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Decomposing Housing Unaffordability

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Abstract: *A US household is considered 'rent burdened' when its rent exceeds 30% of its income. This simple ratio can be decomposed to better understand the sources of unaffordability across space. To demonstrate this new approach, I rewrite the equation for rent burden as a sum of four factors: rent gap, income gap, excess size cost, and demographic baseline, and show that US rental unaffordability is mostly the result of low incomes. Focusing on the New England region, however, I show that high rent is the primary cause of unaffordability in high-cost, high-wage metro areas. This decomposition can help affordability advocates prioritise strategies appropriately across space.*

Keywords: housing economics; private rented markets.

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Introduction

In US policy discourse, 'housing unaffordability' is usually defined by whether a household spends more than 30% of its income on housing costs. This ratio-based definition yields the elementary insight that housing can be 'unaffordable' due either to high prices or low income. The relative contributions of those two factors have substantial geographic variation.

Unaffordability rates are often similar in very different regions. For example, housing is unaffordable to about 45% of renter households in both woodsy Penobscot County, Maine, and urbane Cambridge, Massachusetts. That similarity, however, masks differences in the local composition. In Cambridge, 73% of renters facing unaffordability are principally burdened due to high rent; that share is only 7% in Penobscot County.

These data show that 'unaffordability' should not be approached as a single phenomenon. Instead, policymakers should distinguish high rent from low incomes and approach each cause of unaffordability with an appropriate set of policies.

The remainder of the paper is organised as follows. I begin by offering a brief review of the conceptual literature on housing unaffordability. I then present the central idea and result of this paper and follow with a more detailed description of the data. The next section uses data from the New England sub-regions to demonstrate the value of decomposing rent burden. I conclude by connecting the local results to distinct policies for places with different problems.

Literature

For historical reasons, most analyses consider housing 'unaffordable' when it consumes more than 30% of household income. A household in this situation is termed 'rent-burdened'. Stone (2006) calls this the 'ratio approach', distinguishing it from four other, less common ways of defining housing unaffordability. The history of the 30% standard in the United States is well-documented in several sources, including Stone (2006) and Schwarz and Wilson (2008). The same standard is used in international analyses by Dewilde (2018), Acolin and Green (2017), and others.

The conventional definition is unsatisfying for several reasons. First, it does not do justice to poverty. One's buying power after paying rent is constrained by the amount of income left over, not the share. Second, it does not do justice to the cost of housing. In Brookline and Newton, Massachusetts, the share of people paying above 30% of their income in rent is a bit below average. However, that area would be extremely unaffordable to most Americans – it only appears to be 'affordable' because affluent people outbid moderate-income people for the privilege of living there.

Stone (2006) and Jewkes and Delgadillo (2010) recommend the 'residual income' method of measuring affordability. This method essentially defines a poverty line and asks whether each household has income above that threshold after paying for housing. Herbert, Hermann, and McCue (2018) note that this approach requires detailed information (such as state tax schedules) and extensive assumptions about consumption needs. In the end, it gives aggregate results that

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differ little from the 30% standard. However, the residual income approach does not distinguish between areas with high rents and areas with low incomes.

Fisher et al (2009) offer what might be called a 'residual rent' approach to understanding affordability, holding income constant and measuring rental cost across the 141 towns of Greater Boston. They impute rent to owned houses and adjust for three important amenities. The residual rent reflects the physical attributes of each town's housing stock and any unmeasured amenities.

The approach proposed here, by contrast to the residual income and residual rent approaches, does not aim to replace the conventional definition of unaffordability but to understand it by decomposing it into its component parts. This approach is conceptually close to that of Dewilde (2018), who used aggregate data on rent and income to draw conclusions about intertemporal changes in affordability across Western Europe.

