Short-term Incidence of Property Tax Hikes: Evidence from a Recent Reassessment in Philadelphia

Lei Ding[a*] Yilin Hou[b] Sisi Zhang[a]

[a] Federal Reserve Bank of Philadelphia
[b] Syracuse University

*Corresponding author: Lei Ding, Email: lei.ding@phil.frb.org; Address: Ten Independence Mall, Philadelphia, PA 19106

July 9, 2025

Highlights

- This study provides novel evidence on the short-run impact of property tax, based on a policy shock that led to tax hikes in Philadelphia.
- No significant evidence of short-term tax-induced rent increase at the market level, for large-scale, professionally managed apartments, or for MLS-listed rental properties.
- Tax hikes have a negative impact on the property values, but the magnitude is small and statistically insignificant.
- Results shed light on the behavior of heterogeneity of landlord behavior, with implications for optimal design of the property tax.

Abstract

Property tax incidence refers to who ultimately bears the tax burden. We revisit this concept by studying the over 30% tax increase from 2022 to 2023 in Philadelphia induced by a long overdue comprehensive reassessment. Theory suggests that in such scenarios renters bear only a marginal share of the tax increase in the short run but shoulder higher shares in submarkets with more elastic housing supply or where landlords possess substantial market power. Using several unique property-level rent datasets and a difference-in-differences framework, we find no evidence of tax-induced rent increase at the market level, for large-scale, professionally managed apartments, or MLS-listed rental properties two years after the shock. Results suggest landlords likely have to bear the increased taxes in the short run. This paper enriches the tax incidence literature on the short-term impact of property taxes and sheds light on the heterogeneity of landlord behavior, with implications for optimal design of the property tax.

Key words: real property tax; housing price; rent; property assessment
JEL codes: H22, H31, H71, R51

Disclaimer: The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. Any errors or omissions are the responsibility of the authors.

1. Introduction

The property tax is the main own-source revenue for local governments in the United States.[1] Property tax hikes, as increased costs for property owners, can be shifted forward onto renters and capitalized into property values. Thus, the nature of tax incidence – who bears the burden of property taxes – carries important policy implications. When the extra tax imposed on a rental property is passed on to renters in the form of higher rents, it claims a larger share of household income for poor families than for the middle class and the well-to-do, exacerbating the regressivity of the property tax. If instead landlords have to absorb all the tax increases, it will inevitably disincentivize investors from staying in or entering the rental market, reducing the supply of rental housing. Since the COVID-19 pandemic, there have been unprecedented increases in both property values and rents (Bolhuis et al., 2022), which calls for another thorough examination of the extent and scope of the tax and rent increases, as well as the mechanisms through which the property tax affects rents.

Theoretical analysis suggests that renters may bear in the short run only a small portion of a rise in property tax, as the short-term housing supply tends to be inelastic – it takes time to build new houses or for the current providers to adjust their supply. By this logic, the pass-through of the increased taxes would only become manifest in a longer term. However, anecdotal evidence suggests that certain rental housing providers are more or less responsive to changes in market conditions. For example, one stream of studies suggests that large rental companies are more capable of absorbing expense increases and thus likely less responsive to tax hikes than small landlords (e.g., Coven, 2024). Other studies, in contrast, suggest that large corporate landlords are more likely to use algorithmic pricing and are less concerned with tenant retention or vacancy, which can lead to systematic and more frequent rent increases (e.g., Raymond et al. 2018;

[1] Property tax base typically includes homes and business real estate and, in some cases, cars and business property other than real estate, instead of all forms of wealth. This study focuses on real estate tax only.

Immergluck, 2018; Calder-Wang and Kim, 2023; Lee and Wylie, 2024).[2] Small landlords, in comparison, are less likely to use new technologies, more likely to negotiate rental rates and keep rents at fixed rates for longer periods of time to avoid excessive costs associated with high turnover rates, evictions, and extended vacancies (Decker, 2023; Balzarini and Boyd, 2024). Therefore, large, more technology-driven landlords may respond to tax hikes differently from those traditional individual landlords.

Taking advantage of a shock in property tax levy in the City of Philadelphia, this study focuses on the short-term impact of property tax. In Philadelphia, the value of residential properties increased sharply from 2019 to 2022 (as was true of other parts of the country during the COVID years), but property assessments remained largely unchanged during that period. On May 9, 2022, Philadelphia released updated assessed values for all properties in the city for the 2023 tax year, which led to an increase of 36.7% and 34.4% for the median assessed value of residential properties and the median tax levy, respectively (or an $630 increase in the mean tax levy). Though more generous exemptions like higher homestead exemptions helped partially or fully mitigate the tax increase for homeowners, the sharp tax increase in aggregate was expected to cast a substantial, negative impact on the real estate market, especially in the rental market.

Using a difference-in-differences (DiD) framework and a control group of 10 peer cities[3] to isolate the impact of the tax shock in Philadelphia, this paper tries to identify and estimate the degree of the large tax increase that was shifted onto renters in the form of higher rents. The empirical analyses employ several unique property-level rent datasets to add depth and precision to our estimates that higher-level aggregates cannot provide. The main data are provided by RealPage, a property management software company that also collects details on lease terms, rents (average asking rent and effective rent), concessions,

[2] For example, Calder-Wang and Kim (2024) find evidence that algorithmic pricing helps building managers set prices that are more responsive to market conditions, with adopters lowering rents more rapidly than non-adopters during economic downturns. They estimate that the coordination channel results in an average markup increase of $25 per unit per month.

[3] These cities are Baltimore, Boston, Chicago, Cleveland, Minneapolis, New York, Pittsburgh, Portland, Seattle, and Washington, DC. The choice of the group of control cities was based on data availability and for their similarity with Philadelphia and data availability.

floor plans, and amenities of multi-unit, professionally managed rental properties across the country. To assess the robustness of the results, several alternative datasets, including property-level CoreLogic Multiple Listing Service (MLS) data and zip-code level Zillow rent data, were also employed.

The empirical results are generally consistent. We find no significant evidence of tax-induced rent increase for large-scale apartments after the announcement (in May 2022) of assessment increases. Our estimates from the MLS rent or the zip code-level Zillow rent index data are qualitatively consistent, with no evidence suggesting a significant rent increase at the market level or for rental properties listed on the MLS after the tax shock. Landlords, instead, likely have to absorb the increased property taxes, at least in the short term. The impact on the sales price is negative but not statistically significant. We did a variety of robustness checks using alternative models (event history and synthetic difference-in-differences), specifications and datasets; all reaching generally consistent results.

This paper contributes to the literature in several important ways. First, different from early studies that focus solely on long-term tax incidence, this study provides novel evidence on the short-run responses to a tax shock. Only a handful empirical studies focus on the effects of property taxes on rental housing or the burden of the property tax on renters (e.g., Orr, 1968, 1970; Heinberg and Oates, 1970; Carroll and Yinger, 1994; Goodman, 2005; Tsoodle and Turner, 2008; Muthitacharoen and Zodrow, 2012; Rolheiser, 2019). Extant studies generally suggest that property taxes would be partially capitalized into rents for rental properties in the long run; but the extent of pass-through varies wildly across the studies and is sensitive to the mobility of renters, the variation in public services in urban areas, and restrictions on rent increases, among other factors (Carroll and Yinger, 1994). The magnitude of tax incidence varies widely, ranging from 15% (Carroll and Yinger, 1994) to 40%–50% in more recent studies and almost 100% in a study of commercial real estate (Rolheiser, 2019). The Institute on Taxation and Economic Policy (ITEP), whose analysis of the U.S. tax burden distribution is widely used by policy analysts, uses 50% as

benchmark pass-through rate, based on the average empirical estimate found in the literature (Davis et al., 2024).

