

The Limited Supply of Rental Housing Explains Elevated Rent Inflation during the Pandemic

Joel A. Elvery¹

joel.elvery@clev.frb.org

December 6, 2024

This is an advanced copy of a forthcoming Federal Reserve Bank of Cleveland *Regional Policy Report*. **Please do not cite or distribute.**

Abstract

To better understand why rent inflation was elevated in 2021, 2022, and 2023, this report explores changes in the rental vacancy rate in the years leading up to, during, and after the COVID-19 pandemic. Using quarterly data for 59 large metro areas in the United States, I study the determinants of rental vacancy rates from 2011 through 2019 and factors that were of special importance during the pandemic. Between 2017 and 2019, rental vacancy rates declined because there was a rapid increase in the number of households per 100 people without an offsetting increase in the number of rental housing units. The results suggest that temporary programs designed to prevent evictions during the pandemic and increases in per capita income were the primary drivers of the drop in the rental vacancy rate during 2021, while rising rents and a decline in per capita income explained much of the rebound in the rental vacancy rate during 2022.

Executive Summary

There is a strong relationship between rent inflation and the rental vacancy rate, which is the proportion of rental units that are vacant. A decline in the rental vacancy rate tends to increase rent, with a larger increase in rent when the rate was low prior to dropping.

The analysis in this report shows that this is what occurred in the US rental housing market during the COVID-19 pandemic. Because of an increase in the number of households per 100 people and a stagnant supply of rental housing, the US rental vacancy rate fell from 7.0 percent at the start of 2017 to 6.4 percent at the end of 2019, the lowest it had been since 1985. The rental vacancy rate then declined sharply in 2021, reaching a low of 5.6 percent at the end of

¹ The views expressed in this paper are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Cleveland or the Board of Governors of the Federal Reserve System. The author thanks Hal Martin and Stephan Whitaker for sharing their data and Isabel Brizuela and Jayme Gerring for their assistance.

2021. This drop spurred elevated rent inflation in 2021 and 2022. The rental vacancy rate rose in 2022 and 2023, and rent inflation decelerated.

The majority of this report is focused on understanding the mechanisms behind the rapid decline and rebound in the rental vacancy rate during the pandemic. Based on quarterly data for 59 large metropolitan areas (“metros”) from 2011 through 2019, I use a panel model to determine the degree to which vacancy rate changes during the pandemic can be explained by factors that typically explain trends in the rental vacancy rate: population, per capita income, the number of rental units, and rent four quarters earlier. My results suggest that, in the average metro, increases in per capita income lowered rental vacancy rates (especially in 2021) and increases in rent raised vacancy rates (especially in 2022).

The panel model explains much of the change in the average metro’s rental vacancy rate in 2020 and 2022, but less than half of this rate’s drop in 2021. To shed light on additional factors that affected rental vacancy rates during the pandemic, I use cross-sectional models to determine what is associated with vacancy rate differences across metros. These models focus on a few key factors:

- Eviction moratoria and special assistance programs to help people stay in their homes were put in place in 2020 and 2021. The lower-than-typical number of evictions may have kept rental units occupied and reduced the rental vacancy rate.
- Domestic migration patterns changed during the pandemic, likely raising demand for rental housing in some metros and lowering demand in other metros.
- Far fewer immigrants arrived in 2020 and 2021 than was typical in the years leading up to the pandemic, likely reducing demand for rental housing in metros that were immigrant gateways in the 2010s.
- During the pandemic, it became more difficult for homebuyers to find a home to purchase. This tightening of the for-sale housing market may have increased demand for rental housing and thereby reduced the rental vacancy rate.

Using separate models for each year, the results suggest that drops in evictions and the changes in domestic migration patterns contributed to changes in the vacancy rate in 2020 and 2021, but these effects had largely faded by the end of 2022. During all three of these years, reduced immigration raised rental vacancy rates in metros with a high proportion of new immigrants in the years leading up to the pandemic. The relationship between the tightness of the for-sale housing market and rental vacancy rate is clearest in 2022; all else equal, the more a metro’s for-sale housing market tightened between 2019 and 2022, the lower the metro’s rental vacancy rate in 2022.

All told, this analysis suggests that increasing the supply of housing would reduce future rent inflation. The report closes with a discussion of two ways governments could foster the growth of housing supply: loosening zoning restrictions and increasing the supply of skilled construction labor.

Introduction

One reason overall inflation was elevated in 2021, 2022, and 2023 is that rent inflation was unusually high. Rent rose 8.8 percent in the 12 months leading up to March 2023. Economic conditions during this period were very different than they were the last time rent inflation was that high, the 12 months leading up to April 1982.² In the earlier 12-month period, the economy was in a recession and the unemployment rate averaged 8.0 percent, while in the more recent 12-month period, the economy had largely recovered from the COVID-19 pandemic and the unemployment rate averaged 3.6 percent.³ What these two periods do have in common is low rental vacancy rates.

The rental vacancy rate, the percentage of rental housing units that are not occupied, is a key determinant of rent inflation. A lower rental vacancy rate makes finding rental housing more difficult, putting upward pressure on rents. I will refer to the rental vacancy rate as the “vacancy rate.” Figure 1 plots the quarterly vacancy rate on the horizontal axis and annualized one-quarter rent inflation on the vertical axis. The green line summarizes the relationship between the vacancy rate and rent inflation.⁴ From 1960:Q1 through 2023:Q4, the relationship between the vacancy rate and rent inflation is nonlinear. If the vacancy rate falls from 8 percent to 7 percent, the associated increase in annualized rent inflation is 0.5 percentage points. An equal-sized drop in the vacancy rate from 7 percent to 6 percent is associated with a 1.5 percentage point increase in annualized rent inflation. Thus, when the vacancy rate is low, a further decline is associated with a large increase in rent inflation. This is what happened during the pandemic.

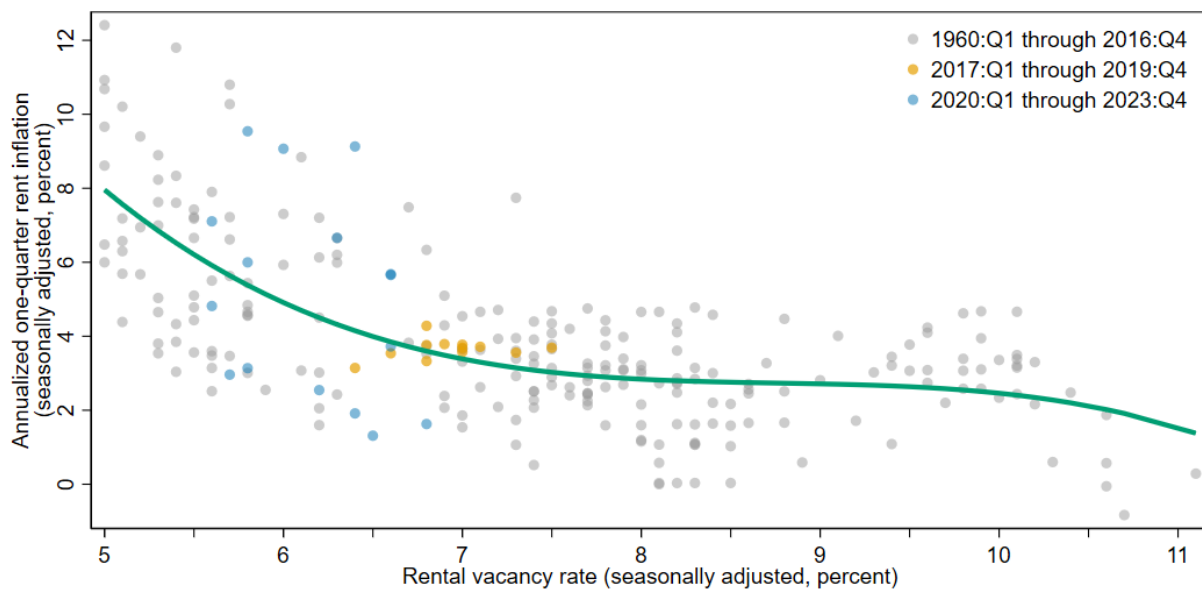
In the three years prior to the pandemic (orange dots), the vacancy rate hovered around 7 percent, the range where rent starts to respond more dramatically to drops in the vacancy rate. Figure 2 shows how the vacancy rate and quarterly rent inflation evolved from 2019 through 2023. The vacancy rate fell rapidly in 2021, reaching as low as 5.6 percent. As the vacancy rate fell, rent inflation accelerated, and it continued to accelerate while the vacancy rate was low in 2022. As the vacancy rate rose in 2023, rent inflation decelerated. The blue dots in Figure 1 show that rent inflation during the pandemic was on par with that during past periods with similar vacancy rates. Thus, to understand recent rent inflation, one must understand why the vacancy rate was low during the pandemic, which is the focus of this report.

² The rent inflation measure referred to in the two prior sentences is the 12-month change in the rental of tenant-occupied nonfarm housing price index for personal consumption expenditures published by the Bureau of Economic Analysis (BEA).

³ Based on 12-month averages of the total US unemployment rate published by the Bureau of Labor Statistics (BLS).

⁴ The rent measure used in this graph is the rental of tenant-occupied nonfarm housing price index for personal consumption expenditures published by the BEA. The rental vacancy rate is from the Census Bureau’s Housing Vacancy Survey. The green line is a fitted line from a cubic regression.

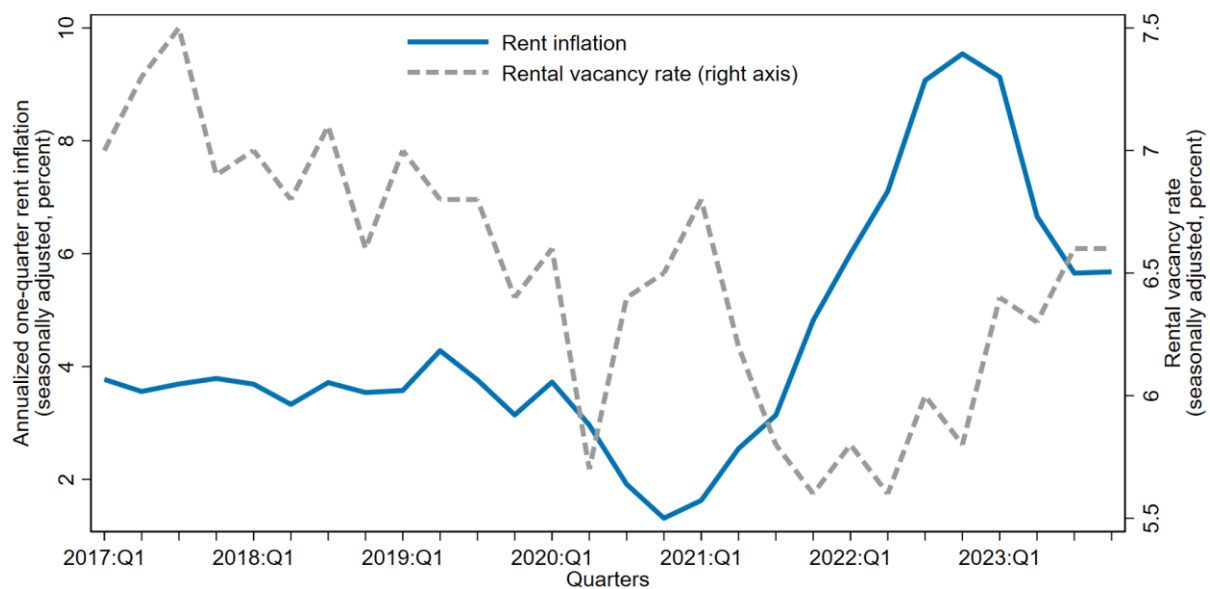
Figure 1. Quarterly Rent Inflation and Rental Vacancy Rate, United States, 1960 through 2023



Sources: BEA and Census Bureau (accessed via Haver Analytics)

Note: The solid line summarizes the relationship between the vacancy rate and rent inflation.

