Is America's Housing Affordability Problem a Housing Problem?*

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Abstract

We document what fraction of the housing stock in US cities is affordable to different family types. Rather than looking at what fraction of their income people *actually* pay in rent in each city, we look at the extent to which the housing stock is affordable using discrete housing expenditure share cutoffs and the distribution of rents. We find that housing affordability is largely a problem for single-parent families and, to a lesser extent, single-person households. Several of the least affordable cities by our metrics are not glamour cities in the US Northeast, California, or South Florida but rather cities with both low incomes and low rents. Finally, we show how overcrowding in many high-cost cities leads to an understatement of the extent of affordability problems if affordability is measured using the actual share of income paid toward rent.

JEL: I31, R21, R31

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1 Introduction

While there are many different definitions of housing affordability, it is common to consider housing affordability for renters based on the fraction of their incomes going toward rent. Rent burdened is often defined as 30% or more of gross income going toward rent while a severely rent burdened household is usually defined as one that spends more than 50% of its gross income on housing.[1] Because low-income households spend a much larger fraction of their incomes on rent (see Figure 1), and most low-income households are renter households, it is much more common for low-income households to be rent burdened.[2]

Rental affordability thus reflects both demand and supply with the share of gross income going toward rent being the equilibrium. The demand side is the ability and willingness of households to pay rent. The supply side reflects the cost of constructing units and can be influenced by local policy, raw materials prices, and the natural geography of an area. Housing affordability can thus be seen as a numerator or denominator problem – rent is too high (the numerator) or household income is too low (the denominator). Figure 2 reveals that the numerator has been rising while the denominator has experienced little growth for renter households over the last five decades.

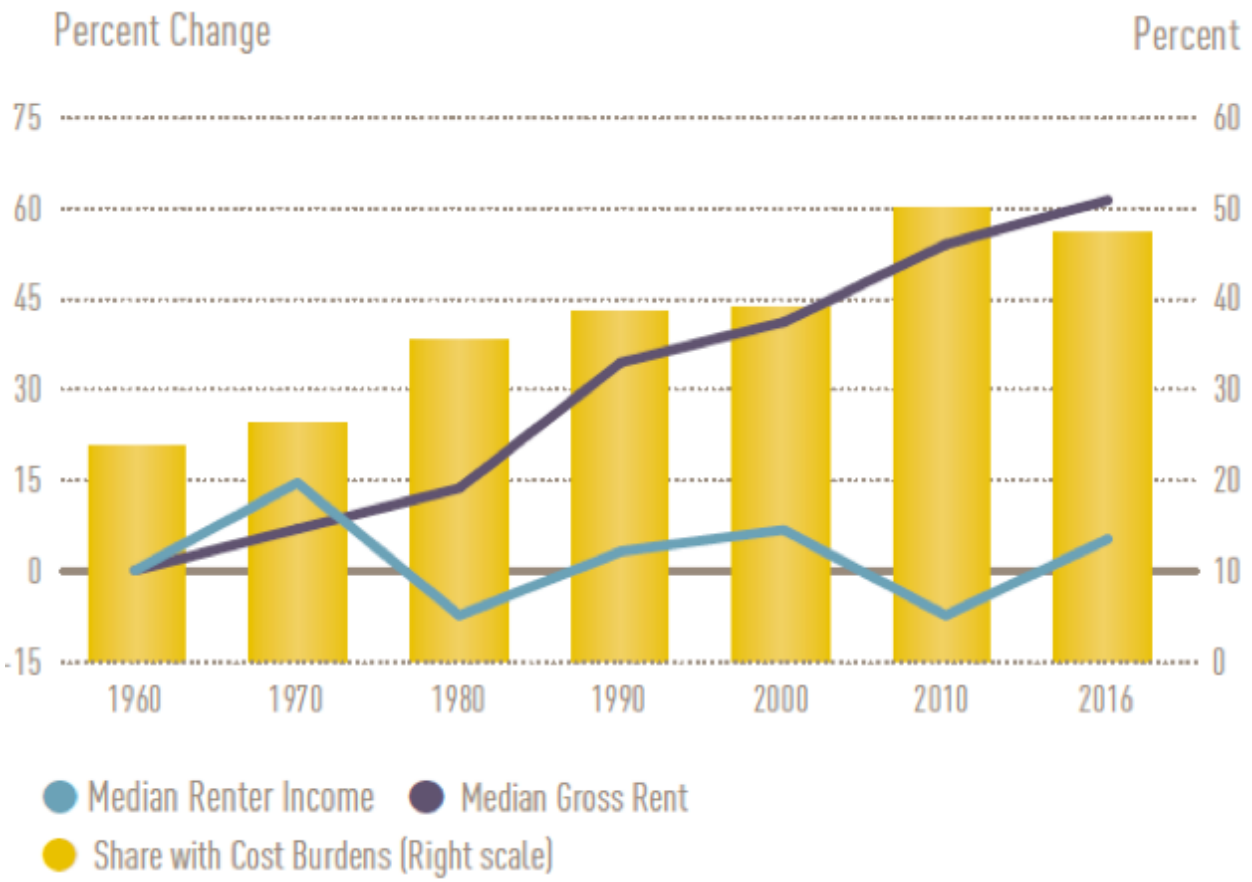
While there is no formal economic theory underlying the commonly used 30% and 50% thresholds for rent burden, Figure 1 suggests that renters' housing choices may be the product of utility maximization subject to subsistence concerns, similar to what Jensen and Miller (2008) find for dietary staples. Since the cost of non-housing consumption goods does not vary substantially across US cities (Handbury and Weinstein, 2015), and lower income consumers spend a larger share of their income on food, the 30% and 50% thresholds might be a shorthand for stating that subsistence concerns over food and housing characterize the utility functions of many renters.

[1] See, for example, U.S. Department of Housing and Urban Development (2014), Larrimore and Schuetz (2017), Favilukis, Mabille, and Van Nieuwerburgh (2019), and Schwartz (2021). 30% is also the threshold used for the Section 8 Voucher program.

[2] Figure 1 is consistent with a large number of studies that find that a 1% increase in income results in a much less than 1% increase in housing expenditure. See, for example, Rosen (1979), Glaeser, Kahn, and Rappaport (2008), and Rosenthal (2014).

Figure 1: Lower Income Renters Spend More on Rent
Source: Authors' calculations based on 2018 5-Year ACS Public-Use Microeconomic Sample. Green and Malpezzi (2003) present a similar graph based on earlier data.

Figure 2: A Growing Share of Renters are Cost-burdened
Source: Joint Center for Housing Studies of Harvard University (2018). A renter is cost-burdened if it spends 30% or more of its gross income on rent.



We adopt the subsistence approach in this paper by considering that different size households require a different minimum number of bedrooms. Rather than looking at how much households actually spend on rent to assess whether a household is rent burdened, we look at the share of housing units in an MSA that would be available to households of a given type and income level within an MSA under the 30% threshold. Even if *some* units are affordable to low-income households within a city, housing affordability can be a problem if not enough low-cost units are located near low-income renters within a city and households face high intraurban mobility costs.

We find that housing affordability differs dramatically by household type. In every US city in our sample, at least 50% of housing units are affordable to two-parent households at the median income. Even for two-parent households at the 30th percentile of the income distribution, more than half of rental units are affordable in the vast majority of cities. Only in coastal California do we see two-parent households facing serious affordability problems. In contrast, for single parents at the median income, the majority of the housing stock is affordable in only a handful of cities. For single parents at the 30th percentile of the income distribution, less than 10% of the housing stock is affordable in most US cities.

Our analysis reveals a surprising set of cities that are unaffordable. Of the ten least affordable cities for single parents, only one is in California and only two are in the Northeast. In all of these cities, the median rent on a two-bedroom home is less than $1,000 per month. Rather than housing costs being particularly high in these cities, incomes are often quite low.

However, our analysis also shows how standard affordability metrics based on the share of income actually paid toward rent understate the housing affordability problem in some high-cost parts of the country. In particular, we find that in Southern California and the New York City metro area, households manage to appear less rent-burdened by renting units with fewer bedrooms than our adequacy measures stipulate, e.g., three people in a studio apartment. In addition to increasing the spread of disease, overcrowding leads to worse educational outcomes for children (Goux and Maurin, 2005) illustrating some of the broader ramifications of lack of affordable housing.

The next section details the data we use and our methodology. We present and discuss our findings in Section 3.

2 Data and Methodology

2.1 Data

2.1.1 IPUMS

We use data on the subset of households in the 2014-2018 IPUMS USA 5% survey residing in a metropolitan statistical area (MSA). An MSA is loosely defined by the U.S. Office of Management and Budget (OMB) as a geographic area having "at least one urbanized core of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by community ties" (Nussle, 2008). The 2014-2018 IPUMS data uses the 2013 definition of MSAs as defined by the OMB. Our definition of an MSA is distinct from a Core-Based Statistical Area (CBSA), which is either multiple MSAs combined or an MSA combined with a micropolitan statistical area, and excludes micropolitan statistical areas. The IPUMS data offers a granular view of the cross-section of American households at any given year, sampling 1% of all households across the country. We use the pooled samples from 2013-2018 to gain greater accuracy of our estimates for small geogaphies. Each household in the sample has a separate entry for each person in the household, including children.

The IPUMS data provide household-level information such as geographical location, the total annual income, whether the dwelling is rented or owned, the annual gross rental rate of all dwellings in the rental stock, the number of bedrooms in each dwelling, and the composition of each household. We identify the number of non-adult children in each household as children of the head of household that are less than 18 years of age.

The final dataset contains records on 6,178,231 households and 15,091,263 persons across 260 MSAs.

2.1.2 Violent Crime Data

The 2018 IPUMS sample for Los Angeles County is augmented with PUMA-level violent crime data to assist in the estimation of the marginal willingness to pay (MWTP) for an additional bedroom. We collect this data to compare the MWTP for an additional bedroom to the marginal willingness to pay for a safer neighborhood. The total number of renter households in the sample is 16,769. The geography of the violent crime data is the the PUMA-level, of which there are 69 in Los Angeles county.

Los Angeles County is serviced by a large number police departments. The Los Angeles Police Department (LAPD), Los Angeles Sheriff's Department (LASD), and the Long Beach Police Department (LBPD) together cover a large majority of the population of the county. Smaller municipalities within the county may have their own police department.

The LAPD and LASD make crime data publicly available the lat-long geography. This consists of a large geographical portion of the total area of Los Angeles county. We then aggregate the number of crimes to the PUMA-level in a spatial join.

The LBPD reports their crimes data by the reporting block level, which tends to be much smaller than a PUMA. The reporting districts crime statistics are aggregated up at the PUMA level. If a PUMA is contained in multiple reporting blocks, the crime is assumed to be uniformly distributed across space.

Finally, for the remaining geographical area covered by smaller police departments, the FBI Uniform Crime Reporting data is used. Typically these departments are located in less dense areas, so the PUMAs are larger. When the enforcement area of the police departments crosses multiple PUMAs, once again we assume the crimes are uniformly distributed across space.

Care is taken to ensure the definition of a violent crime is consistent across the multiple data sources. In total, we have data on 55,375 violent crimes that occurred in Los Angles County over the year 2017. To a quick idea of the coverage of the data, the California Department of Justice reports 59,924 violent crimes occurring in Los Angeles County in 2017. Thus, we estimate our coverage is roughly 92.3% of total number of reported violent crimes.

Figure 3: Violent Crimes per 100,000 Residents by PUMA in 2017
Source: Los Angeles Police Department, Los Angeles Sheriff's Department, Long Beach Police Department, FBI Uniform Crime Reporting Statistics.

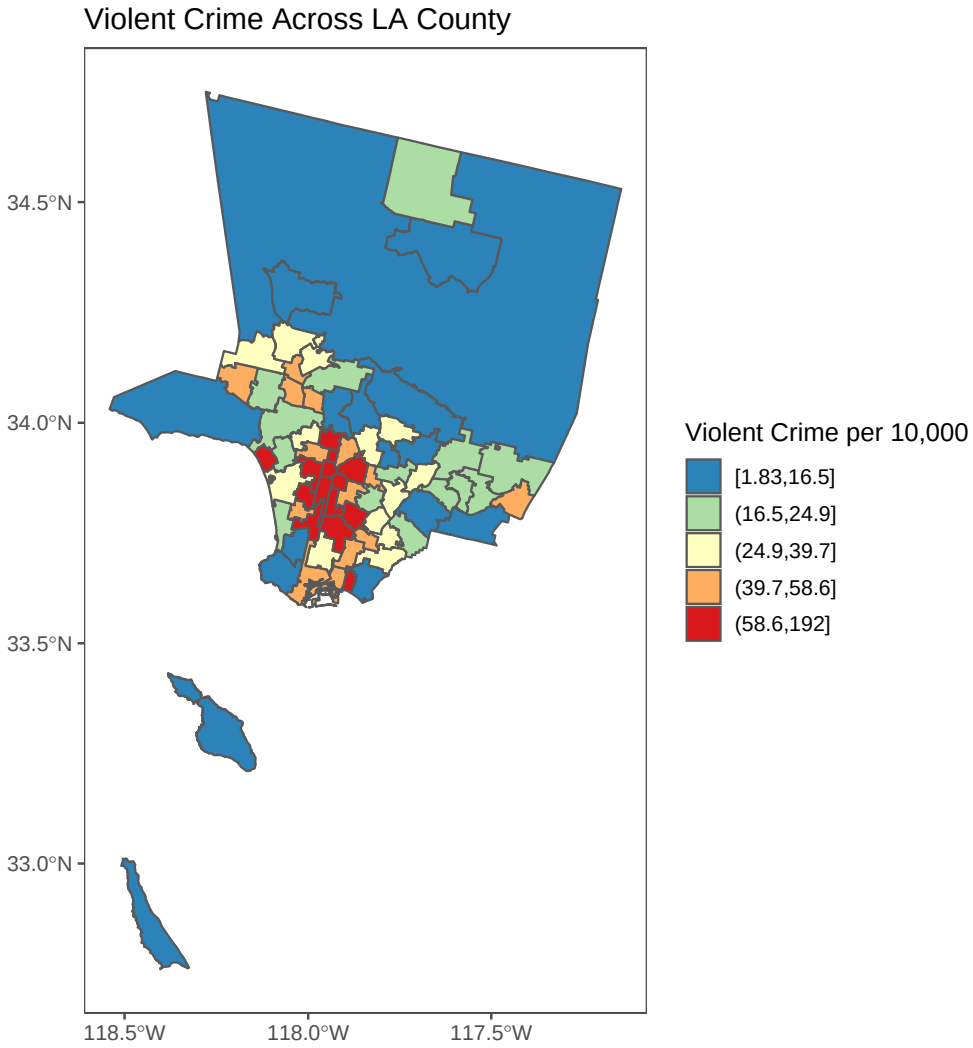


Figure 3 shows the spatial distribution of violent crime per 100,000 residents in Los Angeles. There is a clear pattern the most violent crimes occur in Downtown Los Angeles in the areas south of Downtown Los Angeles, roughly in the city center. As we move away from the city center, the violent crime rate is decreasing but not in a montonically.