Second, this paper uses property-level data and a DiD framework to isolate the impact of property tax increase on rents, which differs from most previous studies that use across-jurisdiction regressions to compare the extent to which rents vary with tax rates. The highly mobile tenants and wide differences in the public services across jurisdictions make it difficult to derive the causal relationship from such cross-sectional or panel regressions.

Third, this study provides (though indirect) evidence that sheds light on the potentially heterogeneous behavior of different landlords. An emerging literature suggests that the activities of large corporate investors are correlated with neighborhood-level rent increases in the single-family housing market (Raymond et al., 2018; Immergluck, 2018; Fields, 2022; Gomory, 2022; Gurun, et al., 2023; Lee and Wylie, 2024; Balzarini and Melody, 2024). There are also studies suggesting that large-scale rental companies, especially those using algorithmic pricing, are more responsive to changes in market conditions (e.g. Calder-Wang and Kim, 2023). The finding of a generally insignificant impact of tax increase on rents for large-scale multi-family properties, however, is more consistent with the literature suggesting large-scale rental companies are capable of absorbing expenses through scale economy (Coven, 2024), while small landlords are generally less likely to pass increased expenses to tenants. This study thus provides novel evidence on how these large landlords respond to sharp increases in holding costs.

Finally, our findings have important policy implications. A generally insignificant pass-through of taxes implies that landlords have to absorb the tax increases in the short term. Large rental companies often can lower costs because of economies of scale. Small landlords that need to absorb the ballooning taxes, however, may be incentivized to lower their quality of service or leave the market completely. Raising the homeowner exemptions together with reassessment, instead, can make homeownership more attractive. The consequences of tax shocks for different stakeholders should be carefully evaluated and taken into consideration in the process of policy making. That all said, there remains the

call for more research to track the long-term effects of property tax increases and identify the responses to higher holding costs by smaller landlords and landlords in the single-family housing market.

2. Theoretical Analysis and Institutional Background

2.1 Theoretical Analysis

Tax incidence in general is about the distribution of tax burden between suppliers and consumers or between landlords and tenants in the case of the rental market. The *X*-axis in Panel (a) of Figure 1 represents the quantity of rental housing and the *Y*-axis the rental price per unit of housing. The solid dark color line, S_1, depicts relatively inelastic rental supply (i.e., supply of housing is less responsive to rent), while the yellow line, D, represents the demand for rental housing. The supply curve slopes upward, while the demand curve slopes downward. When the rental market clears, the equilibrium point of supply and demand is with an equilibrium rent, R_0, and an equilibrium quantity, Q_0.

Theoretically, after the property tax is levied, the tax raises the owner's cost of holding rental properties, which provides an incentive for them to reduce rental supply by pulling (some of) their properties off the rental market, selling them off, converting them to other uses, or in an extreme scenario, abandoning them. Any of these options will shift the supply curve upwards from S_1 to S_1', with the new equilibrium rent of R_1' and the new equilibrium quantity of Q_0'. With the tax increase, the renter needs to pay the increased rent of R_1', while the landlord can only collect R_1 after tax. The difference between R_1' and R_1 is the amount of tax levied, T.

<Insert Figure 1 and 2 about here>

The degree of tax burden on renters depends on the relative price elasticity of supply (E_S) and demand (E_D): Tax incidence is positively proportional to E_D and inversely proportional to E_S. The short-term tax incidence, or tax burden for renters, is thus equal to $(R_1'-R_0)/(R_1'-R_1)$. The numerator is the area in yellow in Panel (b) and the denominator the

sum of yellow and grey areas. Assuming a constant tax levy T, when $E_S/E_D<1$, the tax is borne more by the supply side, as in Figure 1(b). When $E_S/E_D>1$, the tax is borne more by the demand side. And when housing supply is completely inelastic ($E_S=0$), the tax would be borne by the supply side only. In short, when rental supply is more elastic than demand, renters bear most of the tax burden, while when rental demand is more elastic than supply, suppliers bear most of the cost of the property tax.

The elasticity of housing supply, however, is usually quite low in the short term because housing is a complex and heterogeneous good with a long and uncertain production process. Building new houses requires time and substantive fixed cost and selling rental properties to potential homeowners or converting properties to other uses would also incur high transaction costs.[4]

While housing supply is usually inelastic in the short run, it could be more elastic in certain submarkets as the literature suggests. For example, in cases where large-scale apartment owners collectively have the power to influence rents by manipulating housing supply in response to increased holding costs in a consistent way, the supply curve will shift slightly upward. The reduced supply results in a new equilibrium price that is higher than the original. If so, the supply curve of large-scale apartment units will be more elastic as S_2 in Figure 2. As the cost of holding rental housing rises with property tax increases, the new equilibrium has a new rent of R_2'. The difference between R_2' and R_2 is the actual amount of tax levied, T, as shown in Figure 2(a). If the elasticity of supply is high, a larger share of tax burden will be passed on to renters as these landlords are more responsive to the tax shock, even at the risk of higher rate of vacancy (tax incidence S_2> tax incidence S_1).

Furthermore, due to economies of scale, the marginal cost for large corporate landlords can be constant instead of increasing (Coven, 2024). If these landlords further possess the market power that allows them to collectively set a price above their marginal cost without losing revenue, property tax will be more easily shifted from landlords to

[4] Trojanek and Gluszaks (2022) provide the short-run rental supply elasticities of 0.4–0.7 only, by analyzing how Polish rental markets responded to the influx of Ukrainian refugees into Poland following the 2022 Russian invasion. Greenwald and Guren (2021) also find credit shocks have negligible effects on homeownership, suggesting that a perfectly inelastic supply curve of rental housing in the short run.

renters, which, as shown in Figure 2(b), can be done by setting the rent at R_2', with the difference between R_2' and R_2 (as R_0 in the figure) being the actual tax levy, T.

In short, theoretical analysis suggests that though property tax is levied on property owners (landlords), part of the tax can be passed on from the landlord to renters. The pass-through of property tax to renters is likely to be small in the short run but can be large in the long run or in submarkets with more elastic housing supply or where landlords dispose of market power via coordinated rent setting.

2.2 Institutional Background

Compared with other major U.S. cities, Philadelphia had been more reliant on wage and business taxes than the property tax, but the pattern has changed significantly in recent years. As of 2020, the city's general fund revenue from property tax constituted less than half of what it generates in other major U.S. cities (14.5 percent in Philadelphia, lower than the median of other major cities of 31.5 percent) (Pew Charitable Trust, 2022). Increasing the reliance on property tax more rapidly, however, is politically challenging in Philadelphia because of the unusually high share of low-income homeowners and a long history of inaccurate and often unfair assessments in the past in the city (Pew Charitable Trusts, 2012). Furthermore, there is only one tax rate for all types of properties in the city, which makes less feasible the options to increase tax rates for non-residential properties while keeping the rate for residential properties low.

The Constitution of the State of Pennsylvania does not require local governments to reassess properties regularly (Ding and Hwang, 2021; Pew Charitable Trust, 2022). In Philadelphia, assessments are handled by the Office of Property Assessment (OPA); exemptions are created by state law or local ordinance, and tax rates are set by the City Council and Mayor as part of the annual budgeting process. Before 2013, the property tax system in Philadelphia was characterized by low assessments of properties, extremely high rates of tax delinquency, and lesser reliance on property taxes compared with other jurisdictions (Pew Charitable Trusts, 2012). Since the 1980s, Philadelphia had not conducted a comprehensive reassessment of the market value for properties in the city,

and the assessed values for most properties had been substantially lower than their actual market values until 2013. The city only reassessed the value of very few homes during that time period, most of which were new construction. Pew Charitable Trusts (2012) estimates that the assessed values listed on tax bills of city properties, on the whole, were, on average, about 60 percent lower than true market values and the assessments were often inaccurate and unfair.