Figure 2. Rent Inflation and Rental Vacancy Rate by Quarter, United States, 2019 through 2023



Sources: BEA and Census Bureau (accessed via Haver Analytics)

The analysis in this report suggests that vacancy rates were especially low in 2021 and 2022 because of both the pandemic and longer-term trends. The longer-term trends that I find to have reduced vacancy rates include stagnant construction of new rental units, increased household formation, and a tight for-sale housing market. Based on the regression analysis later in the report, pandemic-related factors that appear to have reduced the vacancy rate include disruptions in domestic migration patterns and programs such as the eviction moratoria and stimulus payments. These factors were partially offset by low immigration during the pandemic.

Since mid-2022, the pandemic-related effects on vacancies have dissipated, and the completion of new rental units has increased. Thus, the vacancy rate has risen, and rent inflation has slowed, as shown in Figure 2. However, as of the fourth quarter of 2023, the vacancy rate remained low at 6.6 percent, 0.3 percentage points below the quarterly average from 2017 through 2019.

The vacancy rate could fall further in the next few years, if, for example, household formation remains elevated or the for-sale housing market becomes tighter. A further drop in the vacancy rate could lead to another acceleration in rent inflation. Increasing the construction of housing, especially rental housing, could help mitigate this inflation risk. This report closes with a discussion of policies and programs that could be used to increase housing construction.

Trends Affecting Vacancy Rates

As shown in Figure 2, the vacancy rate was trending down before the pandemic and was unusually low in 2018 and 2019. This set the stage for large increases in rents when the vacancy rate dropped sharply during the pandemic.

Vacancy rates respond to changes in rental housing supply and demand. Increasing the number of rental housing units should raise the vacancy rate, all else equal. Growth in population and per capita income increases demand for rental housing, which reduces vacancy rates. Finally, housing supply and demand respond to rent levels, with rent increases raising vacancy rates, all else equal.

The following is a preview of the analysis in the remainder of this section. The trends that seem to have contributed most to the vacancy rate's falling before the pandemic are rising household formation and stagnant housing construction. These trends largely continued through the pandemic. Neither per capita income nor the tightness of the for-sale housing market appears to have driven the changes in the vacancy rate before the pandemic, but both experienced large changes during the pandemic that likely reduced the vacancy rate.

Figure 3 shows several trends that affected the United States' vacancy rate in the decade leading up to the pandemic. Notably, the vacancy rate fell even though population growth slowed (panel a). Population growth was stable from 2011 through 2016 but fell from 0.8 percent in 2016 to 0.5 percent in 2019. Population growth slowed even more dramatically for the age group most likely to rent, 20- to 34-year-olds, falling steadily from 1.7 percent in 2011 to 0.2 percent in 2019.

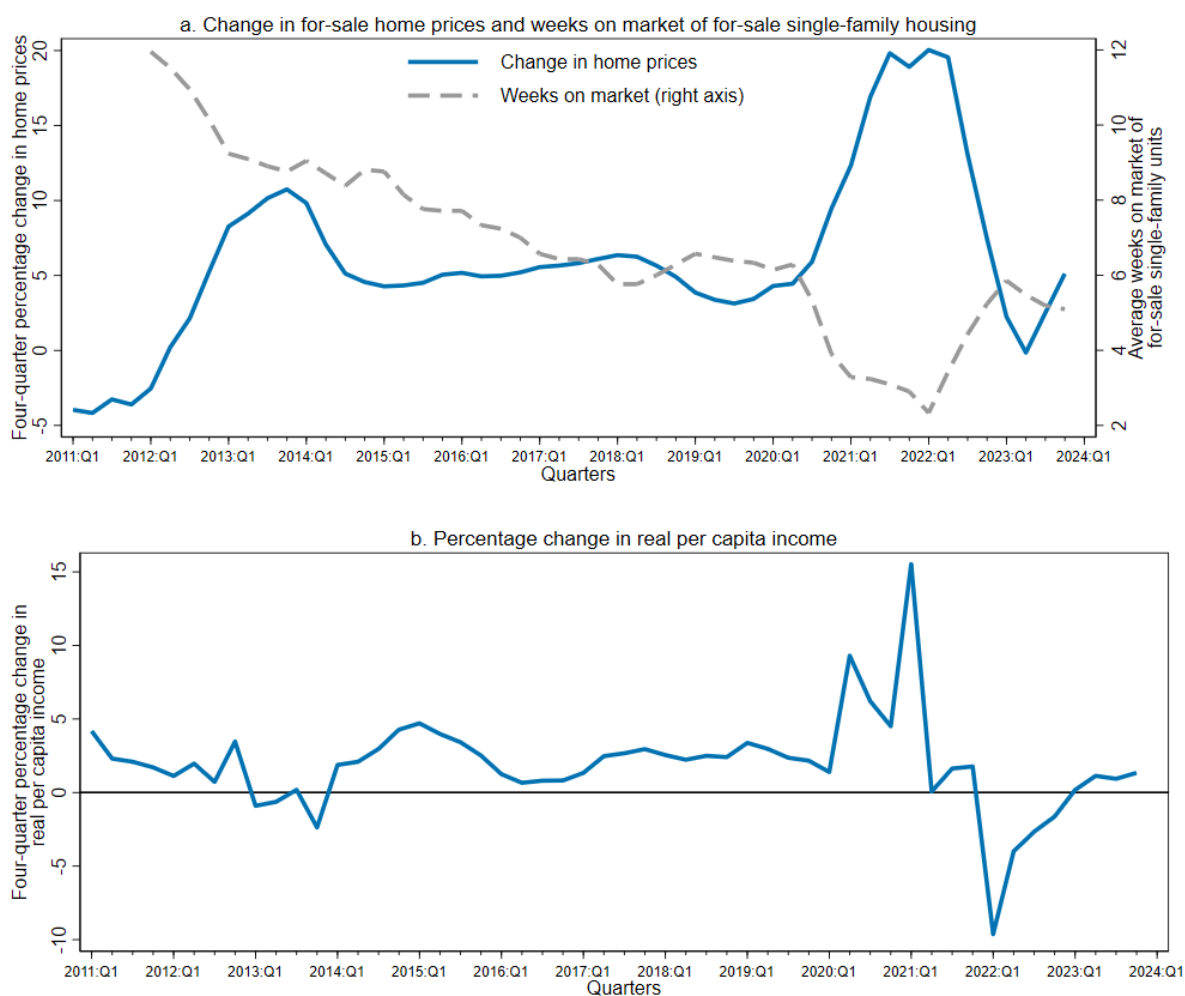
All else equal, the slowdown in population growth should have raised the vacancy rate. One key reason it did not is that the headship rate, the number of households per 100 people, has risen dramatically since 2017 (dashed line in Figure 3, panel a). The higher the headship rate, the more housing units a given population occupies. This rate rose from 37.7 percent in 2017 to 38.3 percent in 2019, and further to 40 percent in 2022. These are quantitatively important changes; had the headship rate remained at its 2017 level, there would have been 7.7 million fewer households in 2022, a 6 percent drop. There has been little research on the causes of the recent changes in headship rates. Potential explanations include economic expansion throughout the 2010s (Choi and Painter, 2015), the aging of the population (Khater et al., 2018), and millennials' returning to more normal headship rates after delaying household formation (McCue, 2023). Regardless of the cause, the rise in the headship rate would be expected to reduce the vacancy rate.

Figure 3. Growth of Population and Headship Rates and Change in Amount of Rental Housing, United States, 2011 through 2023



Sources: Census Bureau (via Haver Analytics)

Figure 4. Prices and Weeks on Market of For-Sale Homes and Real Per Capita Income, United States, 2011 through 2023



Sources: CoreLogic, Redfin, and BEA (via Haver Analytics)

Loewenstein and Meyer (2024) state that if the growth of the housing stock fails to keep pace with the growth in the number of households, then the housing vacancy rate falls. Rather than rising in response to the increase in the headship rate, rental housing construction stagnated in the years leading up to the pandemic (Figure 3, panel b). According to the Census Bureau's New Residential Construction data, the United States added 3.2 million rental units from 2012 through 2015, but only 0.9 million from 2016 through 2019. Multifamily housing starts jumped in 2020 and 2021, but this uptick in construction did not increase the number of rental units until 2023. The nation added 2.1 million rental units from 2020 through 2023.

This report focuses on the rental housing market. However, the for-sale housing market can affect the rental housing market because for-sale and rental housing are substitutes for each other. The for-sale housing market was not especially tight before the pandemic, but it tightened

dramatically in 2020 and 2021, with price growth accelerating and the number of weeks homes were on market falling (Figure 4, panel a). The average number of weeks a home was listed prior to selling at the end of 2021 was less than half that at the end of 2019 (2.9 versus 6.3 weeks). The scarcity of for-sale homes and rising home prices may have led to more people's renting during the pandemic. While the for-sale market is no longer as tight as it was during the pandemic, it remains tighter than before the pandemic. At the end of 2023, the weeks on market measure was lower and home price growth higher than at the end of 2019.

When incomes rise, people tend to consume more housing, and, all else equal, the rental vacancy rate falls. Real per capita income growth was fairly steady from 2016 through 2019 (Figure 4, panel b); thus, income growth likely did not play a large role in the prepandemic drop in the vacancy rate. Per capita income saw large increases in 2020 and 2021 that may have reduced vacancy rates during the pandemic. These increases were largely due to pandemic-related stimulus payments and social insurance. Strong wage growth in 2022 and 2023 has kept per capita income above prepandemic levels.⁵

Prepandemic trends and some aspects of the pandemic contributed to the vacancy rate drops in 2020 and 2021. Keep these broader trends in mind as I examine the changes in vacancy rates in greater detail below.

Empirical Approach and Data

The data analysis in this report has two stages, each focused on one of two questions:

1. How much of the drop and rebound in the vacancy rate during the pandemic can be explained by the variables that explain the vacancy rate in a typical year?
2. What additional aspects of the pandemic appear to have affected the vacancy rate?

The first stage estimates the typical relationship between vacancy rates and their determinants, such as rental housing construction, population growth, the age distribution of the population, and per capita income. This is done with a regression using metro-by-quarter data from 2011:Q1 through 2019:Q4. Applying these estimates to data from the pandemic quarters (defined here as 2020:Q1 through 2022:Q4) shows how much of the changes in vacancy rates during the pandemic were due to changes in the factors that normally determine vacancy rates.

The second stage explores other channels by which the pandemic may have affected vacancy rates. The regressions in this stage look at differences across metro areas to see which factors are associated with lower vacancy rates.⁶ I focus on the fourth quarters of 2020, 2021, and 2022. Given how rapidly the economic environment changed during the pandemic, the factors that

⁵ According to the BLS's Current Employment Statistics, average hourly earnings rose by 4.9 percent in 2022 and 4.3 percent in 2023. By comparison, annual wage growth averaged 2.9 percent from 2015 through 2019.

⁶ Using two stages also makes it straightforward to include variables in the second stage that are not available from 2011 through 2019.

explain vacancy rates may have changed across these three years. To accommodate these changes and make the results easier to interpret, I use a separate regression for each quarter.

I have assembled real estate and demographic data from several sources: CBRE (formerly Coldwell Banker Richard Ellis), the American Community Survey, Census Population Estimates, Redfin, Federal Reserve Bank of New York Consumer Credit Panel data, and eviction data from three sources.⁷ The CBRE data are especially important to the analysis because they provide quarterly data on vacancy rates, rents, and the number of rental housing units in large metro areas. CBRE's estimates of these measures appear to be subject to less sampling error than estimates available from other sources. Thus, I have restricted the analysis to metro areas covered by CBRE.

Most of the 65 markets covered by CBRE have the same boundaries as the related metropolitan statistical areas (MSAs); some combine multiple MSAs, and a small number of MSAs are divided into two or three separate markets. Where CBRE combines MSAs, I aggregate the MSA-level data from other sources to match CBRE's market area. Where CBRE subdivides MSAs, I aggregate the CBRE data to the MSA level. I refer to the geographic units that result from this process as "metros." I have 59 metros in my sample, 42 of which have eviction data for some prepandemic and pandemic years.