2.2 Methodology

We first ask what percentage of rental units in a metropolitan area each household type can afford at varying levels of income. We focus on three household types: single parents with

one or two children, married couples with exactly two children, and single-person households with no kids. For each household type, we consider a rental unit to be affordable if the monthly gross rent is less than or equal to 30% of either the 30^{th} or 50^{th} percentile of the monthly income distribution for each given household type and MSA.

To control for the minimum quantity of housing needed for each household type we assign a certain type of rental unit to each household type. For single parents, we look at what percentage of two- and three-bedroom rentals they can afford. For married couples with two children, we look at three- and four-bedroom rentals. For single-person households, we consider studio and one-bedroom rentals.[3]

To illustrate the procedure, consider the case of single-person households in the Rocky Mount, NC MSA. First, from the sample distribution of annual household income for all single-person household in Rocky Mount, NC, we compute the 30^{th} and 50^{th} percentile of monthly household income. Next, from the sample distribution of monthly rent for *all* studio and one-bedroom homes in Rocky Mount, NC, we compute the percentage of those rental units whose monthly rent is less than or equals to 30% of the income quantiles previously computed.

We do not report any observations for which the size of the sample used to compute the affordability cutoffs is less than 30. The minimum cell size is why we include single-parent households with one or two children instead of restricting our analysis to the set with exactly two children. Our assumption is that, conditional on living in a particular MSA, the income distributions of single parents with one child and single parents with two children are not radically different from one another.

[3]We include three-bedroom rentals in the sample for single-parents with two children to increase the sample size. In the full sample of two- and three-bedroom rentals 64% are two-bedroom units. In the full sample of three- and four-bedroom rental units, 80% are three-bedroom units. In the full sample of studio and one-bedroom rentals, 82% are one-bedroom units.

To understand how our measure of affordability differs from standard affordability measures based on actual rent paid, for each household type, MSA, and income cutoff, we compute the percentage of renters making less than the income cutoff that are rent-burdened (gross monthly rent not exceeding 30% of monthly household income). While our measure of affordability looks at the supply of affordable rental units controlling for income and a minimum subsistence level of housing for each household type, this empirical measure of rent-burden only controls for income and represents real-world outcomes. We omit observations where cell size of renters making less than the income cutoff is less than 10.

By comparing our supply-side measure of affordability with the percentage of renters who are actually rent-burdened, we can learn where households are able to avoid being rent-burdened by substituting to a less-than subsistence quantity of housing. For example, if 10% of appropriate rental units are available low-income single-parent renters in a MSA, but only 30% of low-income renters are rent-burdened, it likely implies a large number of households are renting affordable units with less bedrooms than we consider to be adequate. For example, in the Los Angeles /Long Beach/ Anaheim MSA, around 25% (10%) of single-parent households with one or two children are renting a one-bedroom (studio) apartment.

2.3 Estimating the Marginal Willingness to Pay for an Additional Bedroom

In the main analysis of the paper, we take a stand on types of rental units that are appropriate for each household type based roughly on the number of bedrooms per person being close to unity. A family time living in a less than-suitable rental unit we consider to be overcrowded.

For single-parents with 1-2 children, we consider a an apartment with 2-3 bedrooms to be appropriate. In this arrangement, either each child gets their own room, or the children double-up in one room. Thus we allow for a slight departure from a 1:1 ratio of bedrooms per person to be considered appropriate.

While having enough space to suit all members of a household is intuitively important, there are other factors to be considered as well. We believe safety and access to education of

two important characteristics a single-parent would also highly value. It may be that low-income single-parents are choosing to trade-off space (as measured in bedrooms per person), to live in a safer neighborhood or a high-quality school district.

To argue for our definition of subsistence housing using bedrooms per person, we employ the methodology of (Bishop and Timmins, 2019) to (1) compare the magnitude of the MWTP for an additional bedroom to living in a safer neighborhood, and (2) to show that MWTP for an additional bedroom is highest for those with a ratio of bedrooms per person less than unity.

The model employed is the two-stage estimation of (Rosen, 1974). In the first stage, we non-parametrically estimate the hedonic rent function. And in the second-stage we connect the first-derivatives of the hedonic rent with respect to the number of bedrooms to structural demand elasticities.

While the second-stage of (Rosen, 1974) is known to have endogeneity issues [4], (Bishop and Timmins, 2019) address this concern by directly accounting for the correlation between the error-term and variable of interest in an maximum likelihood framework.

2.3.1 Hedonic Rent Function

Following (Bishop and Timmins, 2019) , the hedonic rent function,

$$R = R(Z_{i,j}, H_{i,j}, \epsilon_{i,j}; \beta_j) \tag{1}$$

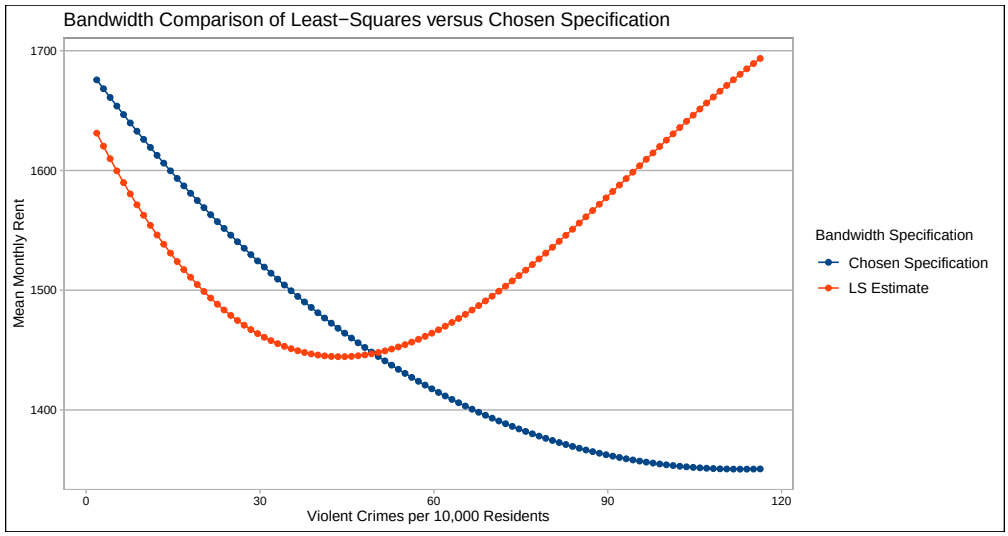
is a function of our amenity of interest ($Z_{i,j}$), other observed housing characteristics ($H_{i,j}$), an error term $\epsilon_{i,j}$, and a vector of parameters $beta_j$, where j indexes the PUMA the rental unit is in, and i indexes rental units within PUMA j.

In our analysis $Z_{i,j}$ is equal to the number of bedrooms ($br_{i,j}$), $H_{i,j}$ is a vector consisting of both the age of the structure $age_{i,j}$, and violent crime rate vc_j. And β_j includes a PUMA-level fixed-effect.

In practice, the hedonic rent function is considered to be nonparametrics in all vari-

[4] Brown and Rosen (1982), Brown (1983), Bartik (1987), Epple (1987)

Figure 4: Illustration of Bandwidth Selection Methodology.



ables besides the error term,

$$R = f(br_{i,j}, age_{i,j}, vc_j; \beta_j) + \epsilon_{i,j} \tag{2}$$

where $\epsilon_{i,j} \sim N(0, \sigma^2)$, β_j is a vector of coefficients for PUMA j.

The nonparametric function $f(\cdot)$, is a Bernstein polynomial of degree 2 in each input variable. Bernstein polynomials are used over raw polynomials due to numerical stability.

A Gaussian kernel is used to smooth the coefficients over space. The bandwidth is increased from the OLS-equivalent bandwidth to achieve better estimated of the first-derivative (Henderson and Parmeter, 2015), and a smooth conditional mean function. We follow (Bishop and Timmins, 2019) in increasing the bandwidth to ensure the conditional mean function of the MWTP for a higher violent crime rate is monotonically decreasing in the violent crime rate, and always negative.

To illustrate the choice of bandwidth figure 4 shows the mean monthly rent as a function of the violent crime rate with our chosen bandwidth, and the what the OLS estimate would imply. The OLS is U-shaped, with the most expensive rents occuring in the most violent neighborhoods, implying renters would pay a premium to be in the most violent neighborhoods. While our chosen specification shows the relationship is monotonically decreasing, and rents are highest in the safest neighborhoods.

2.4 Preferences for Housing

We assume households derive utility from the characteristic of their dwellings in addition to their consumption bundle. Preferences are shifted by observed household characteristics as well as unobserved household characteristics,

$$U = U(Z_{i,j}, H_{i,j}, \epsilon_{i,j}, C_{i,j}, X_{i,j}, \nu_{i,j}; \alpha_j), \tag{3}$$

where α_j is parameterizes the utility function and is allowed to vary by PUMA.

Households face a budget-constraint, where their spending on housing $R(\cdot; \beta_j)$, and consumption (the numeraire) must not exceed their income ($I_{i,j}$)

$$I_{i,j} \geqslant R(Z_{i,j}, H_{i,j}, \epsilon_{i,j}; \beta_j) + C_{i,j} \tag{4}$$

Assuming households are utility maximizers and marginal utility is always increasing in both housing and consumption, the budget constraint binds, and we can substitute for $C_{i,t}$ in the utility function,

$$U = U(Z_{i,j}, H_{i,j}, \epsilon_{i,j}, (I_{i,j} - R(Z_{i,j}, H_{i,j}, \epsilon_{i,j}; \beta_j)), X_{i,j}, \nu_{i,j}; \alpha_j) \tag{5}$$

Preferences are parameterized so that first-order conditions equates the MWTP for an additional bedroom gets interacted with the the size of the household,

$$\begin{aligned} U =& \alpha_{0,j} + \alpha_{1,j} Z_{i,j} + \frac{1}{2}\alpha_2 Z_{i,j}^2 + \alpha_3 X_{i,j} Z_{i,j} + \frac{1}{2}\alpha_4 X_{i,j} Z_{i,j}^2 \\ &+ \nu_{i,j} Z_{i,j} + g(H_{i,j}, \epsilon_{i,j}) + (I_{i,j} - R(Z_{i,j}, H_{i,j}, \epsilon_{i,j}; \beta_j)). \end{aligned} \tag{6}$$

Then first-order results in our estimation equation

$$R'(Z_{i,j}; \beta_j) = \alpha_{1,j} + \alpha_2 Z_{i,j} + \alpha_3 X_{i,j} + \alpha_4 Z_{i,j} X_{i,j}. \tag{7}$$

$R'(Z_{i,j}; \beta_j)$ is obtained by evaluating the first-derivative of the estimate hedonic rent

function.