In 2013, after several years of public discussions and internal evaluations, Philadelphia adopted a comprehensive property tax reform known as the Actual Value Initiative (AVI) which became effective for property tax levy in 2014. Under the AVI, the city conducted its first comprehensive reassessment (since the 1980s) in 2013. Claimed to be a revenue-neutral reform, the AVI redistributed the city's tax burden, so that properties with no or small increases in market values since the 1980s benefited with lowered tax bills, whereas those with large appreciations in value faced with higher tax levies.

The AVI initially required the city to conduct property reassessments annually, but actual reassessments turned out to be much less frequent. After 2013, all commercial properties were reassessed again at full market value for tax year 2018, while residential properties were reassessed for tax year 2019.[5] In May 2022, Philadelphia released updated assessed values for all properties in the city and the reassessments applied to taxes due in March 2023. As the first update to the city's real estate tax rolls in four years,[6] the increases in assessed values were substantive: The median assessed value increased by 36.7% and the median tax levy increased by 34.4% (that translated into an increase of about $630 in the mean).

The effects of the reassessments under the AVI on residential properties are clearly illustrated in Figure 3. The median assessed value changed very little before the AVI but jumped sharply in 2014 when the city reassessed all properties under the AVI. Property taxes, on the other hand, increased only marginally after adopting the AVI as the tax reform

[5] In 2017, the City reassessed commercial and industrial properties in Philadelphia for the 2018 tax year but the City did not reassess residential properties for the 2018 tax year because it argued the assessed values of residential properties already reflected the fair market value of those properties.

[6] The city implemented a new appraisal computer system for the 2023 reassessment as well.

was designed to be revenue neutral. Median assessed value and property tax increased slightly again because of the 2019 reassessment of residential properties. Different from the 2013 and 2019 rounds of reassessment, both median assessed value and tax levy increased sharply from the 2023 reassessments.

<Insert Figure 3 about here>

Together with the 2023 mass reassessments, Philadelphia made several changes to its property tax system, all designed to cushion the impact on homeowners without reducing the tax rate. One significant change was the revised Homestead program, which doubled the assessed value reduction for each eligible owner-occupied property (from $40,000 to $80,000) starting from the 2023 tax year and further increased it to $100,000 beginning in 2025. The updated Homestead program saved a typical homeowner about $1,119 annually on their Real Estate Tax bill starting in 2023. However, landlords and most tenants are not eligible for this tax relief program.[7] Therefore, it is reasonable to assume that after controlling for observable factors and accounting for the time trend, the rent increase following the mass assessment can be attributed to the larger tax hikes.

3. Data and Methodology

3.1 Methodology

The identification of tax incidence is embedded with several challenges. First, the levy changes of property tax are typically small, making it difficult to quantify their effect on rent. However, the steep tax hike in Philadelphia resulting from the lagged mass appraisal [8] in May 2022 offers an excellent case study for this research. We begin by describing the

[7] There were some tax relief programs targeting at older and lower-income renters or new developments, but the coverage is quite limited.

[8] In strict terminology of the real property industry, assessment refers to the annual process of evaluation property values for deriving at tax levies while appraisal uniquely applies to the periodical examination of properties to arrive at more precise valuation. In common usage, however, the two terms are interchangeable. This paper follows the common use.

trends in property assessments, sales prices, and rents before and after the 2023 mass appraisal. Specifically, we examine these trends for Philadelphia as well as for a group of peer cities that did not experience a similar level of tax increases between 2022 and 2023. For identification, we use a standard difference-in-differences (DiD) model to compare sales prices and rents in Philadelphia with those in the comparison cities. Our model is of the following form:

$$Y_{ict} = \beta_0 + \beta_1 Treatment_c + \beta_2 Post_t + \beta_3 Treatment_c{*}Post_t + \beta_4 Prop_i + \beta_5 Qtr_t + \Theta Zip_z + \varepsilon_{ict} \quad (1)$$

where Y_{ijt} is the outcome measure (asking rent, effective rent, or sales price in log) for property *i* in city *c* and year *t*. $Treatment_c$ is the dummy variable that represents properties in Philadelphia (treatment group). $Post_t$ is an indicator of post-reassessment dummy to capture the period after the release of the 2023 reassessment in the second quarter of 2022.[9] The interaction of these two terms ($Treatment_c{*}Post_t$) is our regressor of interest. $Prop_i$ is a vector of property-specific characteristics. Zip_z and Qtr_t are vectors of zip code- and quarter-fixed effects, respectively. The coefficient of the interaction term $Treatment_i \times Post_t$ captures the effect of the 2023 reassessment and property tax change on rents. A positive and significant β_3 indicates that a rent increase after the radical change in property taxes in 2023, which implies that property taxes have been passed to tenants.

While the average effect identified from the standard DiD model should be adequate for a relatively short study period, an alternative event history model can help further analyze the effect of tax increase over time, which can be specified as:

$$Y_{ict} = \beta_0 + \beta_1 Treatment_c + \beta_2 QTR_{t\,t} + \beta_3 Treatment_c{*}\, QTR_t + \beta_4 Prop_i + \beta_5 Qtr_t + \Theta Zip_z + \varepsilon_{ict} \quad (2)$$

Additionally, while we carefully selected the control cities for their similarity to Philadelphia, the parallel trends assumption may be violated in some cases, with treatment and control groups displaying significantly different pre-treatment trends. To

[9] As to the role that the expectation of the tax increase would play, the magnitude of the increase far exceeded the expectation of most landlords while they may expect the tax assessment. Tenants were less likely to pay attention to the tax increase so the impact on their behavior would also be neglectable pre-treatment.

address this, we further employ a synthetic difference-in-differences (SDID) model to verify the results from the preferred model. The SDID method creates a "synthetic control group" that closely mirrors the treated group before the intervention, allowing for a more robust comparison of outcomes (Arkhangelsky et al., 2021).

Although the SDID model offers significant advantages over the traditional DiD approaches in most cases, our analysis primarily relies on the DiD model for the following considerations: (1) SDID applies weights to observations in the control group, making interpretation difficult and complicating the use of weighting of the number of units in the regression; furthermore, it makes it challenging for the comparison of results from models using different outcome variables (different composition of the control group), (2) SDID's application is limited when data is not a balanced panel, as is the case with our models using property-level MLS listing and sales data, and (3) pre-treatment trends are generally not severe during the study period, except for a few months at the start of the pandemic. Of course, we did check the parallel trends assumption and used the SDID model to validate the major findings, using either property-level data (RealPage data) or city-level aggregated data when feasible.

The control group, consisting of up to 10 peer cities, was chosen to isolate the impact of the property tax increase in Philadelphia. The cities were selected based on their similarity to Philadelphia in terms of population size, density, public transportation reliance, residential mobility patterns during the COVID-19 pandemic, and data availability (Rosenthal et al., 2022). These cities are Baltimore, Boston, Chicago, Cleveland, Minneapolis, New York, Pittsburgh, Portland, Seattle, and Washington, D.C. Our study period spans from 2020 to the first quarter of 2024, after the 2019 reassessment of residential properties in Philadelphia and ending just before the release of the next mass reassessment in August 2024.

3.2 Data

This study uses data from several sources. The first is apartment data from RealPage, a company that provides property management software to owners and

managers of apartment buildings. The RealPage dataset is a national sample of large, professionally managed multi-family properties (20+ units). We focus on over 200 RealPage apartment buildings in Philadelphia and more than 2,800 RealPage properties in 10 peer cities. These properties have a total of 45,424 rental units in Philadelphia as of March 2020, representing about 12.5% of the city's rental housing stock. The mean asking rent for RealPage properties in Philadelphia as of May 2022 was $1,985, higher than the citywide average of around $1,500.[10] For each property, the dataset includes a set of static variables (e.g., property address, number of stories, number of units, average unit size, and construction year) and dynamic variables such as average asking rent, average effective rent, asset ratings, and occupancy rates. These variables are updated monthly.