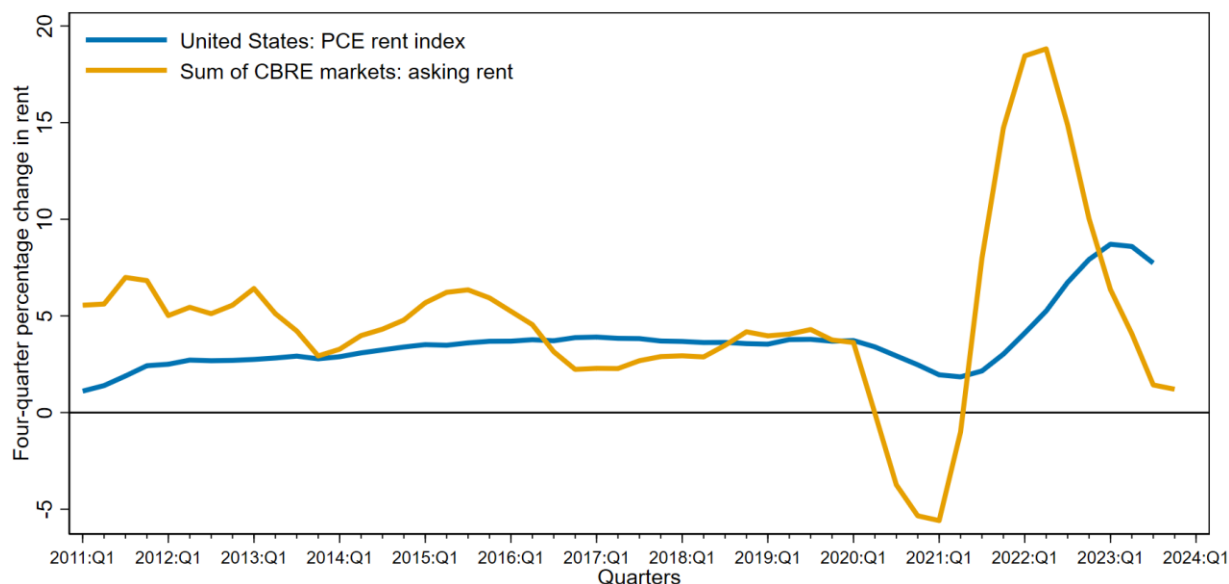
The CBRE data have some limitations. First, the data are not fully representative of the rental market in a metro because CBRE surveys managers of large multiunit apartment buildings. This means the CBRE data reflect neither the single-family rental market nor small multiunit buildings. The second limitation is that they only cover large metro areas and thus do not capture changes that affect only smaller metro areas. Even with these limitations, the vacancy rate from CBRE for the sum of the markets it covers was highly correlated with the national vacancy rate from the Census Bureau's Housing Vacancy Survey, with a correlation coefficient of 0.68 from 2011:Q1 through 2023:Q4.

The first-stage regressions include CBRE rent from four quarters earlier as an explanatory variable. CBRE measures the median rent per square foot for currently available rental units, called "asking rent."⁸ This is not the same as the average rent of all occupied rental units, which is the type of rent the CPI and PCE price indexes measure. These price indexes are less responsive to the conditions in the rental market in a particular quarter than is the asking rent (Adams et al., 2022). Thus, the changes in asking rent during the pandemic were larger and more rapid than the changes in the PCE rent index (Figure 5).

⁷ The eviction data are the superset of the data available from Eviction Lab (Hepburn, Louis, and Desmond, 2020), Legal Services Corporation (2022), and Martin (2023) for the metros included in CBRE data. See Appendix for further details on the eviction data.

⁸ An available unit is one that is listed for rent. Some available units are occupied, and not all vacant units are listed for rent.

Figure 5. Rent Inflation, United States and Sum of CBRE Markets, 2011 through 2023



Sources: Census Bureau and BEA (via Haver Analytics) and CBRE

Determinants of Vacancy Rates Prior to the Pandemic

The first-stage regression, looking at which variables usually explain metros' vacancy rates, is shown in Table 1 below. This regression uses metro-by-quarter data from 2011 through 2019 and includes metro fixed effects. The results are as expected: income growth and population growth (especially of young adults) are associated with a falling vacancy rate, while increases in rent and the number of rental units are associated with a rising vacancy rate.

This parsimonious model explains over one-third of the within-metro variation in vacancy rates across quarters. It captures the vacancy rate trends in a diverse range of metros, including Boston, Las Vegas, and San Francisco (Figure 6). While the model generally fits the data well, in some metros, the model overestimates the vacancy rates in 2018 and 2019. This appears to be partly due to the rise in headship rates described in a previous section of this report. In the fourth quarter of 2019, the model tends to overestimate vacancy rates by a larger amount in metros with greater-than-average headship rate increases between 2017 and 2019.⁹

⁹ To test this, I use metro-level data to regress the change in the difference between actual and predicted vacancy rates from 2017:Q4 through 2019:Q4 on the change in the headship rate from 2017 through 2019. The slope coefficient on the change in the headship rate is -0.47 and is statistically significant at the 5 percent level. The units for both changes are percentage points, the regression estimator is robust to outliers, and the metro-level headship rates are calculated from one-year American Community Survey estimates.

Table 1. Quarterly Apartment Vacancy Rate Panel Regression

Explanatory variables	Prepandemic quarters
Natural logarithm of	
Number of rental housing units	13.435*** (2.575)
Total population	-14.567** (5.862)
Population aged 20 through 34	-6.853** (3.385)
Real per capita income	-9.357*** (2.956)
Four-quarter lag of rent per square foot	6.101*** (1.437)
Time trend	-0.050*** (0.017)
Metro-by-quarter observations	2,124
Metros	59
R-squareds	
Within	0.38
Between	0.00
Overall	0.00
Metro fixed effects	Yes

Sources: CBRE, Census Bureau, and author's calculations

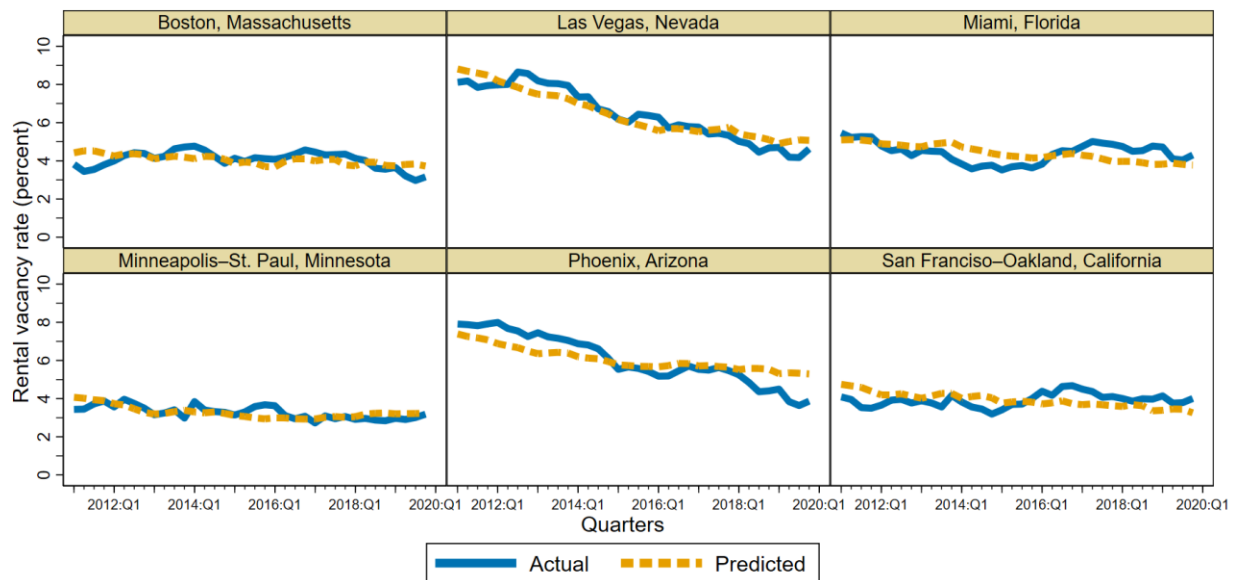
Notes: Regression estimated with data from 2011:Q1 through 2019:Q4. Asterisks denote the level of statistical significance: * = 10 percent, ** = 5 percent, and *** = 1 percent. Standard errors clustered by metro. See Table A1 in Appendix for definitions, sources, and summary statistics of variables used in the regression.

Figure 7 shows the actual and predicted vacancy rates for the six metros in the Fourth District that are included in the CBRE data.¹⁰ The model fits the data well in the Cincinnati, Cleveland–Akron, Columbus, and Lexington metros.¹¹ Actual and predicted vacancy rates have trended down in these metros since 2011, as they have in many other metros. The model does not perform as well in the Dayton and Pittsburgh metros, which have more volatile vacancy rates than most other metros.

¹⁰ The Fourth District encompasses Ohio, western Pennsylvania, eastern Kentucky, and the northern panhandle of West Virginia.

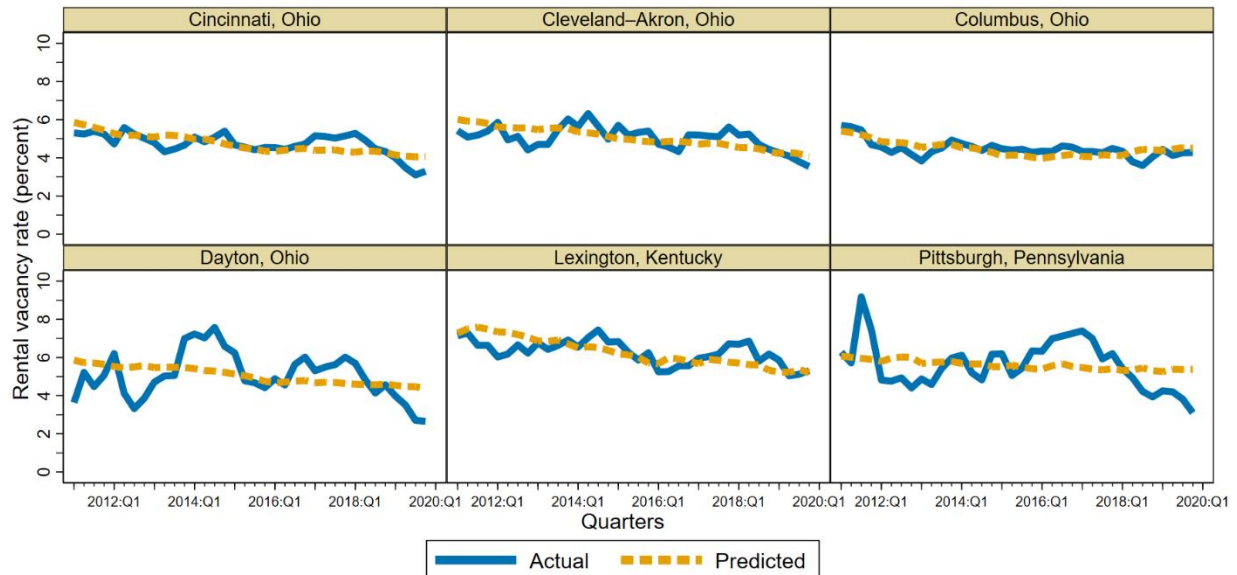
¹¹ The Cleveland–Akron, Ohio, metro covers the Cleveland–Elyria, Ohio, MSA and the Akron, Ohio, MSA.