Rosen (1974) would estimate Equation 7 by OLS, but as mentioned previously, the estimates would be subject to bias. (Bishop and Timmins, 2019) suggest instead performing Maximum Likliehood estimation on the error-term, $\nu_{i,j}$, which differs from the OLS likelihood by the Jacobian or "change of variable correction", $|\frac{\partial \nu_{i,j}(\alpha)}{\partial Z_{i,j}}|$,

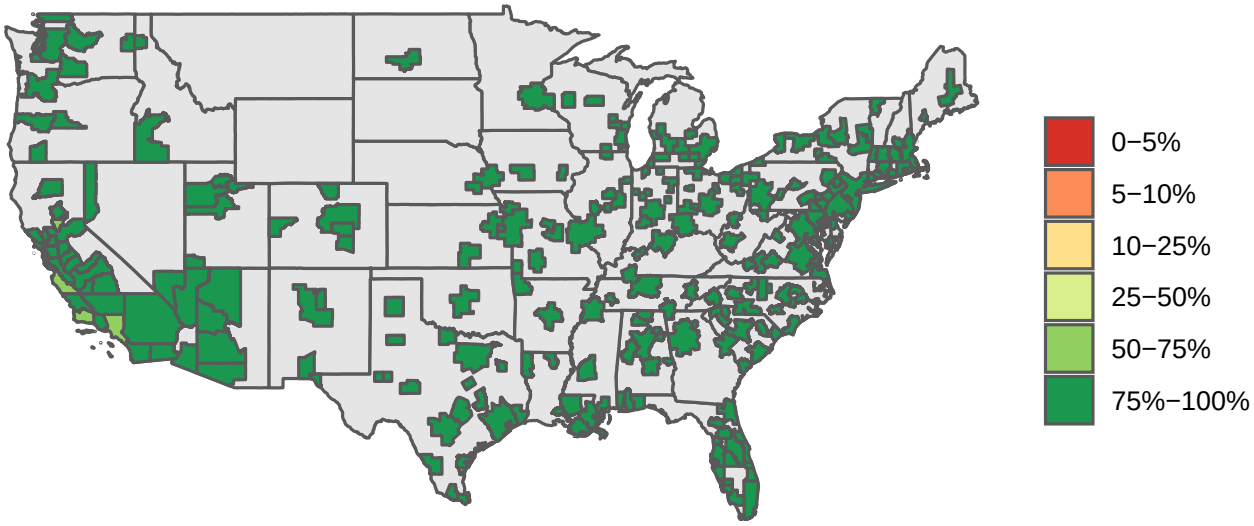
$$|\frac{\partial \nu_{i,j}(\alpha)}{\partial Z_{i,j}}| = |R''(Z_{i,j}, \hat{\beta}_j) - \alpha_2 - \alpha_4 X_{i,j}|. \tag{8}$$

3 Results

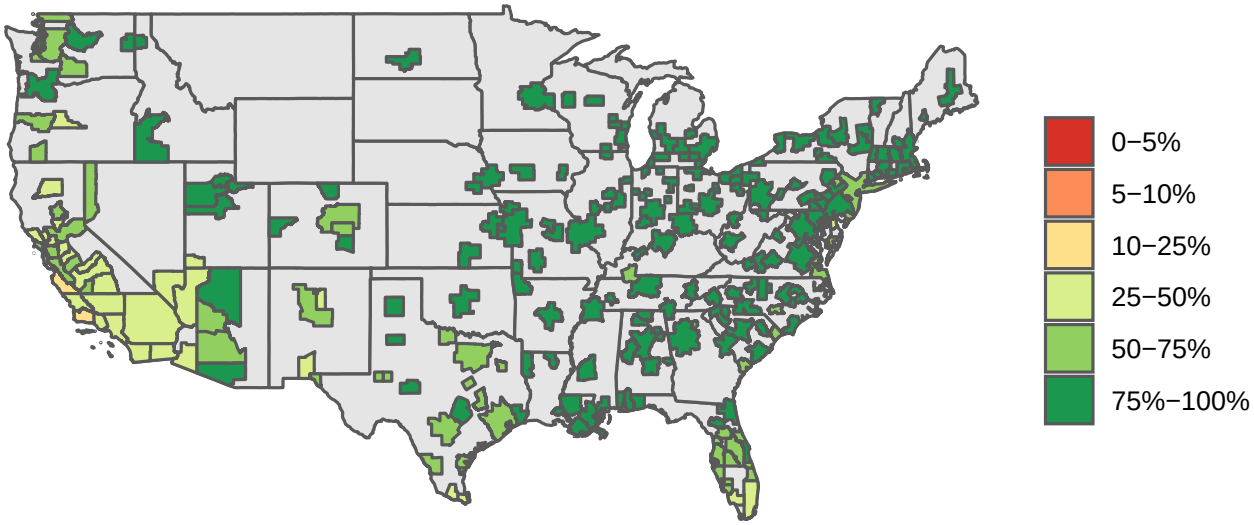
3.1 Who is Rent Burdened?

Rental affordability differs dramatically across household types. As Panel a) of Figure 5 shows, the vast majority of the housing stock in most cities is affordable to two-parent families with kids making the median income for that household type in that city. We define an appropriate rental unit for these households as one three or four bedrooms. Even two-parent households at the 30th percentile (Panel b) can afford most rental units in their city with the exception of families in some parts of Southern California.

Figure 5: Share of 3BR and 4BR Rental Units Affordable to Married Couples with 2 Children



(a) At Median Income of Household Type in the MSA



(b) At 30th Percentile of Income Distribution of Household Type in the MSA

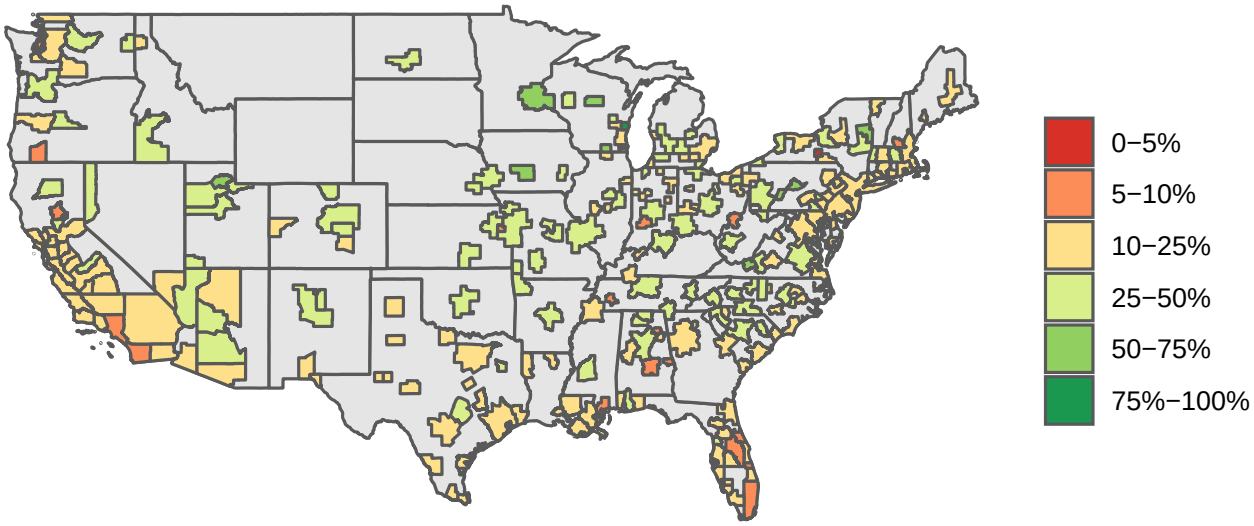
In contrast, as Figure 6 shows, less than 25% of the rental stock in most US cities is affordable to single-parent households that make the median income for that household type in that city where we again assume that adequate housing for a single parent with two kids is a rental unit with two or three bedrooms. For single-parent households at the 30th percentile of the income distribution, the situation is even more dire with less than 5% of housing units available to them.

The story for singles, shown in Figure 7, lies somewhere in between those of married couples with kids and single-parent households. For the median single (Panel a), only a few cities are truly unaffordable. When we move to singles making 30% of income for that household type, less than 25% of the housing stock is affordable in most US cities.

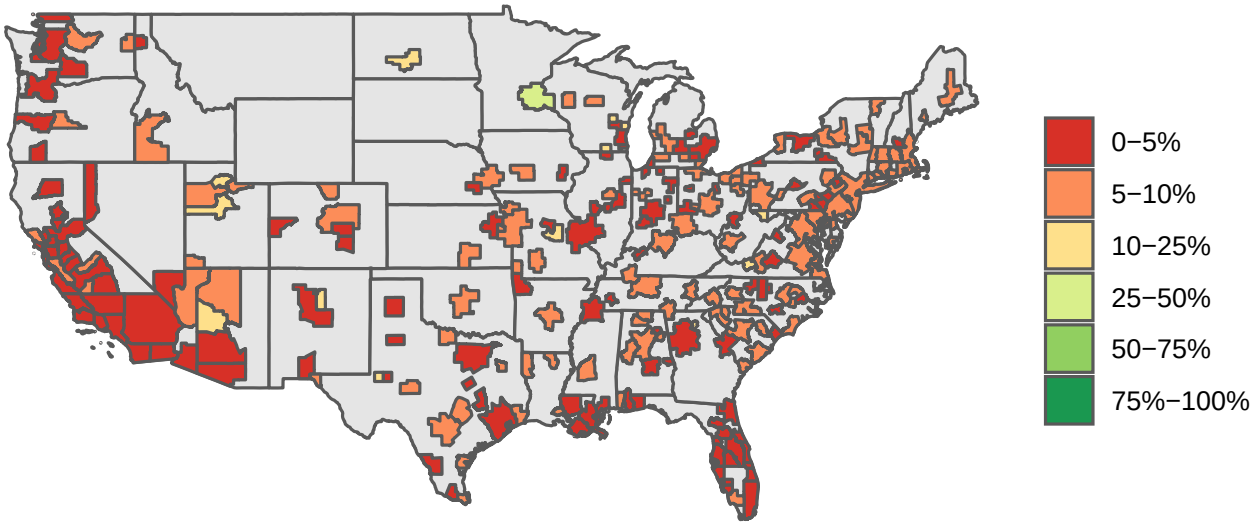
3.2 Where is Rent Affordability a Problem?

As Figures 5 through 7 illustrate, the problem of rental affordability is not limited to glamor cities like New York City, Miami, and Los Angeles. Table 1 lists the ten least affordable MSAs in our sample. Panel A lists them for single-parent households while Panel B lists them for single households. The three least affordable cities for single-parent households are Ithaca, NY, Harrisonburg, VA, and East Stroudsburg, PA. In all of the least affordable cities, single-parent households at the 30th percentile of the income distribution can afford less than two percent of two- and three-bedroom homes using the 30% of gross income housing affordability cutoff. The rents in these cities are not particularly high. The median rent for a two-bedroom home is less than $1,000 per month in eight of ten of the least affordable cities and averages just $887. However, median annual incomes average less than $30,000 per year in all but one of the ten least affordable cities. In Table 2, we rank cities by affordability for single-parent households excluding cities with less than 350,000 people. While the set of cities differs, it remains the case that only two of the ten least affordable cities, Miami-Fort Lauderdale-West Palm Beach and Los Angeles-Long Beach-Anaheim, are in parts of the country we typically think of as highly unaffordable.

Figure 6: Share of 2BR and 3BR Rental Units Affordable to Single Parents with 1 or 2 Children

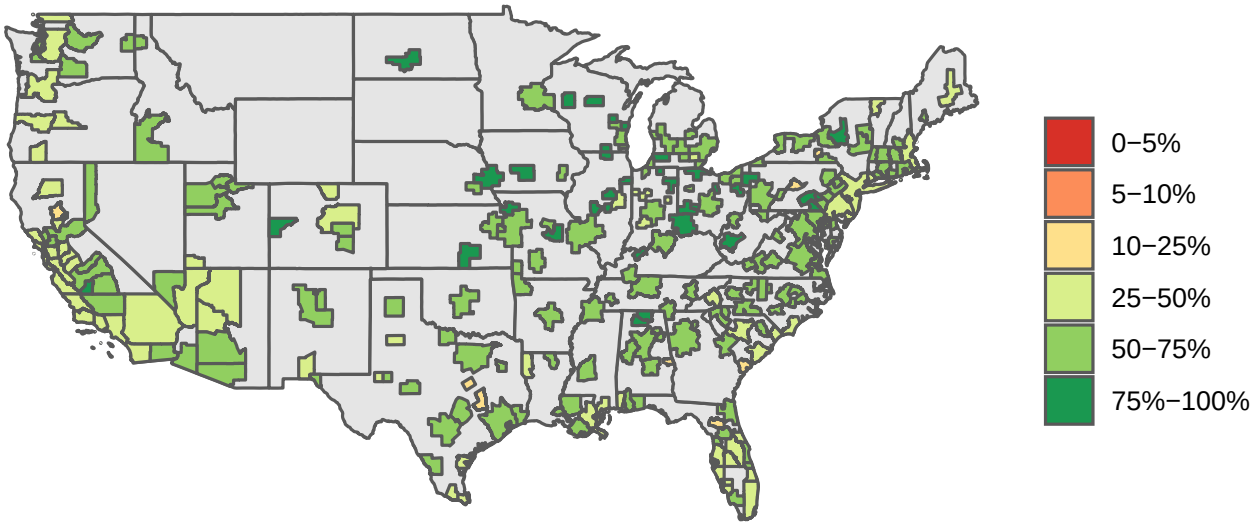


(a) At Median Income of Household Type in the MSA

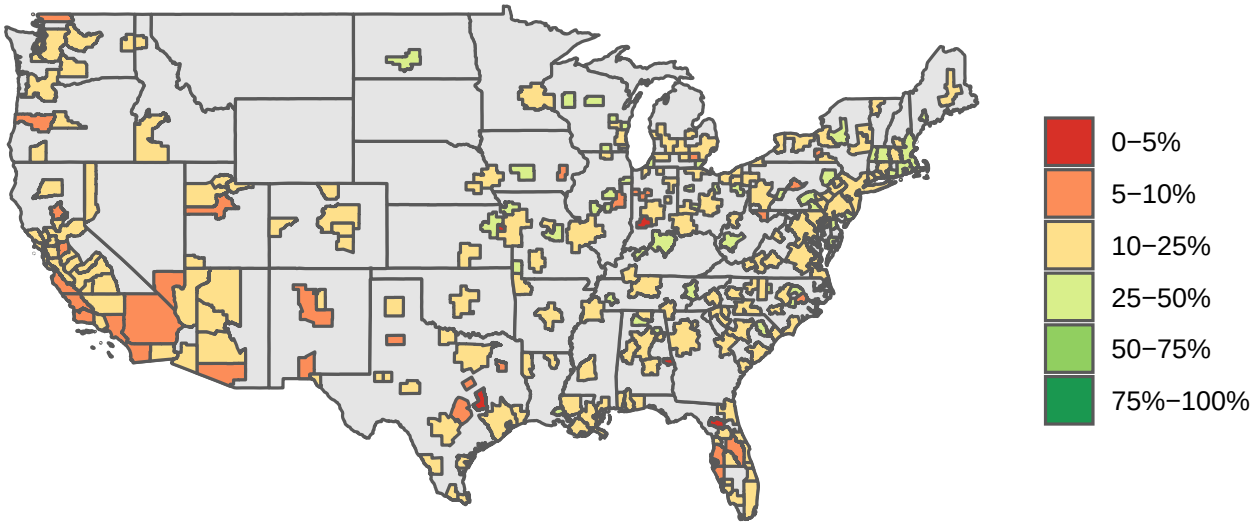


(b) At 30th Percentile of Income Distribution of Household Type in the MSA

Figure 7: Share of Studio and 1BR Rental Units Affordable to Singles Living Alone with No Kids