The second data source is CoreLogic, which provides MLS listing rents, property assessments, tax amounts, sales transactions, and property characteristics. The CoreLogic MLS data covers a broad range of fields, including the listing date, listing price (or rent), and various property features. The MLS data is curated from verified listings by licensed real estate professionals and set up for agents to use. However, the coverage of MLS data may vary across markets and the coverage is likely more limited in smaller or private rentals that are more likely to be listed on platforms like Craigslist, Zillow, or Facebook partly for cost considerations.[11] The MLS data used in this paper includes 46,578 listings of single-family properties in Philadelphia and 140,754 listings in the peer cities from Q1 2020 to Q1 2024. CoreLogic's Owner Transfer Data provides details on property sales, including the date, sale price, and names of the buyer and seller. CoreLogic Property data and Historical Property data include property assessments, tax information, and key property features, which can be linked to the CoreLogic MLS and Owner Transfer datasets.[12]

[10] The average rent is based on this report: https://www.economyleague.org/resources/rising-rents-greater-philadelphia-2022-update#:~:text=As%20detailed%20in%20figure%201,city's%20growing%20cost%20of%20living.

[11] The MLS listing is more expensive, usually charging hundreds of dollars per listing, and thus more likely to be used by larger corporate investors and for more expensive rental properties.

[12] In a few cases, a city does not have complete assessment data for all the years (for example, the 2023 and 2024 assessment data are missing for Chicago). But when the data are unavailable for a particular year, it

The final source is Zillow's Observed Rent Index (ZORI) and Zillow Home Value Index (ZHVI), which measure asking rents and home values at the zip code or city level. Unlike RealPage, which primarily covers large apartment buildings, ZORI is a repeat-rent index for a "typical" rental, weighted to represent the entire market. ZORI is used to capture broader market rent trends. Zillow data was used for descriptive analysis and to verify regression results based on the other data sources.

4. Empirical Results

4.1 Descriptive Analysis

When comparing the percentage changes in assessed values and tax levies from 2022 to 2023, the changes in Philadelphia were significantly larger than those in the comparison cities at the aggregate level (Table 1). The median property assessment (market value) increased by just 1.5% for residential properties in the peer cities from 2022 to 2023, far lower than the 36.7% increase in Philadelphia. Similarly, the median property tax in the peer cities rose by 6.1%, also much smaller than the 34.4% increase in Philadelphia. Properties in peer cities are either reassessed annually (like New York city or Washington, DC) or regularly (like triennial reassessments[13] in Baltimore and Chicago), or not reassessed at all over a longer period (like in Pittsburgh). So, property assessments in peer cities would not change as radically as the mass reassessments after a long interval in Philadelphia. Slight increases in property taxes in peer cities are likely due to adjustments in assessments (but not as large as that in Philadelphia), changes in tax rates, new developments, or reassessments of new property transactions. For Pittsburgh, for example, which is in the same state as Philadelphia, the median property tax only increased by 1.5% from 2022 to 2023, with reassessments remaining largely unchanged.

---

often means there was no mass reassessment for that year. We tried to fill in the assessment data based on the previous year(s)'s data (assuming assessments remain unchanged, and tax amount increases at the average growth rate).

[13] Properties are reassessed every three years and approximately one-third of the properties are reassessed in each year.

When comparing the rent changes (listing rent) from January 2020 to May 2022 at the market level, we see wide variations in the magnitude of changes across cities (Figure 4). Rents, measured by the ZORI index (all homes plus multi-family),[14] increased for all cities in the sample, while the rent increase in Philadelphia (11.8%) was slightly higher than the average of the peer cities (9.8%). Three cities experienced larger increases during that period, including Pittsburgh, Baltimore, and Cleveland, while the other seven had slightly smaller increases. The sharp rise in rents during the pandemic may have reflected a surge in housing demand as household formation jumped in 2021, increased demand for work-from-home, increased short-term rental subsidies, combined with a relatively fixed supply of housing in the short run (Bolhuis et al., 2022).

<Insert Figure 4, 5 and Table 1 and 2 about here>

From May 2022 to March 2024, rent increase in Philadelphia (6.5%), however, was lower than most of the peer cities (average 8.9%). The rent index is based on both single-family and multi-family rentals so the trend for multi-family rentals could be different. When focusing on RealPage multi-family properties in Philadelphia, the increase in the asking rent was slightly larger than that in the peer cities, measured by either the mean asking rent, the standardized measure of the asking or effective rent per square foot (only the effective rent shows a different pattern) (Table 2). The pattern is slightly different for housing value changes (Figure 5). House-value increase in Philadelphia was lower than most cities in the control group either before and after May 2022 and house values even decreased slightly in Philadelphia after the release of the 2023 mass reassessment. Overall, the descriptive results suggest that there is no sign of significantly larger increase in listing rents at the aggregate level, compared with peer cities after the 2023 mass

[14] The index is dollar-denominated by computing the mean of listed rents that fall into the 35th to 65th percentile range for all homes and apartments in a given region, which is weighted to reflect the rental housing stock. Smoothed and seasonally adjusted; downloaded in August 2024.

reassessment except the asking rent increase for large apartments was slightly larger in Philadelphia.

4.2 Regression Analysis

This subsection reports the results from the DiD regressions on the impact of the 2023 reassessments on a comprehensive set of outcome measures of rents and housing prices. Estimates of the economic incidence of property taxes depend on the relative responsiveness of supply and demand to property tax increases or the extent to which renters and landlords and developers can change their behavior to avoid the tax. Regression results suggest that tax increase has not led to a significant rent increase, measured by either the average asking rent, average effective rent, or asking and effective rent per square feet in the professionally managed multi-family market or the listing rent in the MLS-listed rental market. The estimates also indicate that after the 2023 mass reassessments, sales prices decreased slightly but the change is not statistically significant after controlling for housing characteristics. These results depict a nuanced picture of the short-term impact of tax increases on landlords and tenants, suggesting a small and statistically insignificant short-term tax incidence.

Impact on Rent (RealPage and CoreLogic MLS Data)

We first present and discuss the regression results of the short-term impact of the larger tax increase on a variety of rent measures; the coefficient of the interaction term (*TREAT * POST*) represents the change in corresponding outcome measures post-2023 of an average property in Philadelphia. As defined earlier, the control group consists of rental properties in the 10 peer cities, none of which experienced the same level of increase in property taxes as in Philadelphia during the study period (2020 to 2023).

As shown in Table 3, we do not find a significant rent increase associated with the 2023 reassessment in Philadelphia, based on the RealPage data. The sign of the variable of interest, interaction of the treatment and the post-2023 variables, is positive for all four rent measures in the preferred model, with the magnitude ranging from 0.1% to 1.7% for

different outcomes, but none of the coefficients is statistically significant. In other words, there is no significant evidence of property tax-induced rent increase in Philadelphia after May 2022.

The RealPage sample is not a balanced sample, and a small share of properties could be added or dropped out from the panel each month, which may lead to biased estimates if newly added or dropped properties are systematically different.[15] For properties with complete records for each month, the regression results are qualitatively consistent with the results based on data for all properties, except the coefficients for the effective rent outcomes become negative (but insignificant), as summarized in Table 3. So, the results are robust even after excluding properties that do not have complete records for the whole study period.