Figure 6. Actual and Predicted Vacancy Rates, Selected Metros, 2011:Q1 through 2019:Q4



Sources: CBRE, Census Bureau, and author's calculations

Figure 7. Actual and Predicted Vacancy Rates, Selected Fourth District Metros, 2011:Q1 through 2019:Q4

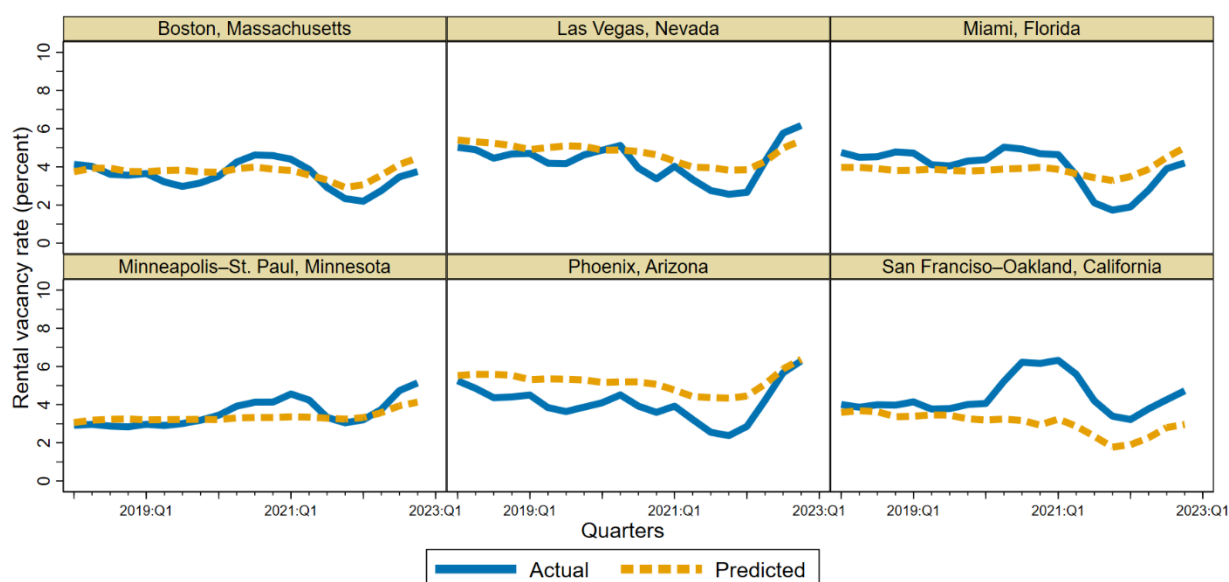


Sources: CBRE, Census Bureau, and author's calculations

Changes in Vacancy Rates during the Pandemic

I now turn to changes in vacancy rates during the pandemic. The model in Table 1 was estimated with data from 2011 through 2019. Figures 8 and 9 show actual vacancy rates and vacancy rates predicted by that model for 2018 through 2022. The path of vacancy rates during 2020 varied dramatically across metros. Some metros had sharp increases in vacancy rates, for example, Boston and San Francisco (Figure 8). Vacancy rates in many other metros stayed on trend in 2020, for example, in Cincinnati and Cleveland (Figure 9). In nearly all metros, the vacancy rate dropped sharply in 2021 and recovered rapidly in 2022. Another pattern common to nearly all metros is that predicted vacancy rates fell in 2021 and rose in 2022, but the changes in predicted vacancy rates were small relative to the changes in actual vacancy rates. This suggests that the pandemic temporarily affected vacancy rates in ways not captured by the first-stage regression; I will return to this topic later.

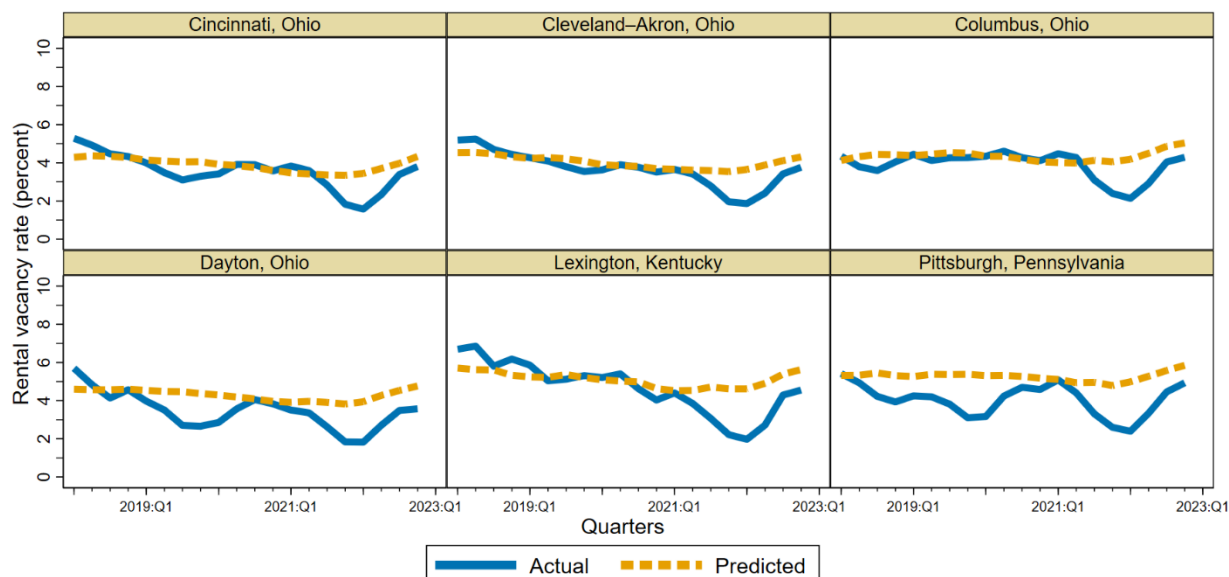
Figure 8. Actual and Predicted Vacancy Rates, Selected Metros, 2018:Q1 through 2022:Q4



Sources: CBRE, Census Bureau, and author's calculations

Figure 9 shows the actual and predicted vacancy rates from 2018 through 2022 for six Fourth District metros. The vacancy rate changes in these metros were similar to those experienced by other metros. Each of the Fourth District metros experienced declines in their actual and predicted vacancy rates in 2021 and rebounds in both vacancy rates in 2022, with the changes in the actual vacancy rate larger than in the predicted vacancy rate.

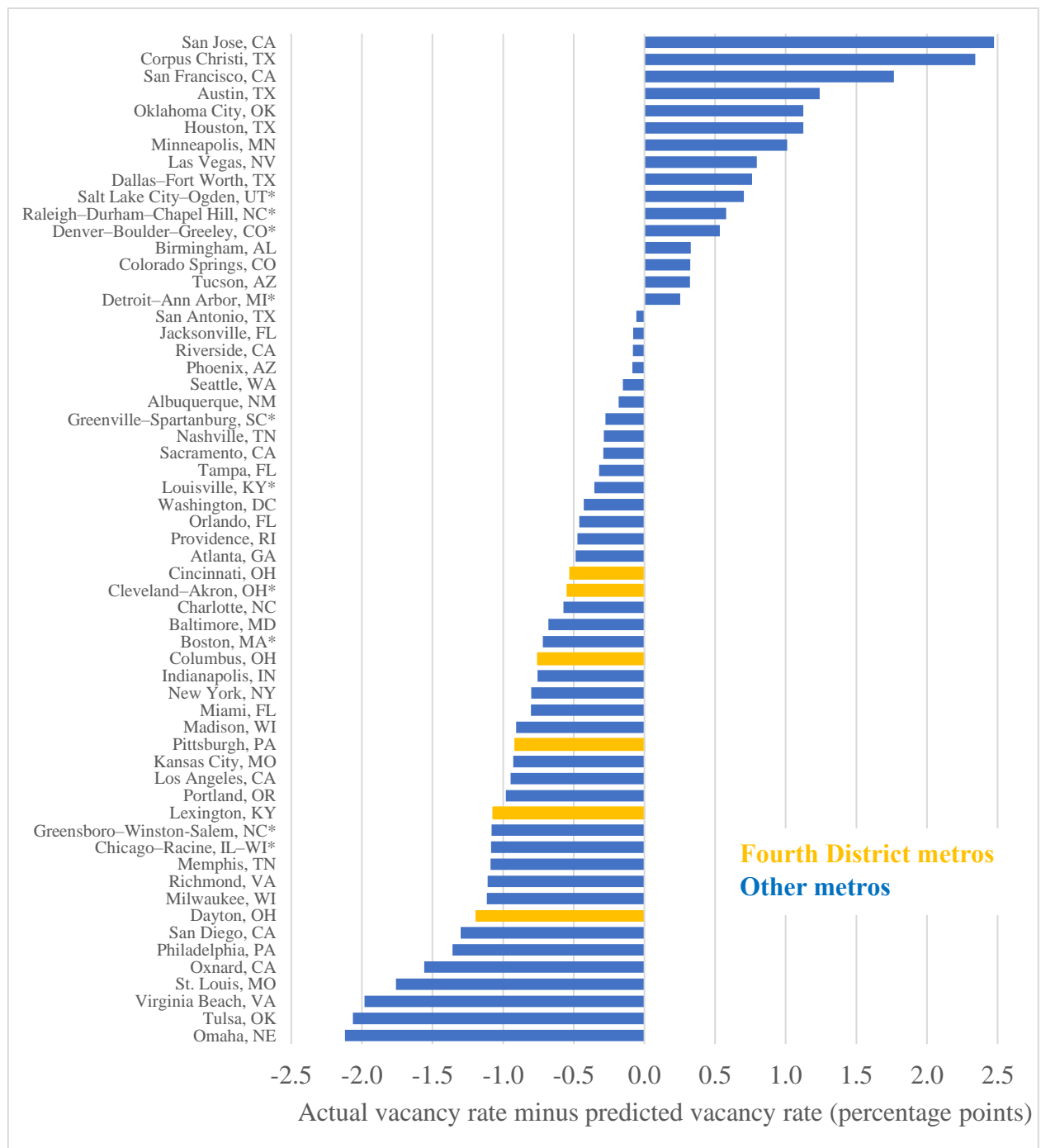
Figure 9. Actual and Predicted Vacancy Rates, Selected Metros, 2018:Q1 through 2022:Q4



Sources: CBRE, Census Bureau, and author's calculations

The gap between the actual and predicted vacancy rates in the fourth quarter of 2022 indicates the degree to which vacancy rates had returned to normal by the end of 2022. Figure 10 shows the size of this gap for each of the 59 metros. A negative gap means the metro's actual vacancy rate was lower than normal, and a positive gap means the metro's actual vacancy rate was higher than normal. The size of this gap varies dramatically across metros, ranging from down 2.1 percentage points in Omaha, Nebraska, to up 2.5 percentage points in San Jose, California. In all six Fourth District metros, the actual vacancy rates were lower than normal at the end of 2022. The gaps of Dayton, Lexington, and Pittsburgh ranked in the bottom third of all the metros. This suggests that, in those three Fourth District metros, relative to other metros, vacancy rates have been trending down faster or the effects of the pandemic on vacancy rates have lingered longer, or both.

Figure 10. Gap between Actual and Predicted Vacancy Rates by Metro, 2022:Q4



Sources: CBRE, Census Bureau, and author's calculations

Note: See body of text for details. Metros named based on the principal city in the MSA.