(a) At Median Income of Household Type in the MSA



(b) At 30th Percentile of Income Distribution of Household Type in the MSA

Table 1: Least Affordable MSAs for Renters

For the two columns under the 'Affordability' label, each numeric entry is the percentage of rental units in the MSA each demographic can afford at each of the cutoffs. *p30* refers to the cutoff corresponding to the 30 percent of the 30th percentile of the distribution of household income for the demographic. *med_rent_1br* and *med_rent_2br* refers to median monthly gross rent in each MSA for a one-bedroom and two-bedroom home respectively. *p30_inc* and *med_inc* refer to the thirtieth percentile and median of annual gross household income for a household of that type in that MSA. *%_renters* refers to the percent of all renters in the MSA that are single-parent and single-person households in panels a and b, respectively.

Panel a: Single Parents w/ 1-2 Children	Affordability		MSA Information			
msa	p30	med	%_renters	med_rent_2br	p30_inc	med_inc
Ithaca, NY	0.68%	2.50%	8.85%	$1,168	$9,539	$17,927
Harrisonburg, VA	0.90%	17.83%	14.27%	$850	$11,998	$27,558
East Stroudsburg, PA	1.05%	17.41%	20.91%	$1,028	$17,807	$32,439
Parkersburg-Vienna, WV	1.14%	7.51%	19.09%	$710	$10,757	$16,743
Auburn-Opelika, AL	1.27%	8.26%	15.22%	$830	$10,086	$20,138
Chico, CA	1.46%	6.28%	13.65%	$984	$14,945	$23,954
Medford, OR	1.48%	8.45%	15.31%	$954	$15,607	$25,814
Lima, OH	1.53%	19.93%	22.03%	$680	$12,034	$22,500
Merced, CA	1.54%	11.52%	23.62%	$818	$11,659	$24,995
Montgomery, AL	1.54%	9.31%	22.72%	$850	$12,348	$23,021
Average	1.26%	10.90%	17.57%	$887	$12,678	$23,508
Panel b: Single-person Households	Affordability		MSA Information			
msa	p30	med	%__renters	med_rent_1br	p30_inc	med_inc
Orlando-Kissimmee-Sanford, FL	6.17%	32.25%	21.60%	$1,110	$20,000	$33,485
Chico, CA	6.84%	14.50%	29.16%	$984	$12,907	$21,128
Tyler, TX	7.48%	54.95%	17.79%	$900	$16,050	$30,731
Austin-Round Rock, TX	7.93%	53.03%	22.62%	$1,263	$26,543	$42,469
Los Angeles-Long Beach-Anaheim, CA	7.97%	38.71%	21.43%	$1,574	$21,235	$42,291
San Diego-Carlsbad, CA	8.34%	43.00%	21.85%	$1,590	$25,114	$45,442
Las Vegas-Henderson-Paradise, NV	8.58%	53.58%	19.56%	$1,004	$20,488	$33,485
Tucson, AZ	8.71%	66.04%	21.45%	$890	$16,959	$29,299
Eugene, OR	8.98%	28.40%	26.54%	$932	$13,289	$23,318
Bellingham, WA	9.01%	41.25%	29.61%	$1,012	$16,217	$30,000
Average	8.00%	42.57%	23.16%	$1,126	$18,880	$33,165

Table 2: Least Affordable MSAs for Renters in MSAs with population of at least 350,000.
This table displayed identical information as Table 1, except only considering MSAs with a population greater than or equal to 350,000.

Panel a: Single Parents w/ 1-2 Children	Affordability		MSA Information			
msa	p30	med	%_renters	med_rent_2br	p30_inc	med_inc
Montgomery, AL	1.54%	9.31%	22.72%	$850	$12,348	$23,021
Las Vegas-Henderson-Paradise, NV	1.91%	16.97%	15.69%	$1,004	$20,400	$33,917
Orlando-Kissimmee-Sanford, FL	2.02%	7.90%	15.50%	$1,110	$20,385	$30,525
Myrtle Beach-Conway-North Myrtle Beach, SC-NC	2.12%	10.09%	15.78%	$874	$12,847	$24,067
Los Angeles-Long Beach-Anaheim, CA	2.24%	7.90%	12.90%	$1,574	$21,092	$37,097
Cape Coral-Fort Myers, FL	2.34%	12.46%	15.78%	$1,014	$20,500	$31,797
Stockton-Lodi, CA	2.40%	11.22%	19.68%	$1,019	$17,000	$31,321
Miami-Fort Lauderdale-West Palm Beach, FL	2.42%	6.38%	15.55%	$1,332	$19,463	$30,731
Visalia-Porterville, CA	2.44%	15.08%	23.38%	$848	$15,395	$25,609
Memphis, TN-MS-AR	2.45%	15.20%	22.23%	$871	$15,366	$27,102
Average	2.19%	11.25%	17.92%	$1,050	$17,478	$29,519
Panel b: Single-person Households	Affordability		MSA Information			
msa	p30	med	%_renters	med_rent_1br	p30_inc	med_inc
Orlando-Kissimmee-Sanford, FL	6.17%	32.25%	21.60%	$1,110	$20,000	$33,485
Austin-Round Rock, TX	7.93%	53.03%	22.62%	$1,263	$26,543	$42,469
Los Angeles-Long Beach-Anaheim, CA	7.97%	38.71%	21.43%	$1,574	$21,235	$42,291
San Diego-Carlsbad, CA	8.34%	43.00%	21.85%	$1,590	$25,114	$45,442
Las Vegas-Henderson-Paradise, NV	8.58%	53.58%	19.56%	$1,004	$20,488	$33,485
Tucson, AZ	8.71%	66.04%	21.45%	$890	$16,959	$29,299
Eugene, OR	8.98%	28.40%	26.54%	$932	$13,289	$23,318
Stockton-Lodi, CA	9.01%	43.58%	17.82%	$1,019	$15,899	$29,299
Santa Maria-Santa Barbara, CA	9.13%	27.05%	23.16%	$1,593	$21,235	$38,157
Albuquerque, NM	9.21%	61.77%	18.41%	$879	$16,533	$29,000
Average	8.40%	44.74%	21.44%	$1,185	$19,730	$34,625

3.3 Where is Overcrowding a Problem?

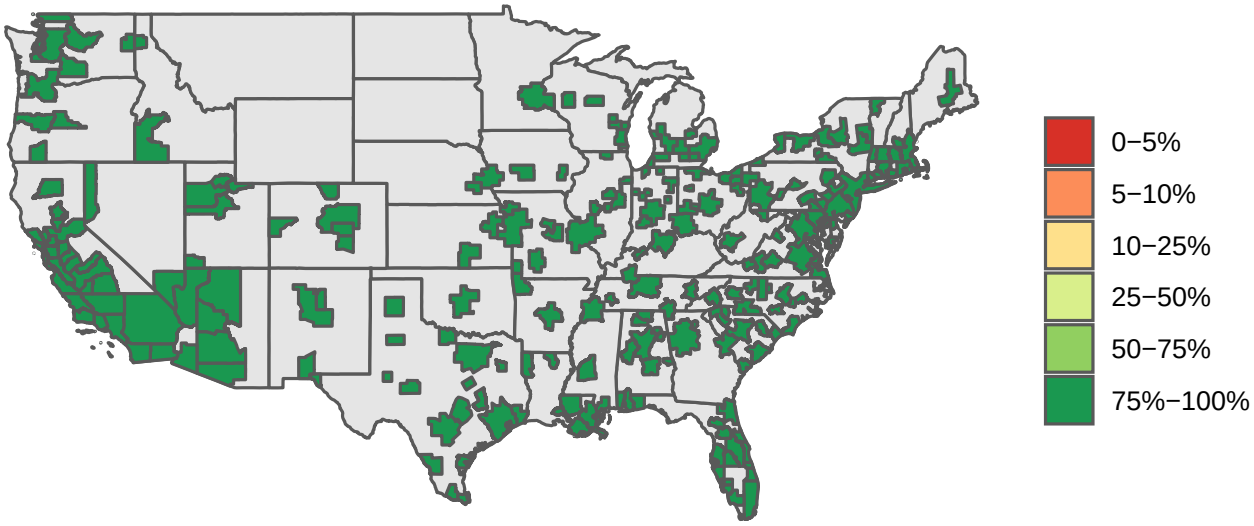
The previous section addresses the question of where rent affordability is a problem using assumptions about adequate housing size for different family sizes. In reality even when there is an inadequate supply of *appropriate* affordable housing, low-income renters are empirically less rent-burdened than we might expect from our previous measure. This is because some low-income renters will save on rent by living in an overcrowded unit. For a single-parent with 1-2 children, we consider a 1-bedroom or studio apartment to be less than adequate, yet this is the reality for many low-income single-parent households.

Figures 8 - 10 show what percentage of low-income households are actually rent-burdened. Except for a few cases, the share of low-income renters who are rent-burdened in each group is greater than the share of appropriate rental units affordable to each group; typically by a factor of two to three.

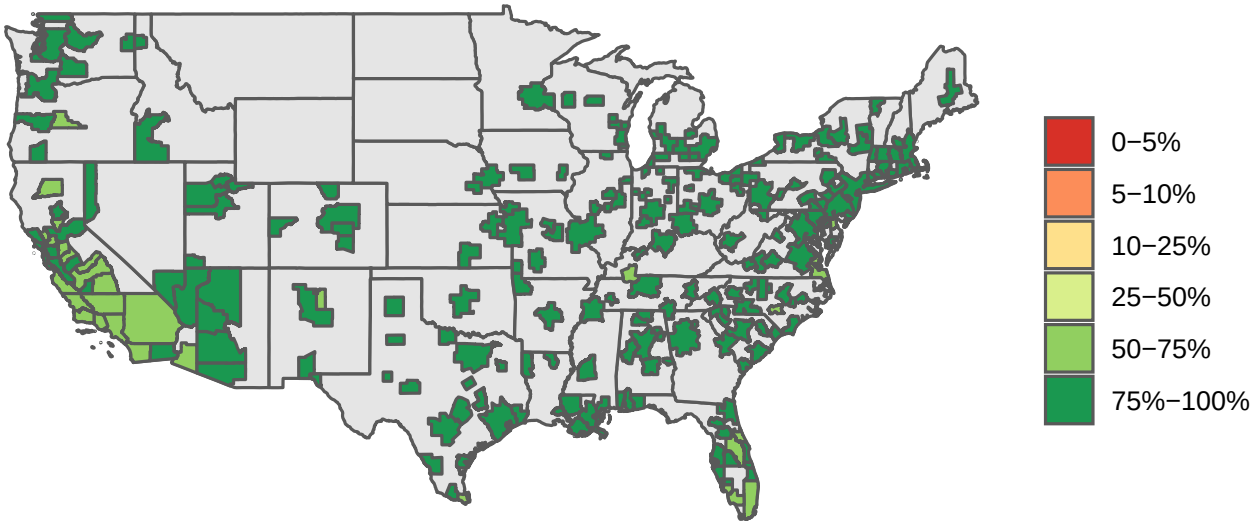
Table 3 shows the top 10 overcrowded MSAs in our sample for single-parent households with 1 - 2 children, along with our measure of affordability, and the percentage of households living in overcrowded units. Panel a shows the top 10 most overcrowded MSAs for renters in the bottom 30% of the income distribution, while panel b looks at renters in the bottom 50% of the income distribution. We only consider MSAs where we have more than ten observations of renters in the bottom 30% of the income distribution, which limits the sample to just 64 MSAs.

Out of the 64 MSAs in our sample, major metropolitan areas usually associated with an affordable housing crisis like Los Angeles, San Francisco, and New York top the list. The Los Angeles MSA is far and away the most overcrowded MSA for single-parents with 2 children. In Los Angles, 38.59% of low-income single-parent renters with one or two children rent either a one bedroom (30.25%) or studio (8.34%) apartment. A likely explanation is we found previously that only 2.24% of rental units that would not result in overcrowding would be affordable to a single-parent household at the 30th percentile of the income distribution.