<Insert Table 3 and 4 about here>

Results based on the CoreLogic MLS data are consistent with those using the RealPage data. When focusing on multi-family (including apartments) rentals listed on MLS, we find that the coefficient of the interaction variable is negative (-4.7%) but insignificant after controlling for property characteristics, suggesting no significant increase in MLS multi-family rent in Philadelphia post-2023, compared with the peer cities (Table 4).[16]

Large multi-family properties may differ from other rental properties, like single-family rentals, in ownership type, business model, and other ways. In Philadelphia, for example, only a small share (8.8%) of single-family residence rentals was owned by large corporate investors (Ding, Zhang, and Diep, 2025), while that share is much higher for multi-family properties. When we include all listings from the MLS data, including both

[15] Over half (53%) of properties have complete records for the whole study period, which account for about 75% of all property month observations (weighted by number of units).

[16] It needs to be noted that the cities in the control group are slightly different as the MLS data are missing for two cities in the control group, Portland and Pittsburgh, which were dropped from this regression. When using the same set of peer cities (those with MLS data), the regression results using the RealPage data are generally consistent as those in Table 3.

multi-family, single-family, and other residential rentals, the results suggest an insignificant change (though negative) in the MLS listing rent post treatment. The results do confirm that there is no evidence in support of a significant pass-through of tax increase to tenants by landlords, either large apartment landlords or the MLS property landlords collectively.

Identification Assumptions and Robustness Checks

There are important assumptions for the DID approach used in this study. The parallel trend assumption, which assumes parallel trends prior to the treatment, is the most critical one to ensure internal validity of DID models. One way to assess this identifying assumption is to look at the trends in outcomes leading up to the 2023 reassessments. The descriptive charts based on the treatment and control groups suggest that the trends for all outcome variables in the treatment group and those in the control group are quite similar during the recovery period from the pandemic but properties in the peer cities were hit slightly harder in the early stage of the COVID-19 Pandemic (the first three quarters of 2020) (see Appendix Figure A1 for the trends in rents).

We conduct additional analysis by running event history models interacting treatment with quarterly dummies (as illustrated in Figure A2, with the second quarter of 2022 as the reference). Results from the event history models are qualitatively consistent with the average effect from the DiD approach discussed early, with effects on the asking rents or effective rents insignificantly different from zero in the post-2023 reassessment quarters. There was a pre-trend in the first two quarters of 2020, in which rents in Philadelphia were significantly lower than that in the peer cities (about 5-6% lower); or in other words, Philadelphia did not experience as sharp a decline in rent as some of the peer cities in the early stage of the pandemic. Other than that, there were no significant violation of the parallel trend assumption during the rest of the pandemic or the post-pandemic period.

The synthetic difference-in-differences model can better address the pre-trend issue by weighting the control group differently. The SDID results suggest the impact on

rents (either measured by effective rent or asking rent) is statistically insignificant (with the magnitude of the interaction term ranging from -0.7% to -0.4% for different outcomes), consistent qualitatively with the results from the DiD models or the event history models. See the illustration in Appendix Figure A3 based on the results for asking rents.

We also conduct analyses to evaluate whether the results are robust when alternative data are used and whether the results are sensitive to the composition of the peer cities. First, to test the effect of property tax increase on the asking rent at the market level, a separate regression was run using the Zillow's Observed Rent Index (ZORI) at the Zip code level. Different from RealPage data that primarily covers large apartment buildings or the MLS data covering only properties listed through MLS, ZORI is a repeat-rent index of a "typical" rental, weighted to represent the entire market and is used to capture the market-level rent dynamics. The results, as summarized in the Appendix Table A1, suggest that at the market level, there was no significant increase in rent in Philadelphia, compared with the peer cities. The rent change post-treatment in Philadelphia was negative (about -2.8%) but statistically insignificant. This is quite consistent with the findings of an insignificant impact of the property tax increase on the rent of either large apartments or single-family rentals in Philadelphia. We also tried other specifications, like testing including additional cities or excluding more influential cities like New York and Chicago, the results are quite consistent.

Impact on Sales Price (CoreLogic Owner Transfer Data)

As to the short-term impact of property tax increase on sales prices, the DiD estimation reveals that the 2023 reassessment leads to a slight decrease in the sales price (about -2.7%), but the coefficient becomes insignificant when important housing characteristics (number of bedrooms, number of bathrooms, and square feet of the property) are controlled for (Table 5). The results suggest a negative immediate response, though statistically insignificant, in property value to property tax increase. This is consistent with the expectation since higher tax is likely to reduce demand for housing, but the decrease is quite small and statistically insignificant in this case.

<Insert Table 5 about here>

Summary

In summary, the results suggest that there is no sign that landlords, either large multi-family property landlords, landlords using MLS to list their properties, or at the aggregate level, have passed the increased property tax onto tenants with a significant amount. The insignificant effect of the larger tax increase on rents suggests a lower or slower pass-through rate, at least in the short term. The result of a generally insignificant effect of tax increase on observed rents is consistent with the theoretical analysis in support of a marginal short-term tax incidence. This is likely because while property taxes increase over time, they have become more predictable, and their effect could be gradual and last over a longer term. In addition, large corporate investors may be better positioned to absorb increased costs because of the increased property tax because of their scale of economy, greater financial resources, and long-term focus. Small and individual property owners, on the other hand, may find it more challenging to absorb such increased costs, with their more limited financial resources and tighter profit margins (Balzarini and Boyd, 2024).

No doubt, it is still too early to observe the full effects of tax increases on rents and housing prices just about two years after the reassessments. Rents may not go up significantly in one jump for many rental properties because doing so might hurt the landlord's chances of keeping and attracting tenants. The landlords may also resort to other means to shift the costs onto tenants as well, such as stopping covering renters' water bills, utilities, or small repairs from the rent, or increasing fees. The true total impact on single-family rentals needs to be examined when data at the more granular level become available or through new qualitative research.

5. Conclusion and Implications

This paper provides new evidence on the incidence of property tax, with a focus on whether the recent tax hike in Philadelphia was passed on to renters in the short run. Overall, about two years after the mass reassessment that led to a significant increase in property tax in the city, there had been no sign of tax-induced rent increase at the market level, for large-scale professionally managed apartments, or for MLS-listed rental properties. The impact of the sharp property tax increase on the sales price is negative but is not statistically significant. More research is needed to identify the long-term effects of property taxes on rents and the overall welfare for renters.

The findings have implications for policymakers in designing property tax policies. The results suggest that landlords are likely to bear most of the tax burdens in the short term. Certain landlords, especially large corporate investors, can absorb the increased expenses because of the economy of scale or the use of new technologies that can lower their costs. Other landlords, however, may choose to lower the quality of services or be disincentivized from staying in the market if they have to absorb the tax increases by themselves. Therefore, property tax could still negatively affect stakeholders other than homeowners; in these scenarios, the more vulnerable stakeholders ought to be considered when designing policy tools like tax exemptions and subsidies for target populations.

Of course, it is still too early to observe the full effects of tax increases on rents just about two years after the reassessments. And rents had gone up substantially during the pandemic; so, that may have provided landlords enough room to absorb the tax increases. The landlords, however, may also resort to other means to shift the costs onto tenants in the long term and the true total impact of tax increases still needs to be monitored carefully. Higher tax bills, when passed through to renters, could put additional strain for lower-income renters on their already tight budgets, making the property tax more regressive.

The findings also call for research on the behavior of different types of landlords. Future research is needed to better understand the heterogeneity in the rate of pass-through by geography, ownership type, and the study period. While this study provides

valuable evidence, a direct comparison of rental properties of different types of landlords would provide more conclusive results. A cross-unit examination would be interesting to identify the heterogeneity in the effects of tax shock within the same city, especially on affordable housing. Qualitative studies on the impact of property tax on landlords and tenants' behavior would also help understand how different stakeholders respond to policy shocks, as well as developing policies to provide needed relief for those who are more vulnerable.