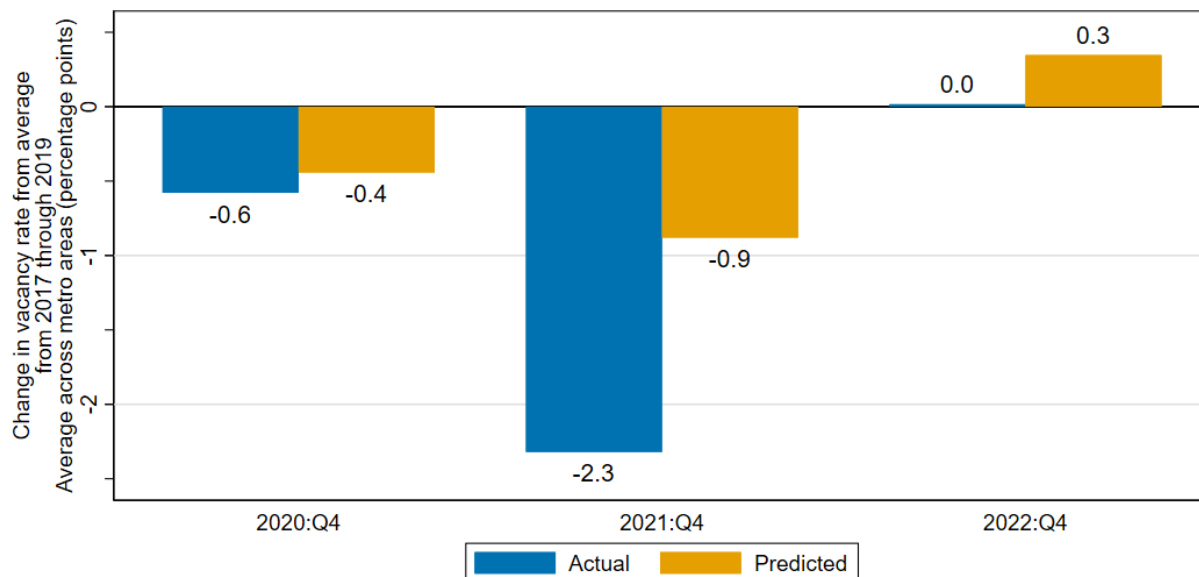
*Indicates that this metro is a combination of two or more MSAs.

Sources of Changes in Predicted Vacancy Rates

The change in vacancy rates during the pandemic can be broken into two components. The first is explained by changes in the explanatory variables in the first-stage regression; this is the predicted change. The second is the change in vacancy rates that is not explained by the variables in the first-stage regression; this is the residual change. These components are shown in Figure 11, which displays the average actual and predicted difference between a quarter's vacancy rate and the average from 2017 through 2019 (the base period). In each quarter, the predicted bar is the predicted change based on the averages of the explanatory variables across metros, and the difference between the actual and predicted bar is the residual change.

Averaging across metros, in 2020:Q4, the predicted change is twice as large as the residual change (−0.4 and −0.2 percentage points, respectively), which means that most of the change in 2020 is explained by the variables in the first-stage regression. By contrast, in 2021:Q4, the predicted change is smaller than the residual change (−0.9 versus −1.4 percentage points, respectively), which suggests that factors not captured in the first-stage regression played a large role in the drop in vacancy rates in 2021. In 2022:Q4, on average, the actual vacancy rate was back to the prepandemic level, while the predicted vacancy rate was 0.3 percentage points higher than in the base period. This means the average residual change in 2022:Q4 was −0.3 percentage points.

Figure 11. Average Change from Average Vacancy Rate for 2017 through 2019, Actual and Predicted Vacancy Rates, 2020 through 2022, Fourth Quarters



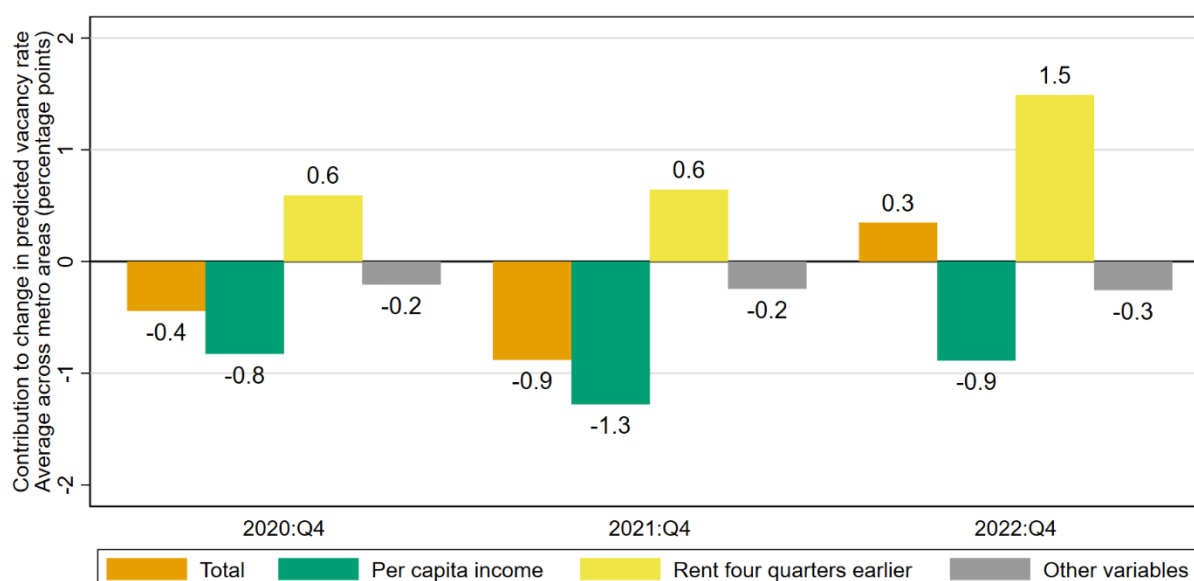
Sources: CBRE, Census Bureau, and author's calculations

Note: Predicted vacancy rate calculated with coefficients from Table 1 and averages across metros of explanatory variables.

Figure 12 looks at the contribution of specific explanatory variables to the predicted changes in vacancy rates by quarter. Per capita income growth reduced predicted vacancy rates in all three

quarters, with the largest reduction in 2021. The federal stimulus programs partly explained the high per capita income in 2020 and 2021. Following the end of the stimulus programs, per capita income was lower in 2022 than in 2021, making the reduction in predicted vacancy rates smaller in 2022 than in 2021. Rent inflation in the prior year increased the predicted vacancy rates in each period. Because of the elevated rent inflation in 2021, the contribution of rent inflation in 2022 was more than double that in 2020 or in 2021. Together, the remaining variables in the model (population, housing units, and time trend) modestly reduced predicted vacancy rates, and the size of the reduction was similar in all three quarters.

Figure 12. Contribution of Explanatory Variables to Changes in Predicted Vacancy Rates, Average Across Metros, 2020 through 2022, Fourth Quarters



Sources: CBRE, Census Bureau, and author's calculations

Residual Changes in Vacancy Rates

I now look at the other component of changes in vacancy rates during the pandemic, the residual change in vacancy rate. This subsection focuses on factors that may have had a large impact on vacancy rates during the pandemic but are immaterial in a typical year. Key examples that can be measured at the metro area level include programs that reduced evictions, rapid tightening of the for-sale housing market, and atypical immigration and domestic migration patterns. Examining the relationships between these factors and metros' residual changes, like those shown in Figure 10 above, sheds light on the channels by which the pandemic affected vacancy rates and why changes in vacancy rates during the pandemic differed across metros.

In response to the pandemic, government programs were put in place to prevent evictions (Martin, 2022). In 2020 and 2021, eviction moratoria and rental assistance programs were designed to help renters stay in their homes during the pandemic. Other, more general programs that added to households' income, such as Pandemic Unemployment Assistance, may have also prevented evictions. Hepburn et al. (2021) estimate that in 2020, "... at least 1.55 million fewer

eviction cases were filed than would be expected in a normal year.” After being evicted, many households either combine with an existing household or become homeless, both of which result in fewer occupied rental units. Thus, the eviction moratoria, rental assistance programs, and other assistance likely reduced the vacancy rate.

During the pandemic, interest in buying a home surged and the number of homes for sale fell, making it more difficult and expensive to buy a home. The sudden tightening of the for-sale market likely reduced the vacancy rate because it prevented some renters from transitioning to homeownership. This would happen in response to the higher home prices or because the renters were unable to find a home to buy, either of which would increase demand for rental housing.

Immigration fell dramatically during the pandemic (Peri and Zaiour, 2023). The average annual increase in the foreign-born population of the United States in 2020 and 2021 (168,000) was roughly one-third of the average annual increase between 2015 and 2019 (506,000).¹² The drop in immigration may have increased vacancy rates, especially in metros that attracted a disproportionate share of immigrants prior to the pandemic.

The pandemic also changed domestic migration patterns (Whitaker, 2021a; Whitaker, 2021b; Peri and Zaiour, 2023). This happened for several reasons, including remote-work arrangements that enabled people to live further from work, colleges’ being remote, and people’s choosing to live in less dense areas to avoid COVID-19. Regardless of the cause, the migration changes would be expected to reduce vacancy rates in metros where net migration rose and increase vacancy rates in metros where net migration fell.¹³ However, they should have little effect on the national vacancy rate.

The pandemic may have affected vacancy rates in other ways. The number of adults living with their parents or grandparents rose (Amorim and Pilkauskas, 2023). Some healthcare workers rented additional apartments to live in part time to protect their families from exposure to COVID-19 (Ellis, 2020). Some people who were previously roommates moved into separate apartments (Bogel-Burroughs, 2020), while other people combined households (Kaufman, 2020). While these responses to the pandemic are interesting and worthy of study, they are difficult to measure and are beyond the scope of this report.

Table 2 provides summary statistics for the variables in the second-stage regressions. The dependent variable in these models is the residual vacancy rate, which is the difference between the metro’s actual vacancy rate and the vacancy rate predicted by the panel regression in Table 1. The residual vacancy rate is essentially the component of the metro’s vacancy rate that is not explained by population, per capita income, rent levels, or changes in the total number of rental units.

¹² Based on one-year American Community Survey estimates.

¹³ Net migration is the difference between incoming and outgoing migrants.

Table 2. Summary Statistics for Residual Vacancy Rate Regressions, 2020 through 2022, Fourth Quarters

Variable	Fourth quarters of		
	2020	2021	2022
Residual vacancy rate	-0.129	-1.433	-0.323
(in percentage points)	(1.236)	(1.089)	(0.990)
Change from 2019 average in four-quarter average of			
Weeks for-sale homes are on the market	-1.497	-4.068	-3.756
	(0.702)	(1.220)	(1.620)
Net domestic migration rate	-0.123	-0.143	-0.428
(migrants per 1,000 people)	(0.750)	(1.086)	(1.039)
Cumulative difference from 2019 eviction rate	-1.343	-2.586	-2.815
(filings per 1,000 renter households)	(0.824)	(1.934)	(2.506)
No eviction data available	0.305	0.305	0.305
(1 if no data, 0 if data)	(0.464)	(0.464)	(0.464)
Natural log of 2015 through 2019 immigration rate	3.165	3.165	3.165
(immigrants per 10,000 people)	(0.378)	(0.378)	(0.378)

Sources: American Community Survey, CBRE, Census Bureau, Equifax/FRBNY CCP, Hepburn, Louis, and Desmond (2020), Legal Services Corporation (2022), Martin (2023), Redfin (via Haver Analytics), Stephan Whitaker, and author's calculations

Notes: Summary statistics for the 59 metros are averages and standard deviations (in parentheses). Where eviction data are unavailable for part of a metro, I assume the change in eviction rate in the missing jurisdictions is the same as in the jurisdictions for which data are available. The 18 metros for which no eviction data are available are assigned the average change in eviction rate of the metros with data. See Table A2 in the Appendix for data sources.

The explanatory variables for the second-stage regressions were chosen to capture the ways that the pandemic could affect the vacancy rates discussed above. The average number of weeks homes are on the market and net domestic migration rate are four-quarter moving averages and are each the change from the metro's 2019 average.¹⁴ The immigration rate is measured for a single period (the five-year average from 2015 through 2019) and transformed using a natural logarithm. This does not directly measure what happened to immigration in a metro during the pandemic, but it captures how much the metro would have been exposed to a change in immigration.

The cumulative difference in eviction rates from 2019 is the sum from 2020:Q1 onward of the differences in the eviction filing rate between a given quarter and the average quarter in 2019.¹⁵

¹⁴ The author thanks Stephan Whitaker for providing the domestic migration data, which he tabulated from a random anonymous sample drawn from credit histories maintained by Equifax, known as the Federal Reserve Bank of New York/Equifax Consumer Credit Panel. See Whitaker (2021a) for more information on source data and methodology for tabulations.