Decomposing rent burden

The familiar equation for rent burden defines

$$BURDEN_i = \frac{RENT_i}{INCOME_i}$$

where *i* indexes households. For any arbitrary constant *C*, it is also the case that

$$BURDEN_i = \frac{RENT_i}{C}\frac{C}{INCOME_i}$$

This paper proposes a series of such elementary operations, in which the individual ratios are meaningful. Readers may offer alternative values for *C* that yield more meaningful ratios in other contexts; the math will work. In the following decomposition, I use US national medians for income and rent. These are by necessity relative measures, since the conceptual basis of the decomposition is relative.

Let *p(i)* index the size of household *i* and *u(i)* index the size of the housing unit occupied by household *i*. (Think 'p' for 'people' and 'u' for 'unit'). Thus, $RENT_{u(i)}$ is the national median rent for housing units the same size as the one occupied by household *i* and $INCOME_{p(i)}$ as the national median income of households the same size as household *i*. Now let

$$BURDEN_i = \frac{RENT_i}{RENT_{u(i)}}\frac{INCOME_{p(i)}}{INCOME_i}\frac{RENT_{u(i)}}{RENT_{p(i)}}\frac{RENT_{p(i)}}{INCOME_{p(i)}} \quad (1)$$

Equation (1) decomposes rent burden into four ratios; it is just as valid to use more or fewer. Taking the natural log of Equation (1), and using lower-case letters to indicate log values, we arrive at an additive decomposition:

$$burden_i = (rent_i - rent_{u(i)}) + (income_{p(i)} - income_i) + (rent_{u(i)} - rent_{p(i)}) + (rent_{p(i)} - income_{p(i)}) \quad (2)$$

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Consider the four parenthetical expressions in Equation (2) individually. The first, the rent gap $(rent_i - rent_{u(i)})$, measures whether the household's rent is higher or lower than the median of that size. This will identify places that are relatively expensive, regardless of local incomes. The second, $(income_{p(i)} - income_i)$, the income gap, measures whether the household's income is smaller than similarly-sized households. This will identify places where incomes are relatively low, regardless of rents.

The third expression, the excess size cost $(rent_{u(i)} - rent_{p(i)})$, measures whether household *i* is occupying a larger-than-usual unit given its household size. This measure will be negative for the many households that squeeze into smaller-than-usual units to economise and will tend to decrease the measured rent burden.

The final expression, the demographic baseline $(rent_{p(i)} - income_{p(i)})$, is the rent burden of the median household of size *p(i)*. If this expression were to account for most of the variation in $burden_i$, we would have the unsatisfactory result that rent burden is mainly a function of household size. That is not the case; median rent burden is 29% or 30% for size categories covering 96% of households.

In many cases, of course, a household is 'burdened' (that is, its rent burden exceeds 30%) despite having above-median income or below-median rent, because it is far enough behind on other ratios.

Table 1 compares burdened and non-burdened households at the 25th and 75th percentiles of each component of Equation (2). Positive log differences indicate a contribution to higher rent burden.

Clear conclusions emerge. First, the variation in income gap is much larger than the others, and there's little variation at all in demographic baseline and excess size cost. Second, the distribution of rent gaps, excess size costs, and demographic baselines are very similar across burdened and unburdened households.

Table 1: Decomposing rent burden

	Burdened		**Not burdened**	
	25th pctile	75th pctile	25th pctile	75th pctile
Rent gap	-0.26	0.34	-0.34	0.29
Income gap	0.14	0.98	-0.86	-0.07
Excess size cost	-0.08	0.06	-0.07	0.06
Demographic baseline (rent/income)	29%	30%	29%	30%

Source: author's calculations.

Looking at the same data another way, Table 2 shows that both nationally and in New England, the income gap is the largest contributing factor for most burdened households. It also shows that very few households are mainly rent burdened because they choose to live in a larger-than-typical house. In addition, few are burdened due to a mix of factors with none predominating.

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Table 2: The taxonomy of unaffordability

Households burdened mainly* by…	US	New England
Rent gap	11%	13%
Income gap	30%	26%
Excess size cost	1%	1%
A mix of factors (none over 67%)	4%	7%
Not burdened	53%	53%

Source: author's calculations.