References

Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., & Wager, S. (2021). Synthetic difference-in-differences. *American Economic Review, 111*(12), 4088–4118.

Balzarini, J., & Boyd, M. L. (2024). Cashing out? How small-scale landlords in Philadelphia perceive big development and tax policies. *Housing and Society*. https://doi.org/10.1080/08882746.2024.2345525.

Bolhuis, M. A., Cramer, J. N. L., & Summers, L. H. (2022). *The coming rise in residential inflation* (NBER Working Paper No. 29795). National Bureau of Economic Research.

Calder-Wang, S., & Kim, G. H. (2024). Algorithmic pricing in multifamily rentals: Efficiency gains or price coordination? *SSRN*. https://doi.org/10.2139/ssrn.4403058.

Carroll, R. J., & Yinger, J. (1994). Is the property tax a benefit tax? The case of rental housing. *National Tax Journal, 47*(2), 295–316.

Coven, J. (2024). *The impact of institutional investors on homeownership and neighborhood access*. SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4554831.

Davis, C., et al. (2024). *Who pays: A distributional analysis of the tax systems in all 50 states* (7th ed.). Institute on Taxation and Economic Policy. https://sfo2.digitaloceanspaces.com/itep/ITEP-Who-Pays-7th-edition.pdf.

Ding, L., & Hwang, J. (2020). Effects of gentrification on homeowners: Evidence from a natural experiment. *Discussion Paper, Community Development and Regional Outreach*, Federal Reserve Bank of Philadelphia.

Ding, L., & Hwang, J. (2022). Has COVID reversed gentrification in major U.S. cities? An empirical examination of residential mobility in gentrifying neighborhoods during the COVID-19 crisis. *Federal Reserve Bank of Philadelphia Working Paper* No. 22-20. https://www.philadelphiafed.org/-/media/frbp/assets/working-papers/2022/wp22-20.pdf

Fields, D. (2022). Automated landlord: Digital technologies and post-crisis financial accumulation. *Environment and Planning A: Economy and Space, 54*(1), 160–181.

Garriga, C., Gete, P., & Tsouderou, A. (2023). The economic effects of real estate investors. *Real Estate Economics, 51*, 655–685.

Gomory, H. (2022). The social and institutional contexts underlying landlords' eviction practices. *Social Forces, 100*(4), 1774–1805. https://doi.org/10.1093/sf/soab063.

Greenwald, D. L., & Guren, A. (2021). *Do credit conditions move house prices?* (NBER Working Paper No. 29391). https://doi.org/10.3386/w29391.

Gurun, U. G., Wu, J., Xiao, S. C., & Xiao, S. W. (2023). Do Wall Street landlords undermine renters' welfare? *Review of Financial Studies, 36*(1), 70–121.

Heinberg, J. D., & Oates, W. E. (1970). The incidence of differential property taxes on urban housing: A comment and some evidence. *National Tax Journal, 23*(1), 92–101.

Hou, Y., Ding, L., Schwegman, D. J., & Barca, A. G. (2023). Assessment frequency and equity of the real property tax: Latest evidence from Philadelphia. *Journal of Policy Analysis and Management*, 1–25. https://doi.org/10.1002/pam.22555.

Immergluck, D. (2018). Renting the dream: The rise of single-family rentership in the Sunbelt metropolis. *Housing Policy Debate, 28*(5), 814–829. https://doi.org/10.1080/10511482.2018.1460385.

Lee, K., & Wylie, D. (2024). Intuitional investors, rents, and neighborhood change in the single-family residential market. *Federal Reserve Bank of Philadelphia Working Paper* No. 24-13. https://doi.org/10.21799/frbp.wp.2024.13.

Mieszkowski, P. (1972). The property tax: An excise tax or a profits tax? *Journal of Public Economics, 1*(1), 73–96.

Muthitacharoen, A., & Zodrow, G. R. (2012). Revisiting the excise tax effects of the property tax. *Public Finance Review*. https://doi.org/10.1177/1091142112448416.

Orr, L. (1968). The incidence of differential property taxes on urban housing. *National Tax Journal, 21*, 253–262.

Orr, L. (1970). The incidence of differential property taxes: A response. *National Tax Journal, 23*, 99–101.

Pew Charitable Trusts. (2012). *The Actual Value Initiative: Overhauling property taxes in Philadelphia*. https://www.pewtrusts.org/~/media/legacy/uploadedfiles/wwwpewtrustsorg/reports/philadelphia_research_initiative/philadelphiapropertytaxespdf.pdf.

Pew Charitable Trusts. (2022). *How property is taxed in Philadelphia: What the city collects and how the process compares with other big cities*. https://www.pewtrusts.org/-/media/assets/2022/09/report-how-property-is-taxed-in-philadelphia.pdf.

Raymond, E. L., Duckworth, R., Miller, B., Lucas, M., & Pokharel, S. (2018). From foreclosure to eviction: Housing insecurity in corporate-owned single-family rentals. *Cityscape, 20*(3), 159–188.

Rolheiser, L. (2019). Commercial property tax incidence: Evidence from urban and suburban office rental markets. *SSRN*. https://ssrn.com/abstract=2993371.

Rotberg, S., & Steinberg, J. B. (2024). Mortgage interest deductions? Not a bad idea after all. *Journal of Monetary Economics, 144*, 103551.

Rosenthal, S. S., Strange, W. C., & Urrego, J. A. (2022). Are city centers losing their appeal? Commercial real estate, urban spatial structure, and COVID-19. *Journal of Urban Economics, 127*, Article 103381. https://doi.org/10.1016/j.jue.2021.103381.

Trojanek, R., & Gluszak, M. (2022). Short-run impact of the Ukrainian refugee crisis on the housing market in Poland. *Finance Research Letters, 50*, 103236.

Tsoodle, L. J., & Turner, T. M. (2008). Property taxes and residential rents. *Journal of Real Estate Economics, 36*(1), 63–80.