¹⁵ In some metro areas, eviction data were only available for some counties or cities within the metro area. I use the data for available jurisdictions and assume this rate applies to the metro area. The basis for this assumption is that

Most metros had fewer eviction filings in 2020 than in 2019. I use the cumulative difference in eviction rates because the effect of the number of eviction filings in 2021 and 2022 depends on whether eviction filings remained low or were elevated to make up for evictions delayed in prior years. For example, if an eviction were prevented in 2020 by an eviction moratorium or rental assistance, this could reduce vacancy rates in 2020, 2021, and 2022. If the eviction were only delayed, occurring in 2021 instead of 2020, this could reduce vacancy rates in 2020 and increase vacancy rates in 2021 and 2022.

The interpretation of the regression results depends on the regression coefficients and how an explanatory variable changed during the pandemic. For example, eviction filings were depressed in 2020, which makes the difference between eviction filings in 2019 and 2020 negative. If the regression coefficient on the cumulative change in the eviction rate were positive in 2020, then the regression would indicate that vacancy rates were decreased by the reduction in the eviction rate. Comparing the regression coefficients across years shows how the relationship between a given variable and residual vacancy rates changed over the course of the pandemic.

The results from the second-stage regressions are shown in Table 3.¹⁶ These regressions help identify factors that may explain why vacancy rates during the pandemic were different from what would be expected based on the factors that explained vacancy rates prior to the pandemic. I will first provide an overview of the results by year and then look at each of the explanatory variables in the models in more detail.

The reasons for vacancy rate changes varied across years. The results in Table 3 suggest that, in 2020 and 2021, the reduction in eviction rates decreased vacancy rates, low immigration increased vacancy rates, and changes in domestic migration helped explain the vacancy rate differences across metros. The coefficients on these three variables are smaller in 2021 than in 2020. This suggests, for example, that the same-sized increase in net domestic migration is associated with a smaller decrease in the residual vacancy rate in 2021 than in 2020. In 2022, the loosening of the for-sale housing market appears to have helped vacancy rates rebound, and the low levels of immigration during the pandemic continued to elevate vacancy rates.

the eviction moratoria were generally enacted at the state or federal level. I was unable to find a source for any eviction data for 18 of the metro areas in my sample. I added an indicator variable for these metro areas and set their cumulative difference in eviction rate at the quarter's average. I did this to increase the number of observations in the regression sample and because a number of populous metros are among those without eviction data, including Chicago and Los Angeles. I have also estimated these regressions using only the 41 metro areas that have eviction data; the results are qualitatively similar, though some coefficients become statistically insignificant.

¹⁶ My regression sample includes 59 metro areas. Because the sample is small, the results can be sensitive to outliers (metro areas with data that look very different from those of the other metro areas). The regressions in Table 3 use automatic outlier detection and give outliers less weight in order to produce estimates that are robust to outliers. These regressions were estimated with the *rreg* command in Stata 17.0. See StataCorp (2021) for additional details.

Table 3. Cross-Sectional Residual Vacancy Rate Regressions, 2020 through 2022, Fourth Quarters

Explanatory variables	2020	2021	2022
Change from 2019 average in four-quarter average of			
Weeks homes are on the market	0.165 (0.194)	0.089 (0.126)	0.277*** (0.093)
Net domestic migration rate (migrants per 1,000 people)	-0.479** (0.182)	-0.262* (0.135)	0.105 (0.137)
Cumulative difference from 2019 eviction rate (filings per 1,000 renter households)	0.503*** (0.161)	0.179*** (0.057)	0.057 (0.047)
No eviction data available (1 if no data, 0 if data)	-0.104 (0.283)	-0.163 (0.227)	-0.166 (0.250)
Natural log of 2015 through 2019 immigration rate (immigrants per 10,000 people)	1.072*** (0.372)	0.577* (0.290)	0.617* (0.310)
Observations	59	59	59
R-squared	0.42	0.41	0.30

Sources: American Community Survey, CBRE, Census Bureau, Equifax/FRBNY CCP, Hepburn, Louis, and Desmond (2020), Legal Services Corporation (2022), Martin (2023), Redfin (via Haver Analytics), Stephan Whitaker, and author's calculations

Notes: Asterisks denote level of statistical significance: * = 10 percent, ** = 5 percent, and *** = 1 percent. Estimator used is robust to outliers.

The change in weeks that homes are on the for-sale market is significantly associated with residual vacancy rates in 2022. This suggests that metros in which the for-sale housing market tightened more between 2019 and the end of 2022 experienced larger reductions in vacancy rates. In 2022, a one-week drop in time on market is associated with a 0.3 percentage point reduction in the residual vacancy rate. These cross-sectional models include the change in the net domestic migration rate, and the first-stage model includes population growth. Having these controls suggests that the coefficients on the change in weeks on market are capturing how the tightness of the for-sale market affected vacancy rates, not whether demand for housing in the market changed overall.

The coefficient on the change in the net domestic migration rate is statistically significant at the 5 percent level in 2020 and at the 10 percent level in 2021. An additional migrant per 1,000 people is associated with a 0.5 percentage point residual vacancy rate decrease in 2020. The change in net domestic migration rates does not help explain residual vacancy rates in 2022. The first stage of the analysis controlled for log total population and log population aged 20 through 34. It is not obvious that changes in net domestic migration rates should have effects on the vacancy rate above and beyond their effect on the population. It may have taken time for the changes in domestic migration patterns to be captured in the population estimates, which would explain why the coefficient on domestic migration was furthest from zero in the 2020 regression.

The results suggest that the eviction moratoria, rental assistance, and other programs reduced the vacancy rate in 2020 and 2021, but by the end of 2022, their effect had largely faded. In both 2020 and 2021, the cumulative change in the eviction filings rate is significantly associated with the unexplained part of the vacancy rate. The reduction in the residual vacancy rate associated with one fewer eviction filing per 1,000 renter households is 0.5 percentage points in 2020 and 0.2 percentage points in 2021. In 2022, the relationship between the cumulative change in the eviction rate and the residual vacancy rate is statistically insignificant and smaller in magnitude than in 2020 and 2021.

All else equal, metros with higher immigration rates in the years prior to the pandemic tended to have higher vacancy rates during the pandemic than other metros. This was especially true in 2020. A 1 percent increase in immigration rate is associated with a residual vacancy rate increase of 1.1 percentage points in 2020 and 0.6 percentage points in 2021 and 2022.¹⁷ This is consistent with immigration's being more depressed in 2020 than in 2021 and 2022. It also suggests that the immigration lost during 2020 had not been fully made up by the end of 2022.

These results, which are from the regressions in Table 3, should not be interpreted as causal evidence. Instead, they provide suggestive evidence about the reasons vacancy rates changed rapidly during the pandemic and the reasons these changes differed across metros. The predictions based on the pre-pandemic vacancy rate panel model show how the factors that normally determine vacancy rates affected vacancy rates during the pandemic. These predictions suggest that the increase in per capita income during the pandemic years played a major role in reducing vacancy rates in 2020 and 2021, while the rent inflation in 2021 was the primary reason vacancy rates rebounded in 2022. The cross-sectional regressions from 2020, 2021, and 2022 highlight the impact on vacancy rates from the changes in for-sale housing markets, domestic migration and immigration, and eviction filings. Changes in domestic migration and eviction filings were important factors in 2020 and 2021, but their explanatory power had faded by the end of 2022. The tightness of for-sale housing markets and the immigration foregone during the pandemic continued to affect vacancy rates at the end of 2022 in the metros where these factors were most relevant.

Policy Implications

One message from the results above is that the effect of the pandemic on vacancy rates had largely faded by the end of 2022. This can be seen in the predicted and residual average vacancy rates, which are much closer to their 2019 averages in 2022 than in 2021 (Figure 11). The return to normal can also be seen in the residual vacancy rate regressions, in which changes in the eviction rate and net domestic migration rate are not significantly associated with residual vacancy rates in 2022 (Table 3).

¹⁷ One reason the past immigration rate matters even though the first stage controls for population growth is that immigration is difficult to measure at the metro level in nondecennial census years. This raises the risk that population estimates for 2021 and 2022 were upward-biased in metro areas that typically have high immigration rates.

While the effects of the pandemic on vacancy rates have faded, the vacancy rate remains low. Nationally, the vacancy rate was 6.6 percent in the fourth quarter of 2023 (Figure 2). This is one percentage point above its lowest point during the pandemic but still low historically. For example, during the 1990s, the vacancy rate averaged 7.6 percent.¹⁸ Raising the vacancy rate to a more normal level would reduce the risk of a return to the elevated rent inflation seen during the pandemic. Increasing the number of rental housing units would directly address the issue, and increasing the number of for-sale housing units would indirectly address it by helping people move from renting to owning.

The lack of available housing has received more attention in recent years, and there are many sources for policy recommendations to increase the supply of housing.¹⁹ Some highlights are as follows:

- The Brookings Institution has created an online “housing policy matchmaker” that helps local government leaders find policy recommendations suited to their community’s needs (Schuetz et al., 2021).²⁰
- The National Association of Homebuilders also has an online guide for state and local policymakers interested in reducing shortages of for-sale homes.²¹
- *The Gap: A Shortage of Affordable Homes* (Aurund et al., 2023) is a report from the National Low Income Housing Coalition on the need for affordable rental housing and provides recommendations for local, state, and federal policy initiatives to increase the supply of affordable rental homes.
- *More for Less? An Inquiry into Design and Construction Strategies for Addressing Multifamily Housing Costs* (Hoyt, 2020) provides a detailed look at the process of developing and building multifamily housing and recommends technical solutions and policy changes that enable those solutions.

I will focus on two broad policy options: changing zoning rules to make building multifamily housing easier and increasing the supply of skilled construction workers. The options on zoning are covered by most policy reports on the topic, while the need for more construction workers has received less attention in those reports.

Changing Zoning Rules to Increase Housing Supply

In most communities, zoning rules dictate what kind of housing can be built on a parcel of land, generally including rules about how much floor space a building can have or whether

¹⁸ 7.6 percent is the average US rental vacancy rate from the Census Bureau’s Housing Vacancy Survey for the quarters of 1990:Q1 through 1999:Q4.

¹⁹ Relative to 2019, searching the phrase “housing shortage” was 3 times more popular in 2022 and 2.5 times more popular in 2023. These data come from Google Trends.

²⁰ The housing policy matchmaker can be found at <https://www.brookings.edu/articles/introducing-the-housing-policy-matchmaker-a-diagnostic-tool-for-local-officials/>.

²¹ This guide is available at <https://www.nahb.org/advocacy/top-priorities/solving-the-housing-affordability-crisis/how-can-you-improve-housing-affordability>.

multifamily housing is allowed. More restrictive zoning means fewer housing units can be built on a given parcel of land. Research has shown that more restrictive zoning is associated with higher home prices and rents (Molloy, 2020).

Housing advocates and for-profit housing developers have argued that zoning rules should be loosened, especially in cities with high housing costs (for example, Aurund et al., 2023 and The Montrose Group, 2024). While specifics vary by community, this generally means expanding the number of lots that can have buildings with three or more stories, increasing the allowable ratio of floor space to lot size, and reducing the number of off-street parking spaces required per unit.