Note*: A household is 'mainly' burdened by rent if high rent is the largest of the three factors and it accounts for at least 2/3 of the difference between the household's rent burden and the median rent burden for households of the same size. That is, if $\frac{(rent_i - rent_{u(i)})}{[(rent_i - rent_{u(i)}) + (income_{p(i)} - income_i) + (rent_{u(i)} - rent_{p(i)})]} \geq 0.667$.

Both ways of looking at the data clearly show that low income is the primary determinant of unaffordability. High rent, however, cannot be ignored. Below, I show that households burdened mainly by high rent are quite concentrated in a few expensive locations.

Data

I use renter microdata from the American Community Survey (2014-2018), aggregated at the Public Use Microdata Area (PUMA) level. PUMAs have populations of 100,000 or more and range from 3.6 km^2 to 1.1 million km^2 in area (McMichael and Chen 2015). The key price series is 'gross rent', which includes utility costs that are sometimes included in rent and sometimes paid separately by tenants. All data are inflation adjusted using the Personal Consumption Expenses deflator and aggregated using household weights. To clean the data, I dropped households living on more than 10 acres (4 hectares), non-cash renters (mainly those receiving rental assistance), those reporting less than $7,500 per year in income, and those reporting less than $200 a month in rent. The results are robust to different cutoffs.

Among the many possible comparisons, I choose size as the most obvious distinction among households and units. Households tend to sort themselves by size: larger households rent larger homes. Larger households, especially those with multiple adults, also earn higher incomes. Households of the same size tend to compete for the same housing units.

The size *u* of a housing unit is its number of bedrooms, top-coded at 7.

Rather than counting individuals, I measure household size *p* as a rough estimate of the number of bedrooms needed. This is, of course, subjective and culturally relative; the point is to compare each household to those that would, if incomes were similar, occupy the same sorts of housing units.

I estimated the number of bedrooms needed as 1 bedroom for the first two adults (since multi-adult households are most often couples), and 1 for each subsequent adult. For children, I set 1 bedroom needed for the two children, and 0.51 bedrooms for each subsequent child. Then I added the adult and child bedroom needs and rounded.

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Spatial variation in the composition of unaffordability

To show how this approach clarifies the geography of unaffordability, I distinguish six sub-regions of New England and show that decomposed rent burden provides much more insight into the geographic variation. Table 3 summarises the key statistics for each sub-region.

Table 3: New England's geography of unaffordability

Sub-region	Not burdened	Burdened mainly by…			Average income	Average rent
		income	rent	size or a mix		
Gateway cities	49%	36%	7%	7%	$ 47,600	$ 12,480
SW Connecticut	51%	19%	22%	9%	$ 78,400	$ 18,600
Massachusetts Bay	53%	17%	21%	9%	$ 77,400	$ 18,840
Northern NE, metro	55%	26%	11%	8%	$ 58,200	$ 14,340
Southern NE balance	55%	29%	9%	7%	$ 55,200	$ 13,200
Northern NE, small-town	56%	36%	4%	4%	$ 44,700	$ 10,620
New England	53%	26%	13%	8%	$ 61,500	$ 15,060

Source: author's calculations.

Gateway cities

The old industrial cities of New England have an obvious pattern of low income and low rent, even when they are surrounded by areas of affluence.[1] These scattered cities still struggle from a legacy of industrial decline dating to the early 20th century. Six of the ten most-burdened PUMAs in New England are from this group.

Southwestern Connecticut and Massachusetts Bay

These are the highest-income and densest parts of New England, and the priciest. Of the 109 PUMAs in New England, the 33 with the most households burdened mainly by rent are in these two regions. In Massachusetts, the epicentre of burdens due to rent is the stretch from Cambridge and Fenway west to Wayland and Sherborn.