Figure 8: Share of Non-Rent-Burdened Married Couple w/ Two Children

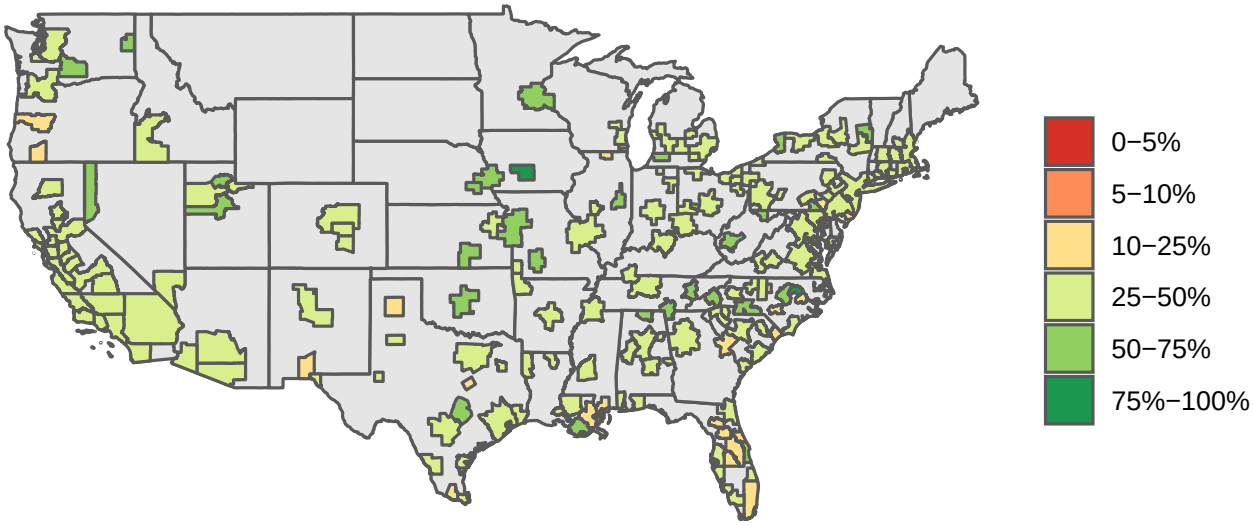


(a) At Median Income of Household Type in the MSA

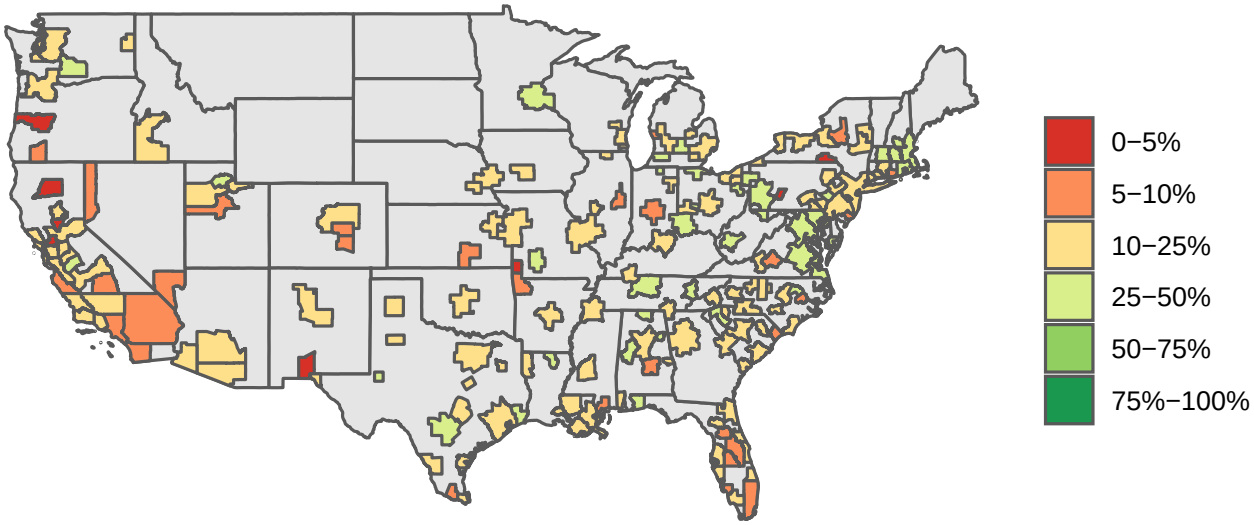


(b) At 30th Percentile of Income Distribution of Household Type in the MSA

Figure 9: Share of Non-Rent-Burdened Single-Parents w/ One or Two Children

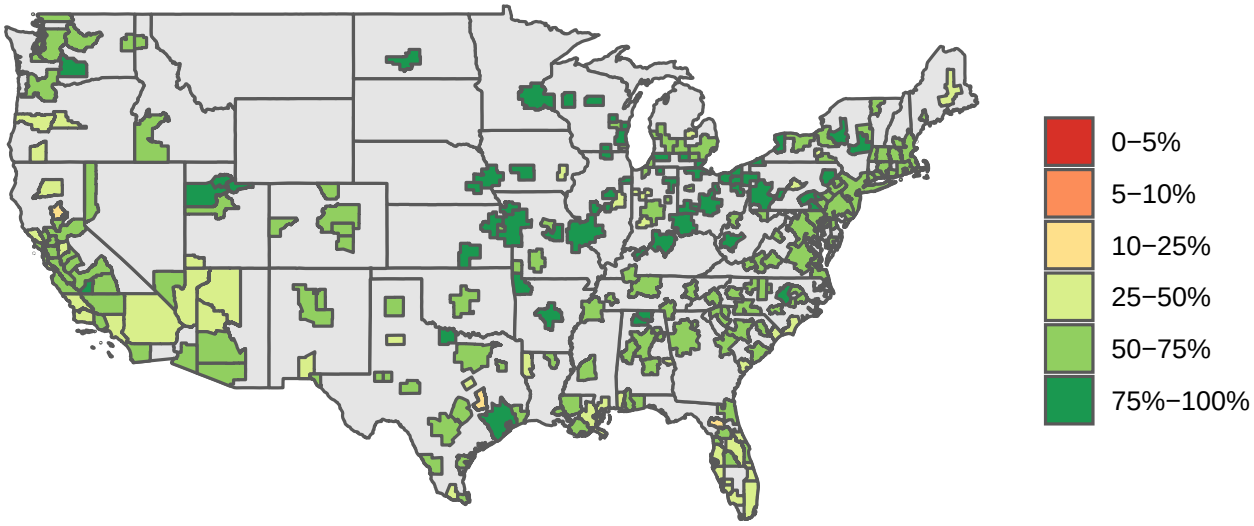


(a) At Median Income of Household Type in the MSA

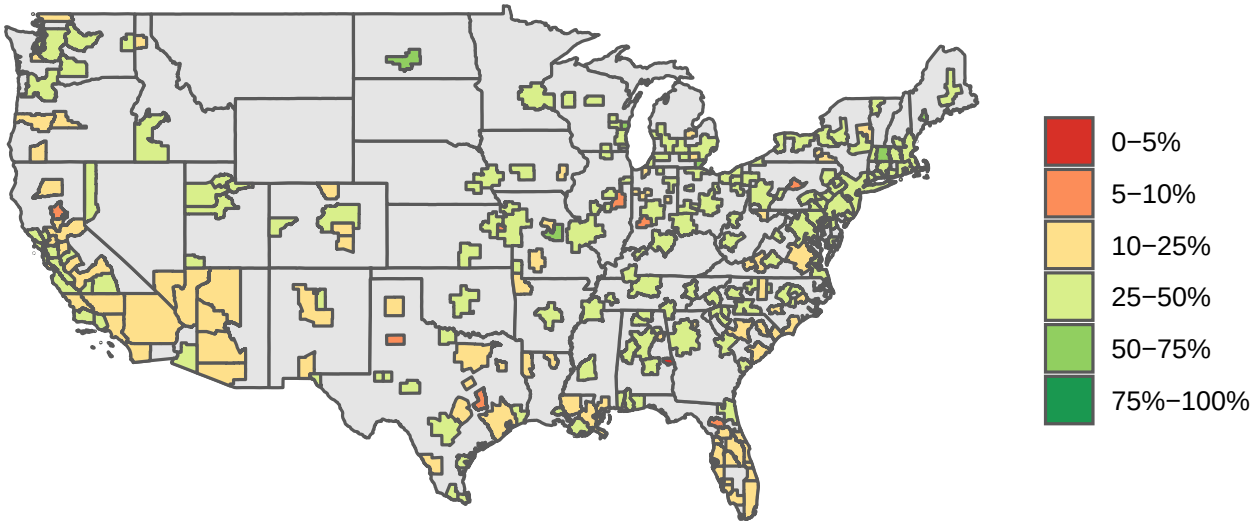


(b) At 30th Percentile of Income Distribution of Household Type in the MSA

Figure 10: Share of Non-Rent-Burdened Singles Living Alone



(a) At Median Income of Household Type in the MSA



(b) At 30th Percentile of Income Distribution of Household Type in the MSA

Table 3: Most Overcrowded MSAs for Low-Income Single-Parent Renters w/ 1-2 Children

Overcrowded refers to the share of single-parent renters w/ 1-2 children in the bottom 30% (50% for panel b) of the income distribution conditional on the household type. *Affordable* refers to the share of the appropriate housing (2-3 Bedroom Apartments) that would be affordable to a single-parent at the 30th (50th) percentile of the income distribution. *Rent-Burdened* refers to the share of single-parent renters who are actually rent-burdened (using previous income cutoff). *Studio Apt* and *1BR* refer to the share of low-income renters living in each dwelling type. And *N* refers to the number of renters of the household-type in the bottom 30% (50%) of the income distribution conditional on household type.

Panel a: Single Parents Households w/ 1-2 Children in Bottom 30% of Income Distribution

MSA	Overcrowded	Affordable	Rent-Burdened	Studio Apt	1BR	N
Los Angeles-Long Beach-Anaheim, CA	38.59%	2.24%	8.60%	8.34%	30.25%	767
Houston-The Woodlands-Sugar Land, TX	25.33%	3.38%	11.87%	1.32%	24.01%	379
San Diego-Carlsbad, CA	25.17%	3.17%	9.93%	1.99%	23.18%	151
Reno, NV	22.58%	3.59%	6.45%	6.45%	16.13%	31
New York-Newark-Jersey City, NY-NJ-PA	21.67%	6.57%	19.39%	2.95%	18.73%	1052
San Jose-Sunnyvale-Santa Clara, CA	20.29%	5.41%	18.84%	2.90%	17.39%	69
San Francisco-Oakland-Hayward, CA	19.34%	4.45%	19.34%	5.52%	13.81%	181
Visalia-Porterville, CA	18.92%	2.44%	8.11%	2.70%	16.22%	37
Dallas-Fort Worth-Arlington, TX	18.85%	4.30%	16.60%	1.43%	17.42%	488
Tucson, AZ	17.54%	3.63%	12.28%	0.00%	17.54%	57
Average	23.83%	3.92%	13.14%	3.36%	19.47%	321.20

Panel b: Single Parents Households w/ 1-2 Children in Bottom 50% of Income Distribution

MSA	Overcrowded	Affordable	Rent-Burdened	Studio Apt	1BR	N
Los Angeles-Long Beach-Anaheim, CA	38.10%	7.90%	25.51%	7.77%	30.34%	1223
San Diego-Carlsbad, CA	22.22%	9.94%	32.05%	2.99%	19.23%	234
Atlantic City-Hammonton, NJ	21.88%	14.07%	21.88%	6.25%	15.63%	32
Houston-The Woodlands-Sugar Land, TX	21.00%	17.41%	42.00%	1.38%	19.62%	581
Salinas, CA	20.93%	11.64%	34.88%	2.33%	18.60%	43
New York-Newark-Jersey City, NY-NJ-PA	20.40%	14.51%	26.73%	2.75%	17.64%	1706
San Francisco-Oakland-Hayward, CA	19.32%	17.19%	42.37%	4.75%	14.58%	295
San Jose-Sunnyvale-Santa Clara, CA	19.05%	19.34%	45.71%	1.90%	17.14%	105
Laredo, TX	17.07%	14.53%	34.15%	9.76%	7.32%	41
Riverside-San Bernardino-Ontario, CA	16.76%	12.79%	30.40%	2.56%	14.20%	352
Average	21.67%	13.93%	33.57%	4.24%	17.43%	461.20

3.4 Marginal Willingness to Pay for an Additional Bedroom

3.4.1 Estimation of Hedonic Rent Function

Figures 11, 12, 13 show the conditional means plot, gradient, and hessian of the hedonic rent function respectively.

We see the on average, rents are strictly increasing in the number of bedrooms. A studio apartment on average costs around $1,150 per month in Los Angeles, while a five bedroom apartment costs $2,100 on averagem a difference of $9,50. The first derivative is for an additional bedroom, not accounting for the size of the household, is always positive, concave, and ranges from around $150 to $240.

We see the on average, newer apartments rents for a premium. A brand-new apartment rents for just above $2,000, and decreases until 60 years-old where average rents are around $1,500. Apartments older than 60 years-old sell for a slight premium, with 90 year-old apartments renting for around $1,550 per month. The gradient in age is strictly increasing, suggesting the rents decrease fastest for new apartments as they age.