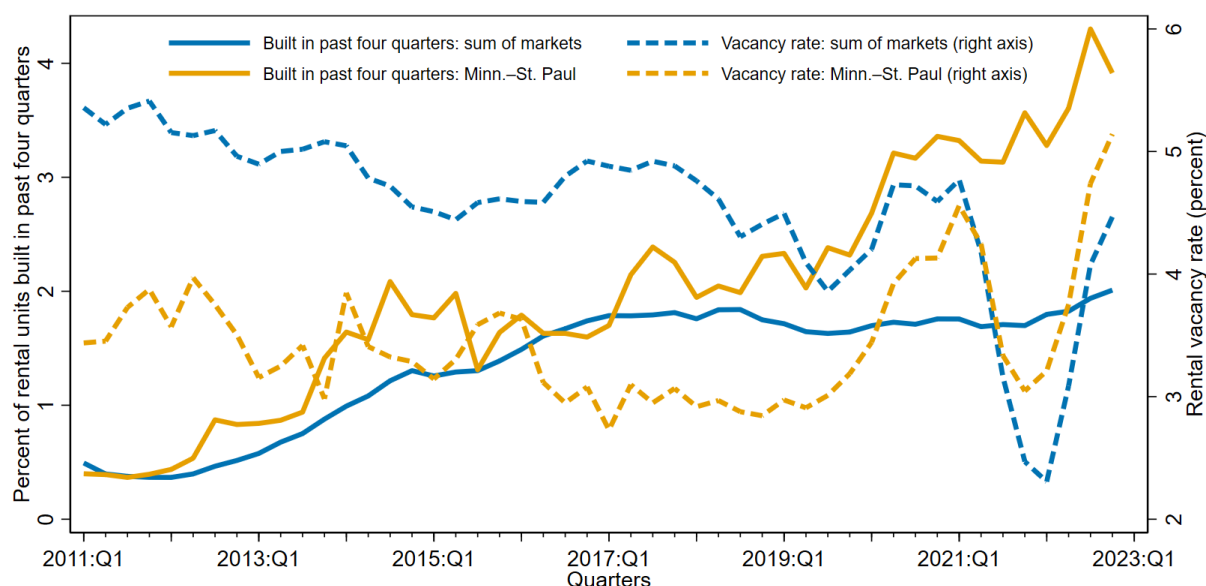
Loosening zoning rules can increase housing supply by reducing the cost of creating additional housing. Increasing the allowed density reduces the cost of constructing a housing unit by spreading the cost of the land across multiple units (Baca, McAnaney, and Schuetz, 2019). Similarly, reducing off-street parking requirements can decrease construction costs; the cost of creating an off-street parking space is estimated to range from \$5,000 to \$50,000 (Cortright, 2016).²² Lowering the requirements for public review and impact assessments can reduce the time it takes to develop a building, which reduces the project's financing costs (Glaeser and Gyourko, 2018).

Minneapolis has been an early adopter of zoning changes that encourage the development of multifamily housing. The city eliminated parking requirements for multifamily buildings, starting with those in downtown zoning districts, in 2009 before removing these requirements for buildings near mass transit stations in 2015 and then citywide in 2021 (Liang, Staveski, and Horowitz, 2024; City of Minneapolis, 2015). In 2020, the city increased the height and floor space allowed on most parcels and established minimum heights for new multifamily developments downtown and along major public transit corridors.

The changes in Minneapolis's rental housing market have been dramatic. Figure 13 shows the percent of rental housing that has been built in the prior four quarters and the vacancy rate for the Minneapolis–St. Paul metro and for the sum of all CBRE markets. Starting in 2017 and continuing through 2022, the share of the metro's rental housing built in the prior four quarters began rising dramatically, while this share remained flat for the CBRE markets as a whole. The metro's vacancy rate also rose relative to the vacancy rate of the sum of all CBRE markets over this time. A more complete program evaluation is needed, but this suggests that the zoning changes have already made rental housing more plentiful in Minneapolis.

²² The low end of this cost range is for a space in a surface lot, and the high end is for a space in an underground garage.

Figure 13. Percent of Rental Housing Units Built in Prior Four Quarters and Vacancy Rate, Minneapolis–St. Paul Metro and Sum of CBRE Markets, 2011 through 2022



Source: CBRE

Increasing the Supply of Skilled Construction Workers

Relaxing zoning constraints will increase housing supply only if enough workers are available to build more apartments. However, many regions appear to have a shortage of skilled construction workers such as carpenters, electricians, and plumbers. The Association of Builders and Contractors (2024) estimates a shortage of at least 500,000 construction workers in the United States in 2024. Recent research has shown that housing supply growth slows when the supply of construction workers falls (Howard, Wang, and Zhang, 2023).

The current shortage of skilled construction workers is partly due to the housing bubble in the 2000s. When this bubble burst, construction employment fell by 1.5 million workers (Freddie Mac, 2017). Construction activity was slow to recover from the Great Recession, leading many former construction workers, especially younger ones, to find new careers (Jefferson, Werner, and Harding, 2022). The share of workers in the construction industry aged 16 through 24 years old fell from 13.3 percent in 2006 to 8.6 percent in 2010 and was 9.4 percent in 2020 (Gallagher, 2022). The lack of young people that entered construction trades in the 2010s has reduced the number of skilled construction workers today and has raised the average age of these workers (Freddie Mac, 2017). Because skilled construction workers are older than in the past, the fraction retiring has increased and is expected to rise more in the years ahead, further reducing the supply of these workers (Association of Builders and Contractors, 2024).

A recent slowdown in the number of immigrants entering the construction sector has also contributed to the shortage of construction workers. The construction sector relies heavily on immigrant labor. In 2018, 30 percent of workers in construction occupations were foreign born (Siniavskaia, 2020) compared to only 17 percent of all workers (US Census Bureau, 2018).

However, the number of immigrants entering the construction labor force fell from 67,000 in 2016 to 44,000 in 2017 and remained below 60,000 in 2018, 2019, and 2020 (Siniavskaia, 2023). A report published by the National Association of Home Builders notes, “The surprising drop of 2017 in the number of new immigrants in construction most likely reflects a change in the US immigration policy that took place during...” that year (Siniavskaia, 2020).

While trade schools and other training programs help, people need work experience to become skilled construction workers.²³ A common way to gain this experience is through apprenticeships. While the number of people enrolled in construction apprenticeships has been trending up in recent years, the growth has been insufficient to keep up with demand (Tran, 2023). For example, it is projected that there will be 808 open carpentry positions in Ohio annually from 2020 through 2030 (Ohio Department of Job and Family Services, 2023), but only 298 Ohio residents completed registered carpentry apprenticeships in 2023 (US Department of Labor, 2024).

One likely reason that construction apprenticeships are not keeping pace with demand for skilled construction workers is that the role of unions in construction has diminished in recent decades. The percent of construction workers covered by union contracts has declined dramatically over the last 40 years; it was 30 percent in 1983, 18 percent in 2003, and 12 percent in 2023.²⁴ While the construction sector has become less unionized, the overwhelming majority of construction apprenticeships continue to be associated with unions (US Department of Labor, 2024). For example, 95 percent of the registered carpentry apprenticeships completed by Ohio residents in 2023 were union apprenticeships (US Department of Labor, 2024).

Government and nonprofit workforce development agencies can help fill the gap left by the decline of unions. In prior work, I made the case for shifting workforce development efforts away from directly serving individuals with employment barriers and toward helping people advance into hard-to-fill skilled jobs (Elvery, 2014). When workers advance, it begins a job chain that can eventually create job openings for individuals with barriers to employment (Persky, Felsenstein, and Carlson, 2004). This means that workforce programs focused on advancement can benefit the workers who advance (by increasing income), the firms that hire them (by boosting the supply of skilled workers), and individuals with barriers to employment (by creating job openings they can fill).

Sectoral workforce development programs often have many of the features of advancement-focused workforce development. These programs work with a group of employers to identify positions that need to be filled, screen applicants for potential to benefit from training, provide hard-skills training, and help trainees find jobs. Randomized trials of sectoral workforce programs have shown that these programs significantly increase participants’ earnings and that the gains last for a number of years (Katz et al., 2022). The size and longevity of the earnings

²³ For example, the BLS reports that most electricians and plumbers learn their trades through apprenticeships that typically include 2,000 hours of on-the-job-training (Bureau of Labor Statistics, 2024a and 2024b).

²⁴ These estimates come from <https://www.unionstats.com/> (Hirsch, Macpherson, and Even, 2024).

gains from sectoral workforce programs are greater than those from typical government-provided workforce development programs (Katz et al., 2022).

The largest source of federal funding for workforce development programs is the Workforce Innovation and Opportunity Act (WIOA) of 2014. While the WIOA requires states to support sector partnerships (Goodman, 2024), sectoral training programs “...still struggle to access public funding through WIOA, or other relevant funding streams” (America Forward, 2021). For example, all government sources accounted for only 7 percent of the fiscal year 2022 revenue of Per Scholas (Per Scholas, 2024), a well-established sectoral training program (Katz et al., 2022).

Conclusion

The rental housing market experienced rapid changes during the pandemic. The large drop in the rental vacancy rate in 2021 spurred dramatic rent inflation. The factors that best explain this drop are the increases in per capita income and temporary programs designed to prevent evictions during the pandemic, such as eviction moratoria. The vacancy rate rebounded in 2022 at least partly because of the rent inflation in 2021. The rebound in the vacancy rate contributed to rent inflation’s slowing in 2023.

Part of the reason that the drop in the rental vacancy rate spurred a large increase in rents is that the vacancy rate was low prior to the pandemic. The combination of rising headship rates and stagnant rental construction are key reasons for this. There is nothing to suggest headship rates have stopped rising. There was an uptick in the completion of new rental units in 2023 (Figure 3 above), and this is likely to continue in 2024. However, in August 2023, multifamily housing starts returned to their prepandemic norm, suggesting that the uptick in the completion of rental units will be temporary.

The pandemic and growth of headship rates were largely unanticipated. Increasing the supply of rental housing could help prevent a spike in rent inflation if similar surprises occur in the future.

Appendix

Table A1. Additional Information about Variables in the Panel Regression

Variable	Average	Standard deviation	Source	Notes
Rental vacancy rate	5.18	1.36	CBRE	The estimates from CBRE are based on the buildings surveyed by CBRE, which tend to be large, professionally managed apartment buildings. Rent is in nominal US dollars.
ln(number of rental units)	1.36	1.14	CBRE	
ln(median asking rent per square foot)	0.11	0.35	CBRE	Adjusted by BEA for regional price differences. In 2017 US dollars.
ln(real per capita income)	10.82	0.14	BEA*	
ln(total population)	14.64	0.78	Census Bureau*	Quarterly population data are linear interpolations of annual estimates.
ln(population aged 20 through 34)	13.08	0.79	Census Bureau*	

Note: *These data were accessed via Haver Analytics. The sample includes 2,124 metro-by-quarter observations from 2011:Q1 through 2019:Q4.

Table A2. Sources of Variables in Residual Vacancy Rate Regressions

Variable	Sources
Vacancy rate minus predicted vacancy rate	Author's calculations
Weeks for-sale homes are on the market	Redfin (via Haver Analytics)
Net domestic migration rate (migrants per 1,000 people)	Equifax/FRBNY CCP and Stephan Whitaker
Cumulative difference from 2019 eviction rate (filings per 1,000 renter households)	Martin (2023), Legal Services Corporation (2022), and Hepburn, Louis, and Desmond (2020)
No eviction data available (1 if no data, 0 if data)	Author's calculations
Natural log of 2015 through 2019 immigration rate (immigrants per 10,000 people)	American Community Survey

References

Adams, Brian, Lara Loewenstein, Hugh Montag, Randal Verbrugge. 2022. “Disentangling Rent Index Differences: Data, Methods, and Scope.” *Bureau of Labor Statistics Working Paper 555*. (October 6). <https://www.bls.gov/osmr/research-papers/2022/ec220100.htm>.

America Forward. 2021. *Policy Proposals to Advance Workforce Systems Alignment and Innovation: Department of Labor Recommendations*. Washington, DC: America Forward. <https://www.americaforward.org/wp-content/uploads/2021/03/POLICY-PROPOSALS-TO-ADVANCE-WORKFORCE-SYSTEMS-ALIGNMENT-AND-INNOVATION-DEPARTMENT-OF-LABOR-RECOMMENDATIONS-3.24.21.pdf>.

