noticeable trends in the data included fewer trips during the winter months and during the weekend. Although the warmer months generally had greater trip counts, fewer trips occurred during July, potentially due to the weather being too warm. During the work week in January, Monday had the fewest trips.

Exhibit 1

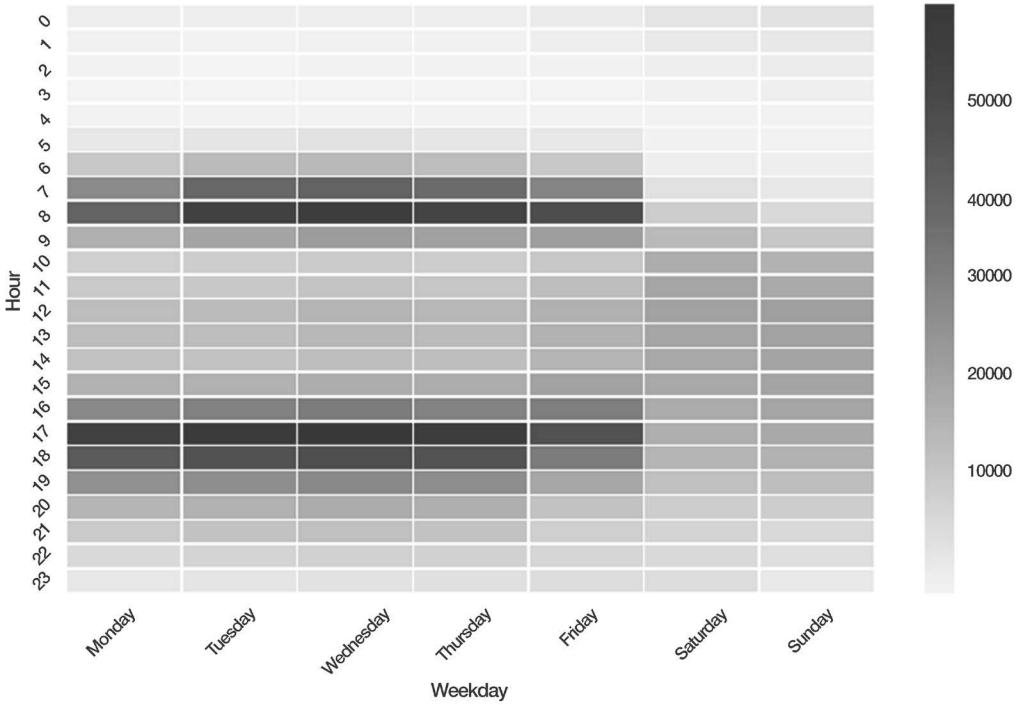
Month by Day of the Week



The heatmap in exhibit 2 explores the number of trips by day of the week and hour of the day. The first and most obvious trend is that ride counts cluster during commuter hours. Compared to the rest of the traditional work week, fewer trips on Friday evenings and during 7:00 p.m. occur. No obvious peak commute times appear during the weekend and instead, the number of trips increases gradually during the day. The weekend days also show more trips between 12:00 a.m. and 3:00 a.m. compared to the work week, and the relative quiet time for the system appears later in the morning.

Exhibit 2

Day of the Week by Hour



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