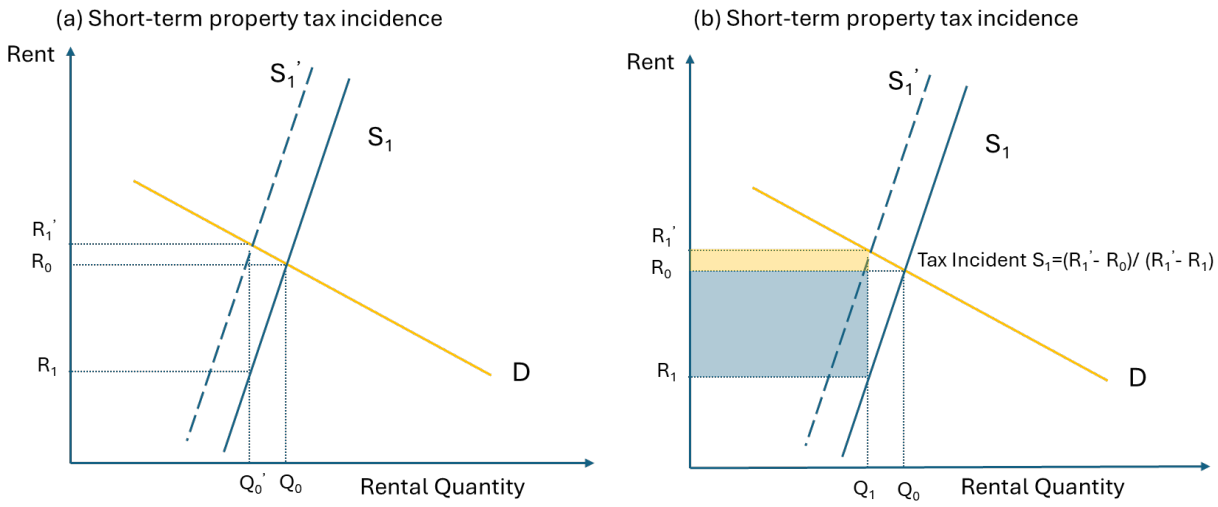


Figure 1. Short-term Impact of Property Tax Levy

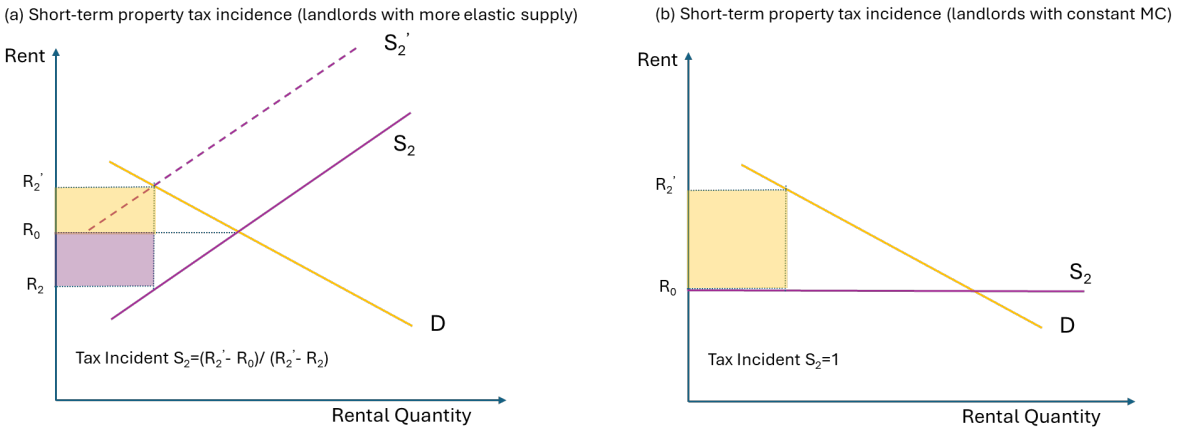


Figure 2. Tax Incidence for Rental Units by Large-scale Apartment Landlords

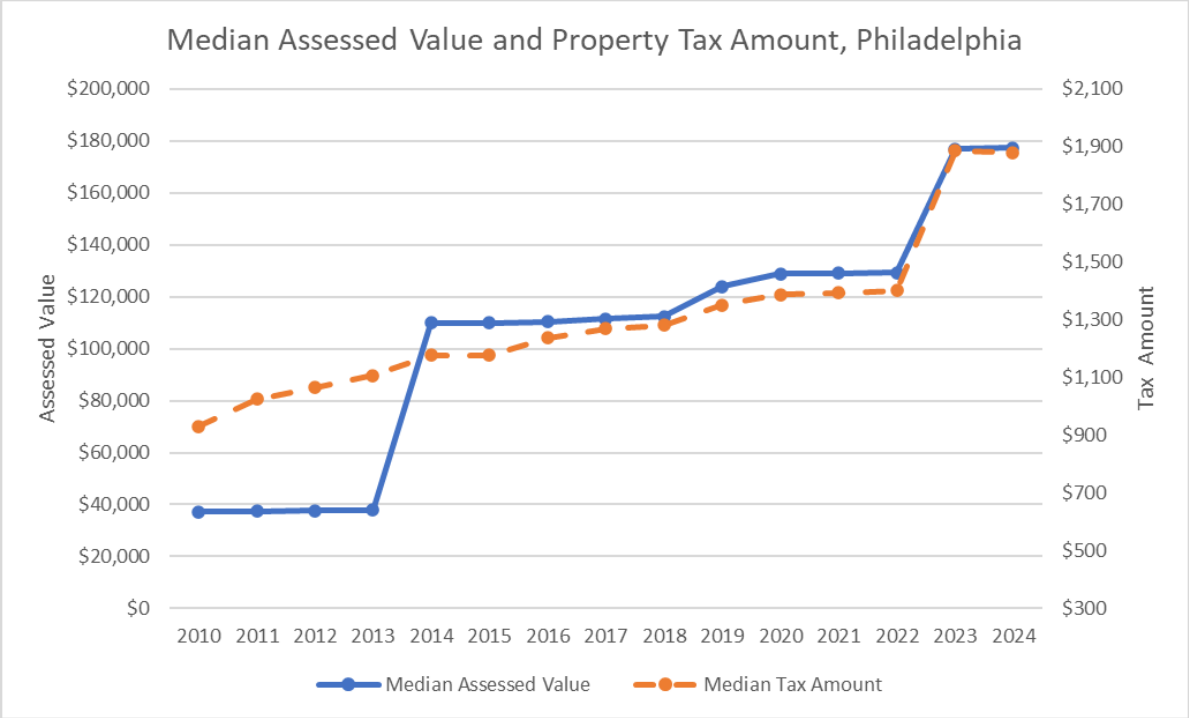


Figure 3. Trends of Median Assessed Value and Property Tax Levy in Philadelphia
Source: Authors' calculation based on CoreLogic data and data from City of Philadelphia's Department of Revenue

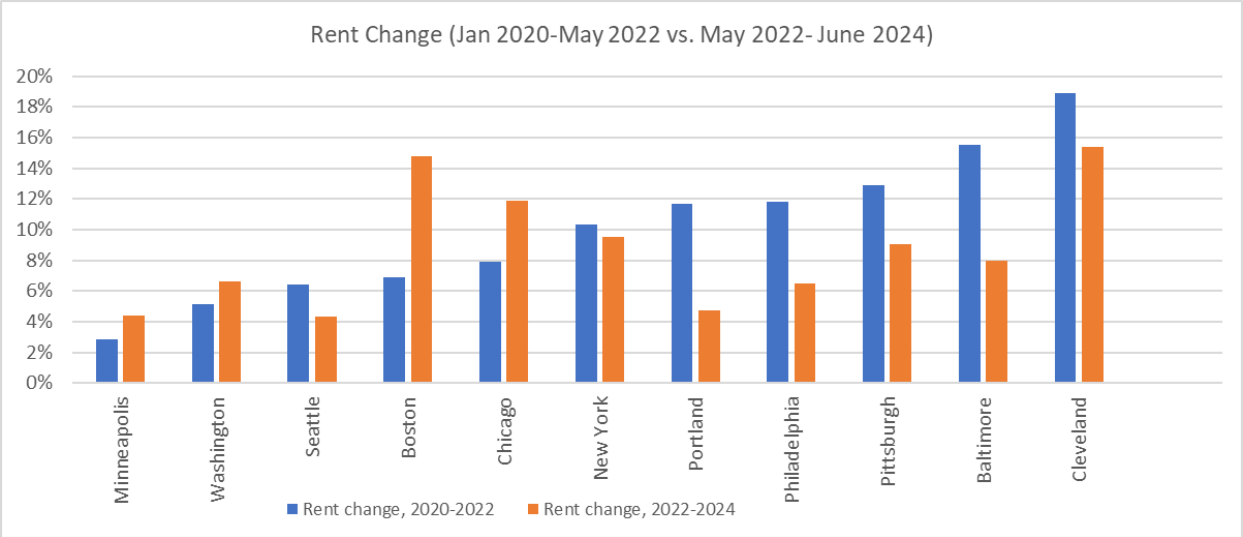


Figure 4. Rent Change before and after May 2022
Source: Authors' calculation based on Zillow Observed Rent Index