Amorim, Mariana and Natasha Pilkauskas. 2023. “‘Excess’ Doubling Up During COVID: Changes in Children’s Shared Living Arrangements.” *Demography*. 40 (5). 1283-307. <https://doi.org/10.1215/00703370-10949975>.

Association of Builders and Contractors. 2024. *2024 Construction Workforce Shortage Tops Half a Million*. (January 31). <https://www.abc.org/News-Media/News-Releases/abc-2024-construction-workforce-shortage-tops-half-a-million>.

Aurand, Andrew, Dan Emmanuel, Emma Foley, Matt Clarke, Ikra Rafi, and Diane Yentel. 2023. *The Gap: A Shortage of Affordable Homes*. Washington, DC: National Low Income Housing Coalition. (March). <https://nlihc.org/gap>.

Baca, Alex, Patrick McAnaney, and Jenny Schuetz. 2019. “Gentle” density can save our neighborhoods. Washington, DC: The Brookings Institution. (December 4). [“Gentle” density can save our neighborhoods \(brookings.edu\)](https://www.brookings.edu/articles/gentle-density-can-save-our-neighborhoods/).

Bogel-Burroughs. 2020. “Roommates in Coronavirus Era: ‘Friends’ It Isn’t.” *The New York Times*. (April 21). <https://www.nytimes.com/2020/04/21/us/coronavirus-roommates.html>.

Bureau of Labor Statistics. 2024a. *Occupational Outlook Handbook*, Electricians. Washington, DC: US Department of Labor. <https://www.bls.gov/ooh/construction-and-extraction/electricians.htm> (Accessed June 11, 2024).

Bureau of Labor Statistics. 2024b. *Occupational Outlook Handbook*, Plumbers, Pipefitters, and Steamfitters. Washington, DC: US Department of Labor. <https://www.bls.gov/ooh/construction-and-extraction/plumbers-pipefitters-and-steamfitters.htm> (Accessed June 12, 2024).

Choi, Jung Hyun and Gary Painter. 2015. “Housing Formation and Unemployment Rates: Evidence from 1975-2011.” *Journal of Real Estate Finance and Economics*. 50 (4): 549-66.

City of Minneapolis. 2015. *Ordinance 2015-061*. <https://lims.minneapolismn.gov/Download/PriorFileDocument/-51356/WCMS1P-142922.PDF>.

Cortright, Joe. 2016. *The Price of Parking*. Portland, OR: City Observatory. (October 18). <https://cityobservatory.org/the-price-of-parking/>.

- Ellis, Emma Grey. 2020. "How Health Care Workers Avoid Bringing Covid-19 Home." *WIRED*. (April 14). <https://www.wired.com/story/coronavirus-covid-19-health-care-workers-families/>.
- Elvery, Joel A.. 2014. "Stop Shoveling: A New Workforce Development Strategy to Promote Regional Prosperity." *The Road through the Rust Belt: From Preeminence to Decline to Prosperity*, ed. by William M. Bowen. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. pp. 95-11.
- Freddie Mac. 2017. "What is Causing the Lean Inventory of Houses?" *Economic and Housing Research Outlook*. Arlington, VA: Freddie Mac. <https://www.freddiemac.com/fmac-resources/research/pdf/201707-Outlook-04.pdf>.
- Gallagher, Claire McAnaw. 2022. "The Construction Industry: Characteristics of the Employed, 2003–20." *Spotlight on Statistics*. Washington, DC: Bureau of Labor Statistics. (April). <https://www.bls.gov/spotlight/2022/the-construction-industry-labor-force-2003-to-2020/>.
- Glaeser, Edward and Joseph Gyourko. 2018. "The Economic Implications of Housing Supply." *Journal of Economic Perspectives*. 32 (1): 3-30.
- Goodman, Veronica. 2024. *Recommendations for Reauthorizing the Workforce Innovation and Opportunity Act*. Washington, DC: The Center for American Progress. <https://www.americanprogress.org/article/recommendations-for-reauthorizing-the-workforce-innovation-and-opportunity-act/>.
- Hepburn, Peter, Renee Louis, and Matthew Desmond. 2020. *Eviction Tracking System: Version 1.0*. Princeton: Princeton University, 2020. www.evictionlab.org (Accessed January 10, 2023).
- Hepburn, Peter, Renee Louis, Joe Fish, Emily Lemmerman, Anne Kat Alexander, Timothy A. Thomas, Robert Koehler, Emily Benfer, and Matthew Desmond. 2021. "U.S. Eviction Filing Patterns in 2020." *Socius*, 7. <https://doi.org/10.1177/23780231211009983>
- Hirsch, Barry T., David A. Macpherson, and William E. Even. 2024. *Union Membership and Coverage Database*. Electronic resource accessed at <https://unionstats.com/>. (January 16).
- Howard, Troup, Mengqi Wang, and Dayin Zhang. 2023. "How Do Labor Shortages Affect Residential Construction and Housing Affordability?" Typescript. (April). http://www.trouphoward.com/uploads/1/2/7/7/127764736/howard_wang_zhang_housing_supply_and_construction_labor_ssrn_feb_2024.pdf.
- Hoyt, Hannah. 2020. *More for Less? An Inquiry into Design and Construction Strategies for Addressing Multifamily Housing Costs*. Boston, MA: Joint Center for Housing Studies of Harvard University. (March). <https://www.jchs.harvard.edu/research-areas/working-papers/more-less-inquiry-design-and-construction-strategies-addressing>.
- Jefferson, Nathan, Devin Werner, and Elisabeth Harding. 2022. "Demographics, COVID-19 Leave Construction with Tight Labor Supply." *Regional Economist*. St. Louis, MO: The Federal Reserve Bank of St. Louis. (April 20). <https://www.stlouisfed.org/publications/regional-economist/2022/apr/demographics-covid19-leave-construction-tight-labor-supply#>.

- Katz, Lawrence F., Jonathan Roth, Richard Hendra, and Kelsey Schaberg. 2022. “Why Do Sectoral Employment Programs Work? Lessons from WorkAdvance.” *Journal of Labor Economics*. 40 (S1). 249-91.
- Kaufman, Joanne. 2020. “Love and the Lockdown.” *The New York Times*. (October 2). <https://www.nytimes.com/2020/10/02/realestate/quarantine-relationship-love.html>.
- Khater, Sam, Len Kiefer, Ajita Atreya, and Venkataramana Yanamandra. 2018. “The Major Challenge of Inadequate U.S. Housing Supply.” Freddie Mac, *Insight*. (December 5). <https://www.freddiemac.com/research/insight/20181205-major-challenge-to-u.s.-housing-supply>.
- Legal Services Corporation. 2022. Civil Court Data Initiative. <https://civildcourtdata.lsc.gov>. (Accessed January 26, 2023).
- Liang, Linlin, Adam Staveski, and Alex Horowitz. 2024. *Minneapolis Land Use Reforms Offer a Blueprint for Housing Affordability*. Pew Charitable Trusts. (January 4). <https://www.pewtrusts.org/en/research-and-analysis/articles/2024/01/04/minneapolis-land-use-reforms-offer-a-blueprint-for-housing-affordability>.
- Loewenstein, Lara and Jason Meyer. 2024. “Comparing Two House-Price Booms.” Federal Reserve Bank of Cleveland, *Economic Commentary*, no. 2024-04. (February 27). <https://doi.org/10.26509/frbc-ec-202404>.
- Martin, Hal. 2022. “Making Sense of Eviction Trends during the Pandemic.” Federal Reserve Bank of Cleveland, *Economic Commentary*, no. 2022-12. (August 23). <https://doi.org/10.26509/frbc-ec-202212>.
- Martin, Hal. 2023. “Data Updates: Measuring Evictions during the COVID-19 Crisis.” Federal Reserve Bank of Cleveland, *Community Development Reports*. (January 31). <https://www.clevelandfed.org/publications/cd-reports/2020/db-20200902-data-updates-measuring-evictions-during-the-covid-19-crisis>.
- McCue, Daniel. 2023. “The Surge in Household Growth and What It Suggests About the Future of Housing Demand.” Harvard Joint Center for Housing Studies, *Housing Perspectives*. (January 17). <https://www.jchs.harvard.edu/blog/surge-household-growth-and-what-it-suggests-about-future-housing-demand>.
- Molloy, Raven. 2020. “The effect of housing supply regulation on housing affordability: A review.” *Regional Science and Urban Economics*. 80(C): 1-5.
- The Montrose Group, LLC. 2024. *Ohio Housing Policy White Paper: Strategies to Address Ohio’s Housing and Economic Challenges*. Electronic manuscript dated March 21, 2024, accessed via <https://montrosegroupllc.com/wp-content/uploads/2024/06/BIA-Housing-Policy-White-Paper-Updated-3.22.24.pdf> on July 31, 2024.
- Ohio Department of Job and Family Services. 2023. *Ohio Job Outlook Employment Projections:2020-2030*. Columbus, OH. https://ohiolmi.com/_docs/PROJ/Ohio/OhioJobOutlook2020_2030.pdf.

Peri, Giovanni and Reem Zaiour. 2023. “Changes in international immigration and internal native mobility after COVID-19 in the USA.” *Journal of Population Economics*. 36(4): 2389-2428. (October).

Per Scholas. 2024. *2023 Annual Report*. New York, NY: Per Scholas.
<https://perscholas.org/2023-annual-report/>.

Persky, Joseph, Danieal Felsenstein, and Virginia Carlson. 2004. *Does “Trickle Down” Work? Economic Development Strategies and Job Chains in Local Labor Markets*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Schuetz, Jenny, Tim Shaw, Katherine Lucas McKay, and Genevieve Melford. 2021. *Introducing the housing policy matchmaker: A diagnostic tool for local officials*. Washington, DC: The Brookings Institution. (November 4). <https://www.brookings.edu/articles/introducing-the-housing-policy-matchmaker-a-diagnostic-tool-for-local-officials/>.

Siniavskaia, Natalia. 2020. “Immigrant Workers in the Construction Labor Force.” *Special Studies*. Washington, DC: National Association of Homebuilders. (March 3).
<https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-immigrant-workers-in-the-construction-labor-force-march-2020.pdf>

Siniavskaia, Natalia. 2023. “Immigrants in Construction: Post-Pandemic Trends.” *Eye On Housing*. Washington, DC: National Association of Homebuilders. (February 15).
<https://eyeonhousing.org/2023/02/immigrants-in-construction-post-pandemic-trends/>.

StataCorp. 2021. *Stata 17 Base Reference Manual*. College Station, TX: Stata Press.

Tran, Tu-Uyen. 2023. *Apprenticeships, a key source of workers for construction firms, aren’t growing fast enough*. Minneapolis, MN: Federal Reserve Bank of Minneapolis. (December 18).
<https://www.minneapolisfed.org/article/2023/apprenticeships-a-key-source-of-workers-for-construction-firms-arent-growing-fast-enough>.

US Census Bureau. 2018. "SELECTED CHARACTERISTICS OF THE NATIVE AND FOREIGN-BORN POPULATIONS." American Community Survey, ACS 1-Year Estimates Subject Tables, Table S0501, 2018, [https://data.census.gov/table/ACSST1Y2018.S0501?q=labor force native born](https://data.census.gov/table/ACSST1Y2018.S0501?q=labor%20force%20native%20born). Accessed on August 1, 2024.

US Department of Labor. 2024. “Apprentices by State Dashboard.” Interactive database at <https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard>. Accessed on August 8, 2024.

Whitaker, Stephan. 2021a. “Did the COVID-19 Pandemic Cause an Urban Exodus?” Federal Reserve Bank of Cleveland, *District Data Brief*. (February 5). <https://doi.org/10.26509/frbc-ddb-20210205>.

Whitaker, Stephan. 2021b. "Migrants from High-Cost, Large Metro Areas during the COVID-19 Pandemic, Their Destinations, and How Many Could Follow." Federal Reserve Bank of Cleveland, *District Data Brief*. (March 25). <https://doi.org/10.26509/frbc-ddb-20210325>.