Finally we see that the safest PUMAs on average rent for around $1,650 per month, while PUMAs in the least-safe neighborhoods rent for $1,350 a $300 difference.

3.4.2 Demand Estimation

Table 4 shows the estimation results for Equation 7, both by OLS and using the methodology proposed by (Bishop and Timmins, 2019). We see the coefficients are statistically different from one-another. The first-order effect of household on MWTP for an additional bedroom nearly doubles from $12.42 for each person in OLS, to $23 using the Bishop & Timmens methodology. Most notably, OLS implies intuitively the MWTP for an additional bedroom is increasing in the number of bedrooms. Once accounting for the Jacobian term, the coefficient flips from $31.30, to -$19.94. Lastly the coefficient on the interaction term between household size and number of bedrooms increases from -$6.52 to -$5.28.

Figure 11: Conditional Mean Plot of Determinants of Hedonic Rent Function

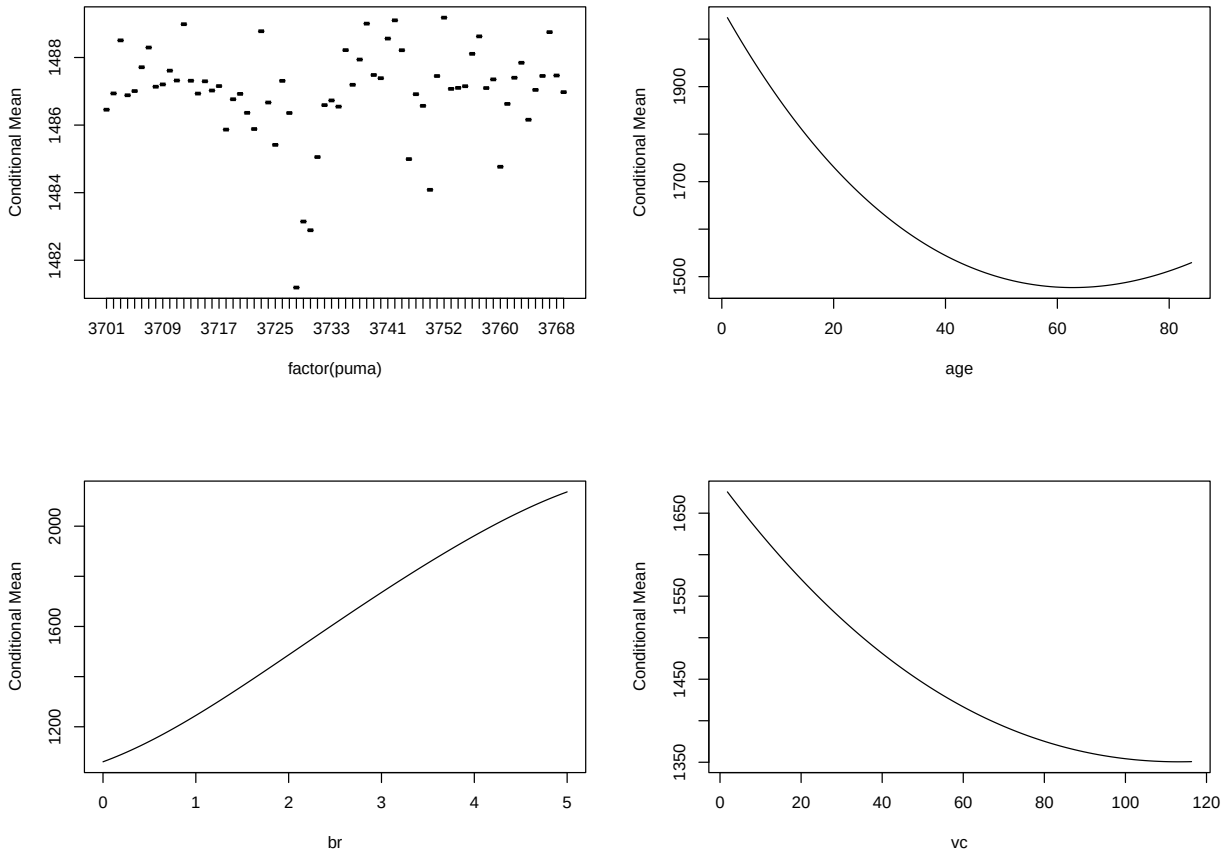


Figure 12: Gradient of Hedonic Rent Function

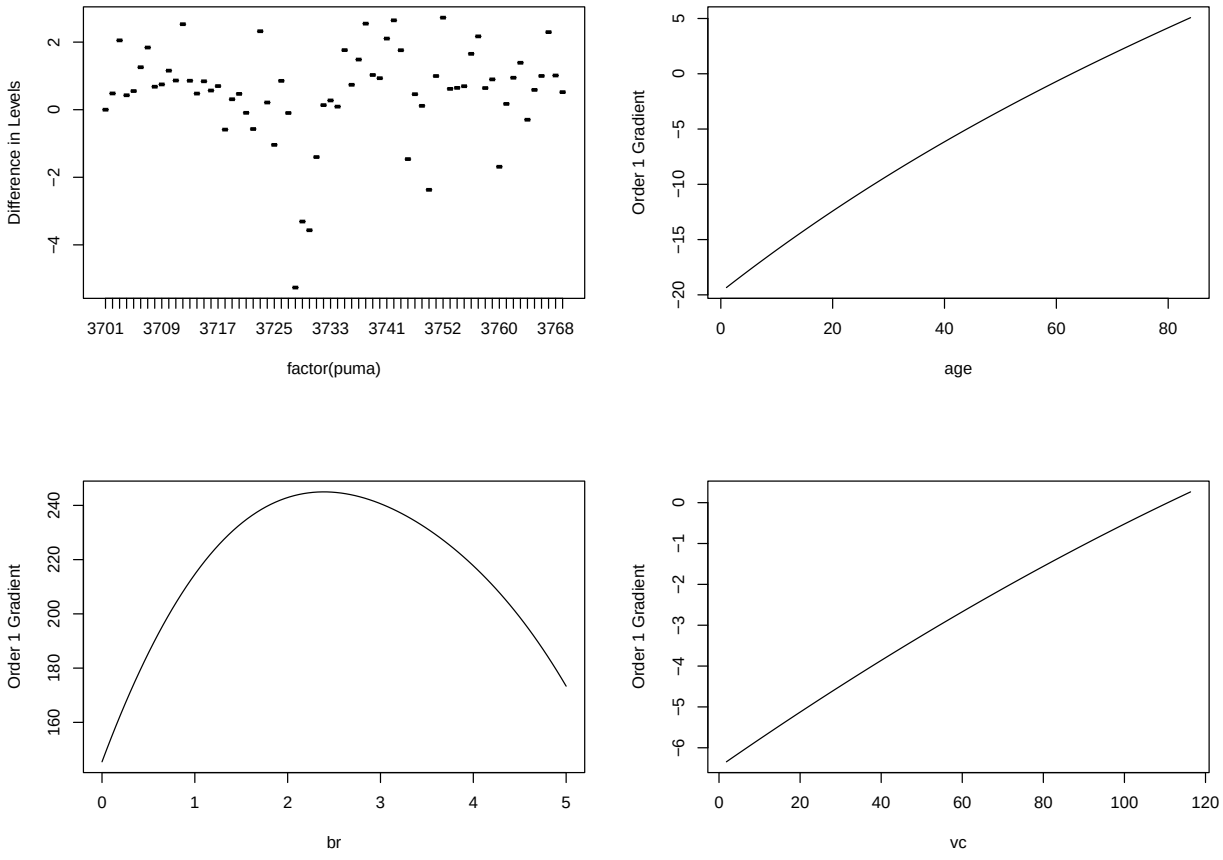


Figure 13: Hessian of Hedonic Rent Function

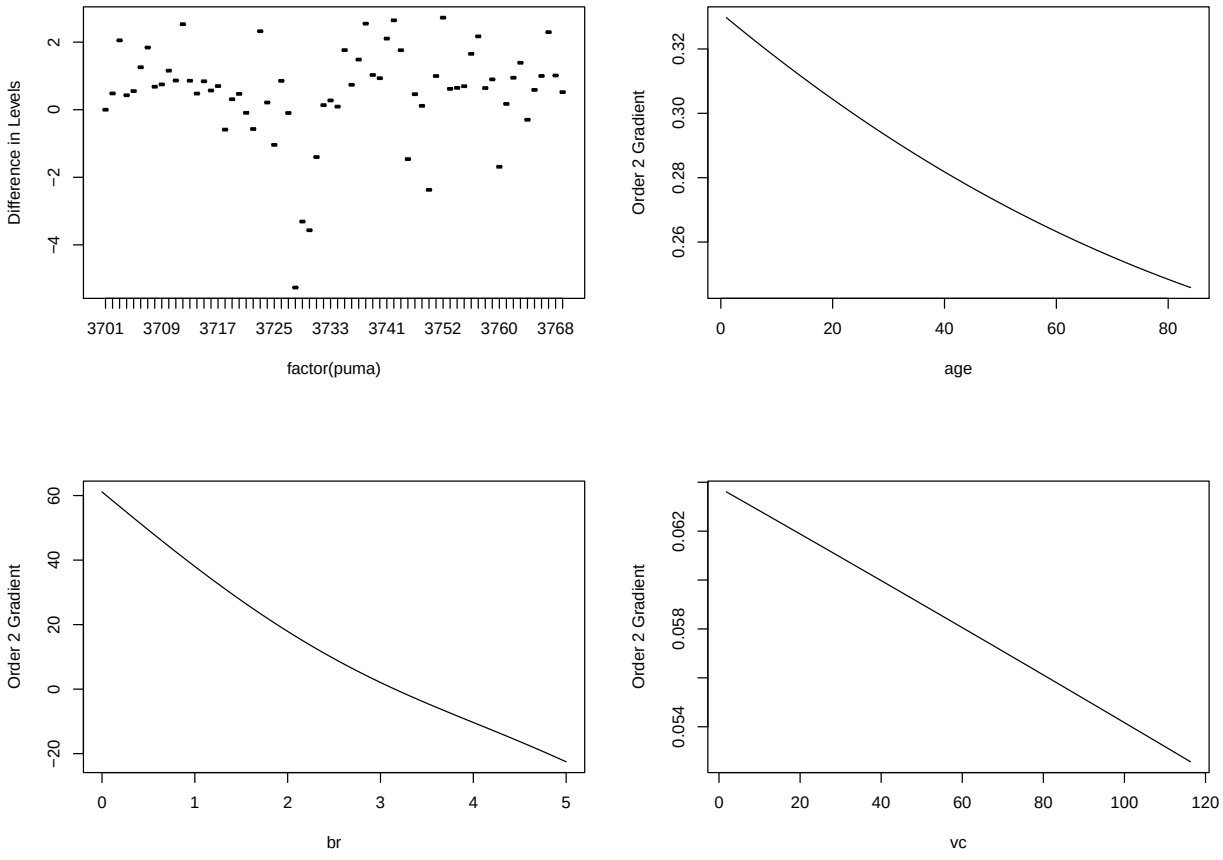


Table 4: Marginal Willingness to Pay for An Additional Bedroom
We estimate Equation 7 by both OLS, and Maximum Likliehood accounting for the correlation between unobserved preferences and the MWTP for an additional bedroom (labeled "Bishop & Timmens"). Standard errors are in parenthesis.

Dependent Variable: Marginal Willingness to Pay for an Additional Bedroom		
	OLS	Bishop & Timmens
Household Size	12.416***	23.0024***
	(0.633)	(0.5348)
Bedrooms	31.300***	−19.939***
	(0.889)	(0.358)
Household Size × Bedrooms	−6.522***	−5.278***
	(0.264)	(0.112)
σ_ν	28.42	49.96
PUMA FE	Yes	Yes
Observations	3,851	3,851
Note:	*p<0.1; **p<0.05; ***p<0.01	

Figure 14 traces out the MWTP for an additional bedroom as a function of the number of bedrooms, by household size. We see in all cases that MWTP is decreasing for in the number of bedrooms, but the slope is steeper the larger the household size. A family of 5 living in a studio apartment would on average spend $325 more in rent per month to live in a one-bedroom apartment, where a single-person household would only be willing to spend around $230 dollars for the same increase in bedrooms.