[1] The term 'Gateway Cities' (MassINC Gateway Cities Innovation Institute n.d.) is commonly used to refer to old mill and port cities in Massachusetts. The gateway cities sub-region consists of the PUMAs that include Bridgeport, Hartford, New Haven, and Waterbury, Connecticut; Providence and Pawtucket, Rhode Island; Brockton, Fall River, Fitchburg, Lawrence, Leominster, Lowell, New Bedford, Springfield, and Worcester, Massachusetts; and Manchester, New Hampshire. For a complete list of the PUMAs included in each region, contact the author.

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Northern New England

Two sub-regions cover Maine, New Hampshire (except Manchester), and Vermont. The 'metropolitan' sub-region covers Southern Maine, Southeastern New Hampshire, and the Burlington area. The remainder includes rural areas and many small towns.

In small-town Northern New England, poverty is clearly the source of unaffordability. However, this area is (by a small margin) the most affordable to its residents because it has (by a large margin) the lowest rent. It shares with the gateway cities the challenges associated with declining industries and an old housing stock.

Metropolitan Northern New England is in higher demand. The most burdened PUMAs in this sub-region are those around Portland, Burlington, and the exurbs west of Nashua. Although those are all places with substantial burden due to rent, low incomes are the primary source of unaffordability everywhere in the sub-region.

Southern New England (balance)

The parts of Connecticut, Massachusetts, and Rhode Island not yet accounted for fall into this group: the suburbs of gateway cities, the exurbs of Boston, rural areas, and small cities with their own longstanding economic patterns.

This sub-region has average income and rent substantially lower than the major urban areas, but substantially higher than the gateway cities in its midst. As in the Northern New England metros, rent is a challenge to affordability in some areas – notably central Connecticut. In every PUMA, however, low incomes are the greater cause of unaffordability.

Matching policies to problems

The regional data make clear that burdens due to high rent are highly concentrated in the most affluent parts of New England and that burdens due to low incomes are substantial everywhere. The challenge of increasing low incomes, especially in post-industrial parts of the United States, is beyond the scope of this article. However, it should be clear that the cost of housing is not the driving force behind unaffordability in small-town Northern New England or the gateway cities.

In the most expensive regions, by contrast, income growth will be relatively ineffective in lowering unaffordability because the tightly limited housing supply responds to income growth with higher prices.

The high housing costs that prevail around Boston and New York are perhaps the easiest economic problem to solve: every 3% increase in the housing stock lowers rent by 2% (Albouy and Ehrlich 2016). If the only tool you have is a hammer, you're well-equipped to solve the housing crisis.

If building more houses is so easy and beneficial, why does it proceed at such a slow pace? Because getting local government permission to build – especially to build densely in high-

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value locations – is devilishly hard in New England. Einstein et al. (2019) and Prevost (2013) examine in detail the mechanics of obstruction in New England. Studying the New Haven suburbs, Ellickson (2020) shows that the vast majority of land is devoted to house lots in excess of an acre, preventing construction and forcing up prices.

Reforming land use regulations to allow more housing construction can benefit renters and homebuyers and expand opportunity, especially in Massachusetts Bay and Southwestern Connecticut. Policies that effectively promote income growth can reduce unaffordability in small-town Northern New England and the gateway cities. In the intermediate parts of the region, both types of policies would be beneficial.

Limitations

This paper uses a narrow geographic application to exhibit the value of decomposition for understanding spatial aspects of unaffordability, which are a growing focus in international scholarship on affordability (Haffner and Hulse 2021; Acolin and Green 2017). However, the method's reliance on common denominators – such as national median income – limits the spatial scope to reasonably comparable areas.

Furthermore, this decomposition does not invalidate the usual criticisms of the ratio approach. Residual income approaches remain a better, although more data-intensive, way to relate housing costs to poverty. And the spatial decomposition certainly understates the inequality in housing prices across space relative to simply looking at housing prices across space.

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