Figure 14

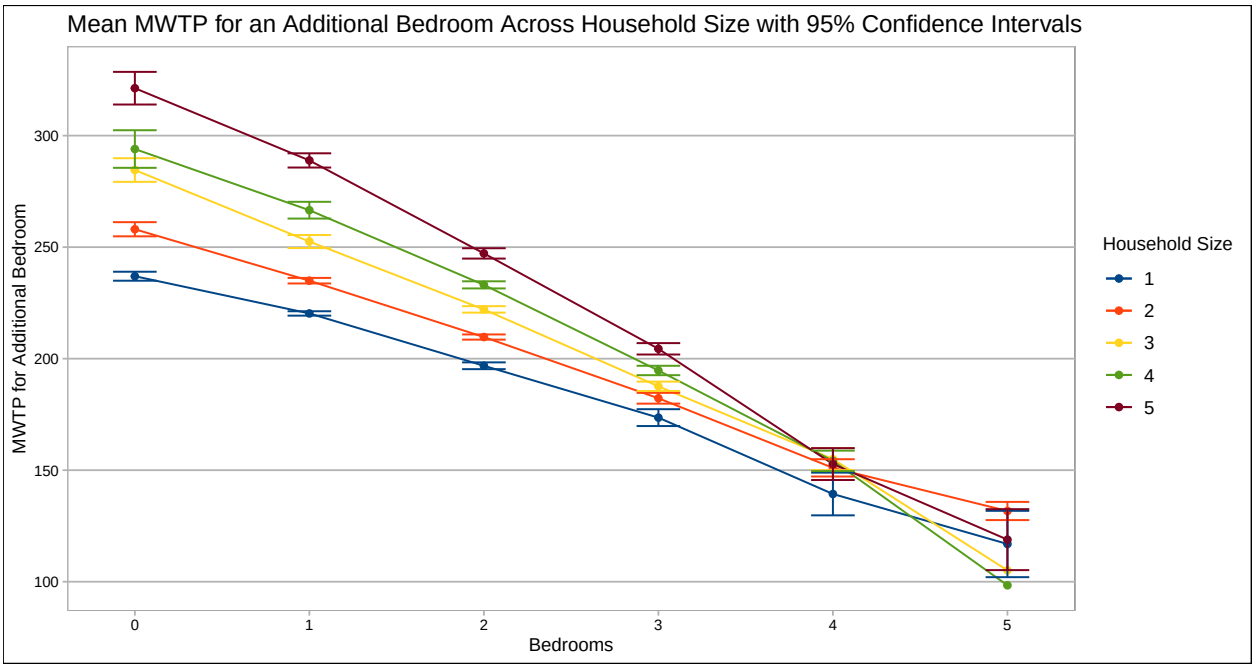
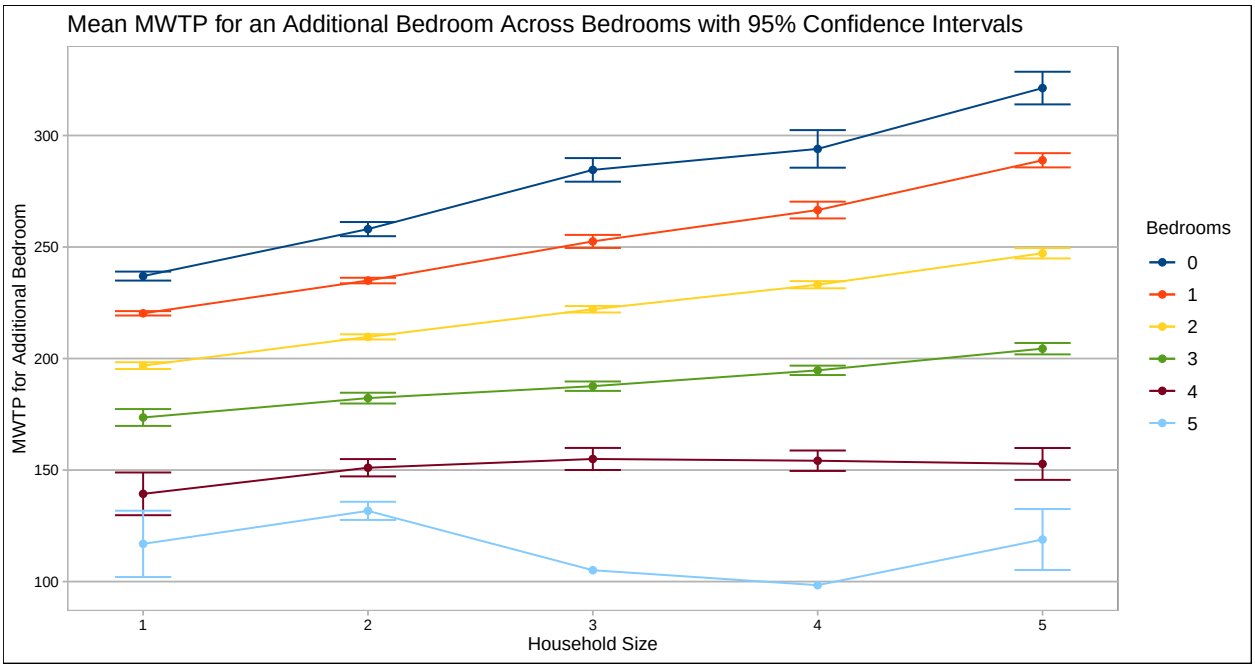


Figure 15 displays the same function differently,by plotting the mean MWTP for an addition bedroom as a function of household size, by number of bedrooms. Here we see for those living in studio apartments there is a positive relationship between household size. However, that slope decreases as we look renters in rental units with more bedrooms. For those with in four or five bedroom apartments, the effect is statistically null.

3.4.3 Discussion

Our results show that MWTP for an additional bedroom is highest for those with ratio of bedrooms per person closest to zero. If we did not find such a relationship, than we would be wrong to use bedrooms per person as a way to define an adequate housing unit.

Figure 15



In addition, for those living in a studio or one-bedroom apartment, the MWTP for one additional bedroom ranges from $225 to $325. In comparison, we estimate the on average apartments in the safest neighborhoods of Los Angeles sell for a $350 premium on average. We conclude that this information that households value adequate living space as first-order to safety in their neighborhood.

Future work looks to compare the MWTP for an additional bedroom to the value differential from the best and worst school districts.

3.5 Supply-Demand Imbalance

A concern with our proposed measure of affordability (as described in Section 2.2) is that it can deem an MSA as unaffordable while simultaneously allowing for markets to clear. To illustrate, suppose in a given MSA there are 10,000 appropriate rental units out of 1,000,000 that are affordable to single-parent households below the 30^{th} percentile of the income distribution. That corresponds to an affordability measure of 1%. Now make the additional assumption that there are only 1,000 low-income single-parent households in the data. If there were perfect sorting of affordable housing to low-income households, it could be that

each low-income household would be able to rent an affordable unit. In this case there would be no unmet demand for affordable housing units by low-income single-parent renters, despite reporting a very low affordability measure of 1%.

To address this concern, in Table 4 and Table 5 we report the ratio of the level of affordable and appropriate rental units available to the level of low-income renters for single-parent and single-person households, for all MSAs and MSAs with populations greater than 350,000 respectively. The new measure of affordability is prefixed by "_s2d", and is reported alongside our previous affordability measure which is prefixed by "_afford".

We find that membership in the top 10 is largely unchanged; the MSAs with the lowest measure of our main affordability index are also the MSAs with the smallest ratio of the level of affordable rental units to the level of low-income renters. For single-parent (single-person) households across all MSAs, 8 (7) of the 10 least affordable MSAs by our main measure are also part of the 10 least affordable MSAs by this new measure of affordability. For single-parent households in MSAs with populations greater than 350,000 membership is shared by 7 (4) of the 10 original least affordable MSAs.

Table 4: MSAs With Lowest Supply Relative to Demand for Low-Income Single-Parent and Single-Person Households

p30_s2d (*med_s2d*) refers to the ratio of the number of appropriate rental units to the number of renters in the bottom 30% (50%) of the income distribution conditional on the household type. *p30_afford* and *med_afford* describes the percent of appropriate rental units available for households at the 30th and 50th percentile of the income distribution, as reported in Tables 1-2. Panel a (b) shows the above statistics for single-parent households w/ 1-2 children (single-person household), whose appropriate rental unit is a 1-2 bedroom apartment (studio or 1-bedroom apartment).

Panel a: Single Parent w/ 1-2 Children	Affordability				MSA Information			
msa	p30_afford	p30_s2d	med_afford	med_s2d	%_renters	med_rent_2br	p30_inc	med_inc
Johnstown, PA	0.00%	0.00%	56.40%	461.54%	19.13%	$630	$8,300	$29,000
Rocky Mount, NC	0.00%	0.00%	6.59%	38.46%	24.24%	$670	$3,880	$12,000
Utica-Rome, NY	0.00%	0.00%	13.52%	163.16%	19.37%	$740	$6,300	$25,000
Saginaw, MI	0.24%	10.00%	17.26%	106.25%	18.94%	$770	$15,500	$25,000
Merced, CA	0.22%	14.29%	11.35%	176.92%	20.09%	$960	$7,100	$25,200
Owensboro, KY	0.49%	14.29%	79.71%	538.46%	23.87%	$715	$10,400	$39,300
Barnstable Town, MA	1.17%	20.00%	1.99%	28.57%	18.08%	$1,360	$16,800	$17,400
Tuscaloosa, AL	0.18%	20.00%	32.93%	416.67%	17.39%	$850	$6,000	$30,000
Laredo, TX	1.22%	25.00%	9.06%	100.00%	21.82%	$880	$15,000	$22,100
Ocala, FL	0.52%	25.00%	3.78%	57.14%	23.44%	$832	$11,000	$19,060
Average	0.40%	12.86%	23.26%	208.72%	20.64%	$841	$10,028	$24,406
Panel b: Single Person Households	Affordability				MSA Information			
msa	p30_afford	p30_s2d	med_afford	med_s2d	%_renters	med_rent_1br	p30_inc	med_inc
East Stroudsburg, PA	0.00%	0.00%	77.35%	31.03%	25.31%	$850	$22,050	$40,000
Lawrence, KS	0.00%	0.00%	26.13%	41.67%	42.11%	$770	$11,640	$26,300
Gainesville, FL	0.90%	1.19%	35.53%	20.65%	47.74%	$785	$14,000	$29,800
Homosassa Springs, FL	5.77%	2.86%	55.01%	13.79%	36.39%	$590	$13,000	$25,000
College Station-Bryan, TX	1.22%	3.92%	20.05%	18.18%	42.57%	$820	$12,500	$26,000
Auburn-Opelika, AL	3.75%	4.76%	9.48%	12.50%	40.43%	$610	$8,000	$13,200
Sebastian-Vero Beach, FL	18.57%	5.26%	42.25%	7.94%	52.10%	$700	$16,000	$25,960
Fort Collins, CO	2.78%	5.36%	48.74%	35.05%	28.82%	$1,035	$23,000	$38,900
Fayetteville, NC	5.77%	5.68%	54.00%	34.19%	32.26%	$710	$14,500	$29,000
Lafayette-West Lafayette, IN	2.00%	5.71%	22.56%	28.57%	41.36%	$769	$12,000	$25,000
Average	4.08%	3.47%	39.11%	24.36%	38.90%	$763	$14,669	$27,916

Table 5: MSAs With Lowest Supply Relative to Demand for Low-Income Single-Parent and Single-Person Households and Population of at Least 350,000

p30_s2d (*med_s2d*) refers to the ratio of the number of appropriate rental units to the number renters in the bottom 30% (50%) of the income distribution conditional on the household type. *p30_afford* and *med_afford* describes the percent of appropriate rental units available for households at the 30th and 50th percentile of the income distribution, as reported in Tables 1-2. Panel a (b) shows the above statistics for single-parent households w/ 1-2 children (single-person household), whose appropriate rental unit is a 1-2 bedroom apartment (studio or 1-bedroom apartment).

Panel a: Single Parents w/ 1-2 Children	Affordability				MSA Information			
msa	p30_afford	p30_s2d	med_afford	med_s2d	%_renters	med_rent_2br	p30_inc	med_inc
Greensboro-High Point, NC	1.66%	32.35%	26.80%	308.93%	18.15%	$800	$13,400	$28,000
Albuquerque, NM	0.71%	35.00%	27.23%	303.77%	15.44%	$890	$14,200	$32,000
Port St. Lucie, FL	1.80%	35.71%	26.73%	276.00%	18.75%	$1090	$17,300	$40,000
Lancaster, PA	2.16%	40.00%	10.10%	116.67%	12.56%	$1,050	$19,600	$29,100
Hickory-Lenoir, NC	1.99%	41.18%	38.89%	396.15%	21.20%	$670	$13,200	$24,900
Miami-Fort Lauderdale, FL	2.46%	44.93%	5.70%	67.49%	13.77%	$1,390	$20,000	$30,800
Memphis, TN-MS-AR	2.54%	45.07%	18.18%	188.18%	20.45%	$895	$17,200	$28,800
Las Vegas-Henderson, NV	1.68%	49.37%	19.88%	298.61%	14.73%	$1,060	$21,600	$36,000
Fort Wayne, IN	4.71%	50.00%	13.61%	116.00%	20.05%	$794	$14,400	$23,300
Lansing-East Lansing, MI	1.70%	50.00%	23.49%	291.30%	16.50%	$890	$16,500	$30,500
Average	2.14%	42.36%	21.06%	236.31%	17.16%	$953	$16,740	$30,340
Panel b: Single Person Households	Affordability				MSA Information			
msa	p30_afford	p30_s2d	med_afford	med_s2d	%_renters	med_rent_1br	p30_inc	med_inc
Fayetteville, NC	5.77%	5.68%	54.00%	34.19%	32.26%	$710	$14,500	$29,000
Port St. Lucie, FL	9.89%	6.17%	42.98%	17.56%	30.25%	$814	$17,330	$30,300
Myrtle Beach-Conway, SC-NC	8.42%	7.00%	31.49%	11.30%	32.18%	$850	$19,000	$30,000
Cape Coral-Fort Myers, FL	10.17%	8.44%	31.50%	21.07%	33.31%	$930	$17,000	$31,500
Hickory-Lenoir-Morganton, NC	10.33%	8.75%	71.98%	33.59%	35.34%	$530	$15,000	$24,900
Gulfport-Biloxi, MS	4.62%	9.38%	41.16%	30.17%	36.04%	$630	$12,000	$23,500
North Port-Sarasota, FL	11.48%	10.68%	32.14%	17.15%	32.23%	$1,062	$19,700	$32,000
Las Vegas-Henderson, NV	5.55%	11.72%	47.57%	48.46%	33.82%	$876	$18,900	$34,300
Charleston, SC	11.15%	11.89%	40.33%	23.49%	37.02%	$1,080	$24,000	$40,000
Orlando-Kissimmee, FL	7.07%	11.98%	30.75%	32.54%	27.92%	$1,028	$21,000	$35,000
Average	8.44%	9.16%	42.39%	26.95%	33.04%	$851	$17,843	$31,050

3.6 Implications

Is there a problem? Intra-urban mobility costs While at first glance, it may be tempting to conclude that housing affordability is not a problem for single parents in some part of the country because *some* housing stock is affordable to them, it is important to bear in mind that our analysis is at the MSA level. To the extent that lower-income households face high mobility costs, either in a pecuniary sense or because of a loss of community services or connections, the within-MSA location of the housing that is affordable to them matters.

Both pecuniary and non-pecuniary moving costs matter. This is especially true for low-income households. Weinberg, Friedman, and Mayo (1981) develop a micro-founded model of residential urban mobility and find search and moving costs to be a major factor in determining the rate of intra-urban mobility. Henderson and Ioannides (1989) jointly estimate a model of tenure, length of stay, and consumption level choice. They find evidence that less-wealthy, less-educated households have less intra-urban mobility.

One reason for Henderson and Ioannides (1989)'s finding is that lower-income households have more geographically proximate social networks. Bailey, Farrell, Kuchler, and Stroebel (2020) examine the location of individuals Facebook friends and find that lower-income zip codes have geographically narrower networks. Clark, Duque-calvache, and Palomares-linares (2017) find empirical evidence in Granada, Spain that having family present in a neighborhood, and more social connections with neighbors both decreases the likelihood of a household moving outside the neighborhood. Hedman (2013) examines data from Uppsala, Sweden and similarly finds that family presence is a strong deciding factor in neighborhood choice. Hedman (2013) also finds that the effect of family presence is stronger for Non-Western migrants, and people of low socioeconomic backgrounds. This suggests that the benefits provided by an established social network in a neighborhood are strongest for poorer households, and the moving cost associated with losing those benefits are potentially large.

There has been little economic research to date that attempts to understand the nature of the benefits of having an existing social network in a neighborhood provides to its

residents. One can imagine that having neighbors you trust to watch your children has value in that you can save money on babysitting, and you might feel more comfortable allowing your children to play outside without your supervision. Eldercare by neighbors may also be more important for low-income households. Exchanging such services in the community, rather than paying for them, requires long-term ties that are not present when moving to a new neighborhood.

Moving may also limit households' labor market opportunities. Bayer, Ross, and Topa (2008) find evidence that informal hiring networks formed from neighborhood social interactions "has a significant impact on a wide range of labor market outcomes." Hellerstein, McInerney, and Neumark (2011) also find evidence of local labor markets and that these networks are more important for low-skilled workers and minorities. This suggests that losing social connections around a place of residence due to a move may make it more difficult to find work in the future.

Will loosening supply restrictions solve the problem? Economists have frequently pointed to land use restrictions and onerous development approval processes as decreasing housing affordability; see Gyourko and Molloy (2015) for a review of the evidence. Furthermore, land use restrictions have tightened in most cities in the last decade (Gyourko, Hartley, and Krimmel, 2019). While it is unquestionably true that decreasing regulatory barriers would improve housing affordability, our analysis suggests that alone may not be enough to substantially mitigate the problem for low-income renters in many cities. We conclude this because it is likely infeasible to build a two-bedroom unit that would rent at less than $1,000 per month with reasonable assumptions about construction costs and return on capital for the developer and her lenders.

To understand why, consider the following calculation. In the least expensive US cities, mean hard costs per unit of multifamily housing are approximately $150,000 (Fannie Mae, 2019). These costs exclude the costs of land and soft development costs. Even were the developer to require only a 5% return on capital (both debt and equity), the unit would have to yield $625 per month in net rents. Assuming expenses are 40% of gross income, the

monthly rent on such a unit would have to be $1,042 which exceeds the median monthly rent of existing two-bedroom units in our least affordable cities (see Table 1).

In the calculation above, we have taken the unit mix and construction quality as given. We can instead hypothesize building a very small two-bedroom unit with inexpensive construction materials. Once again, we exclude land costs. Excluding any land costs, the 25th percentile of the costs of constructing multifamily housing are $124 per square foot (RSMeans, 2019). Assuming a two-bedroom of 800 square feet, it would cost $99,200 to build such a unit. Assuming expenses are 40% of gross income and the required net rental yield is 5%, the landlord would have to earn gross rents of $8,267 per year to net $4,960 per year after she pays expenses implying a monthly rent of $689 on the unit.[5] A rent that low would alleviate the cost burdens for our single parent households. However, since rental yield on such units is risky, in part due to higher rental default rates among low-income tenants, the cost of capital may be 8% or higher requiring a monthly rent of over $1,100.

To truly make housing more affordable in our least affordable cities, we would need housing built at an even lower cost. The 30th percentile of the income distribution of single-parent households is our least affordable cities in less than $10,000 (see Table 1). Even when we confine our analysis to cities with population of at least 350,000, the 30th percentile of the income distribution of single parent households is less than $18,000 (see Table 2). Monthly rent would have to be less than $450 per month for these households to not be cost-burdened. Even allowing the household to spend 50% of its income on rent, such that it would be cost-burdened but not severely cost-burdened, monthly rent would need to be less than $750 per month. At the median income for single-parent households, monthly rent would need to be less than $800 per month for the household not to be cost-burdened.

While our calculations above focus on multifamily housing, Glaeser and Gyourko (2018) suggest the minimum cost of building an economy-quality single-family home in a lightly regulated market is approximately $200,000 and a 2,000 square foot home. Assuming a landlord with a low cost of capital is willing to rent out such a unit for a 5% gross yield

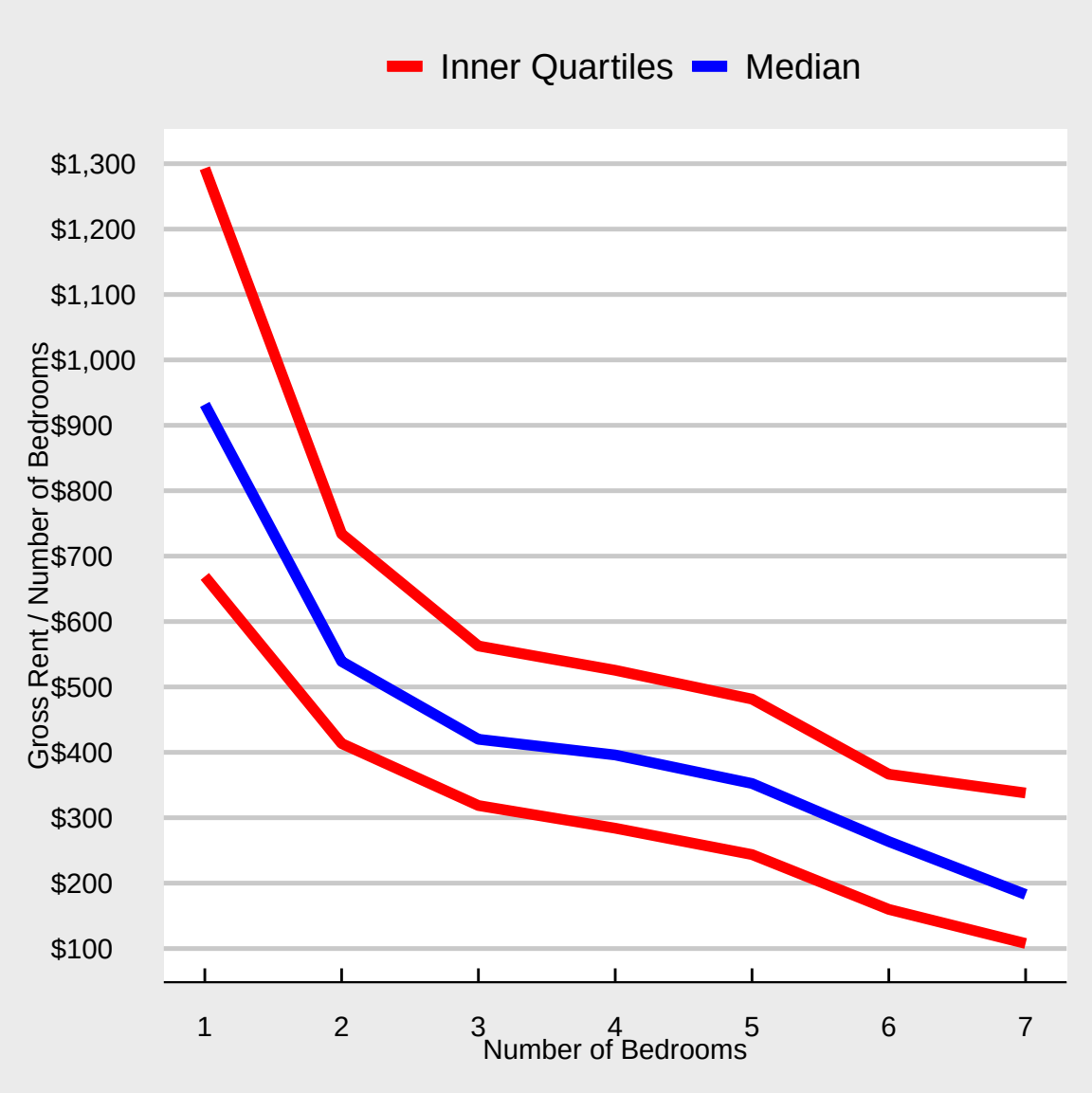
[5]Watts (2021) reports nationwide expense ratios of 41.1% and 41.2% in 2020Q3 and 2020Q4 for Class A and B apartments.

(i.e., not incorporating the expenses the landlord would have to pay) implies the annual rent would need to be $10,000 per year or $833, still above the affordable rent of many single-family renter households. Furthermore, more realistically assuming expenses of at least 25% of gross rental revenue would imply the landlord needs to charge at least $13,333 per year ($1,111 per month) to earn a 5% rental yield net of expenses. While it might be possible to reduce the costs of new construction by building very small homes, there are fixed costs associated with building items all units must have, such as a bathroom and kitchen, that imply construction costs will not scale down directly with square footage. Figure 16 plots average rents by unit size in the ACS and illustrates that, indeed, rent per bedroom falls with the number of bedrooms.

While new supply will not be affordable to many rent-burdened single-parent households, it may be affordable to slightly higher income renters that would then vacate existing units. Rosenthal (2014) finds that creating affordable housing through this filtering mechanism is one way of supplying affordable housing to low-income households in most cities, especially in cities with low rates of home price appreciation. In particular, Rosenthal (2014) finds that the income of the occupant of a home falls quickly with the age of the home. Been, Ellen, and O'Regan (2019) explore the argument that filtering improves affordability and generally concur based on their assessment of current research. More directly, Asquith, Mast, and Reed (2019) show that new market rate construction of large apartment buildings in low-income areas reduces rents on existing buildings on average by 5-7%.

However, it remains unclear whether the filtering process can deliver low enough rents even if there were no regulatory barriers whatsoever to constructing new housing supply. Rosenthal (2014) finds upward rather than downward filtering in some cities, particularly those with faster home price appreciation. Certainly, filtering is likely to be more successful in preserving housing affordability when the new units are nearer substitutes to the existing stock. There is also little evidence that developers will choose to build new market-rate construction in neighborhoods most in need of affordable units.

Figure 16: Rent per Bedroom Decreases with the Number of Bedrooms
Source: Authors' calculations based on 2013-2018 ACS Public-Use Microdata Sample.



Future Research. More research is needed to explore ways to provide more affordable housing for single parents. Single parents could benefit from sharing a rental unit with another single parent. Figure 16 shows that median gross rent per bedroom is monotonically decreasing in the number of bedrooms. From a housing subsistence perspective, a single parent with one child could save 28% on rent by splitting a four-bedroom rental with another single-parent. As discussed above, there could also be non-pecuniary benefits gained by splitting household and childcare duties. Future research should investigate the determinants of the rate of multi-family household formation.

The recent expansion of the Earned Income Tax Credit (EITC) at the Federal Level (Marr, Cox, Hingtgen, Windham, and Sherman, 2021) to workers without children in the home may increase the labor force participation rate of non-working men and perhaps indirectly reduce the share of children being raised in single-parent households. Austin, Glaeser, and Summers (2018) suggest increasing the EITC may be an effective way to reduce the number of men missing from the labor force. An additional benefit would be a reduction in construction costs from more non-college educated men working in the skilled trades. Studying the effect of the EITC expansion would be a fruitful direction for future research.

4 Conclusions

We have studied the availability of housing units in US cities to households of different types. We find that a small fraction of size-appropriate housing units are available to single-parent households in most US cities. Furthermore, the affordability problems are widespread rather than only in coastal and high-income cities.

Building small, low quality two- and three-bedroom units would alleviate some housing affordability problems for some rent-burdened households. New housing construction usually goes to higher income households but, through a filtering process, reduces housing costs for lower income households by freeing up existing housing units. However, even substantially relaxing land use restrictions and regulatory barriers in development is unlikely to reduce the cost of construction enough to significantly reduce housing affordability problems

for many single-parent households. In most of the country, the problem for these renters is not one of insufficient supply of housing but rather one of insufficient incomes.

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