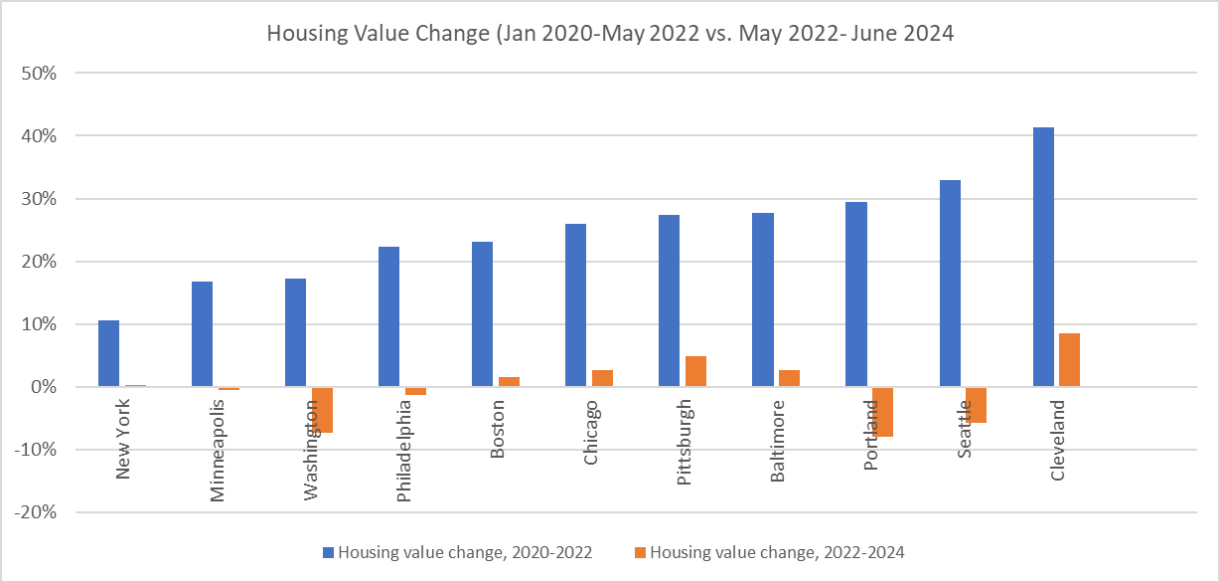


Figure 5. Home Value Change before and after May 2022

Source: Authors' calculation based on Zillow Home Value Index data

Table 1. Percent Change in Median Assessed Value and Property Tax Amount of Residential Properties in Philadelphia and Peer Cities

Assessed_year	Median Assessed Value		Median Tax Amount	
	Philadelphia	Peer Cities	Philadelphia	Peer Cities
2020	$128,800	$246,440	$1,387	$3,718
2021	$129,200	$270,140	$1,394	$3,958
2022	$129,400	$275,756	$1,403	$4,048
2023	$176,900	$280,000	$1,886	$4,299
% change 2022-2023	36.7%	1.5%	34.4%	6.2%

Source: Authors' calculation based on CoreLogic property data and data from City of Philadelphia's Department of Revenue. Peer cities include Baltimore, Boston, Chicago, Cleveland, Minneapolis, New York, Pittsburgh, Portland, Seattle, and Washington, DC.

Table 2. Summary Statistics of RealPage Rent Data for Philadelphia and Peer Cities (Need to decide if focusing on cities with MLS data only; and add stats from MLS data?)

Variables	May, 2022		March, 2024 (% Change from 2022)	
	Philadelphia	Peer Cities	Philadelphia	Peer Cities
Number of properties	222	2895		
Number of units	45,424	592,795		
Mean unit size	844	790		
Mean occupancy rate	90.0%	92.3%		
Median number of stories	5	6		
Median construction year	1986	2008		
Mean asking rent	$1,985	$2,509	$2,065 (4.0%)	$2,594 (3.4%)
Mean effective rent	$1,955	$2,455	$2,004 (2.5%)	$2,542 (3.5%)
Mean asking rent/sqare feet	$2.40	$3.25	$2.57 (6.8%)	$3.35 (3.1%)
Mean effective rentt/sqare feet	$2.36	$3.18	$2.49 (5.1%)	$3.28 (3.3%)

Note: author's calculation based on RealPage data; weighted by number of units of corresponding property.

Table 3. Summary of Coefficients of the Interaction Terms (Impact on Rents) Using RealPage Data

	Effective Rent (in log)			Asking Rent (in log)			Effective Rent Per Sq Feet (in log)			Asking Rent Per Sq Feet (in log)		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Controlling for property characteristics (preferred model)												
Philly	-0.554	0.018	0.000	-0.598	0.017	0.000	-0.542	0.021	0.000	-0.584	0.026	0.000
Post_assmnt_23	0.043	0.006	0.000	0.038	0.005	0.000	0.042	0.006	0.000	0.037	0.005	0.000
Philly*Post_assmnt_23	0.001	0.011	0.949	0.010	0.009	0.303	0.007	0.011	0.552	0.017	0.009	0.107
Properties with complete data for all months												
Philly	-0.384	0.038	0.000	-0.400	0.038	0.000	-0.353	0.039	0.000	-0.367	0.040	0.000
Post_assmnt_23	0.025	0.004	0.000	0.021	0.003	0.000	0.025	0.004	0.000	0.021	0.003	0.000
Philly*Post_assmnt_23	-0.006	0.011	0.589	0.003	0.010	0.722	-0.005	0.011	0.641	0.004	0.010	0.667

Note: authors' calculation based on the RealPage data; other control variables include asset grade, average unit size, occupancy rate, number of stories (categorical), construction year (categorical), and quarter and zip code dummies, weighted by number of units. Standard errors clustered at the city level. Total number of observations is 139,333 and 97,410 property years for the preferred models and models using properties with more complete data for all months.

Table 4. Summary of Coefficients of the Interaction Terms (Impact on List Rent) Using MLS Data

	List Rent (in log)			List Rent (in log), housing characteristics controlled		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Apartments and other multi-family properties						
Philly	-1.411	0.027	0.000	-1.403	0.035	0.000
Post_23	0.047	0.017	0.037	0.041	0.015	0.032
Philly*Post_23	-0.062	0.031	0.090	-0.047	0.035	0.223
All properties						
Philly	0.000	0.014	0.977	-0.678	0.097	0.000
Post_23	0.053	0.014	0.004	0.037	0.011	0.010
Philly*Post_23	-0.052	0.019	0.027	-0.048	0.022	0.062

Note: authors' calculation based on the CoreLogic data; other control variables include number of bedrooms (categorical), number of bathrooms (categorical), living area (in log), and quarter and zip code fixed effects. Standard errors clustered at the city level. Total number of observations is 46,026 and 187,307 listings for the two sets of models.

Table 5. Summary of Coefficients of the Interaction Terms (Impact on Sales Price)

	Sales amount (log)			Sales amount (log), control for housing features		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Philly	-2.574	0.020	0.000	-2.596	0.054	0.000
Post_assmnt_23	0.202	0.038	0.000	0.159	0.028	0.000
Philly*Post_assmnt_23	-0.027	0.011	0.035	-0.026	0.021	0.248

Note: based on CoreLogic data. Other control variables include property type (single-family), number of bathrooms, built-year, property size (total square feet in log), and monthly and zip code fixed effects. Standard errors clustered at the city level. Total number of observations is 590,148 property years.

Appendix

Table A1. Summary of Impact of Property Tax Increase on Rents Using Zillow Data

	Zillow Observed Rent Index ($)			Zillow Observed Rent Index (log)		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Philly	-1,480.385	38.051	0.000	-0.692	0.008	0.000
Post_23	62.404	26.552	0.041	0.021	0.004	0.000
Philly*Post_23	-150.086	86.817	0.115	-0.026	0.014	0.108

Source: authors' calculation based on the Zillow ZORI data (Q1 2020-Q1 2024).

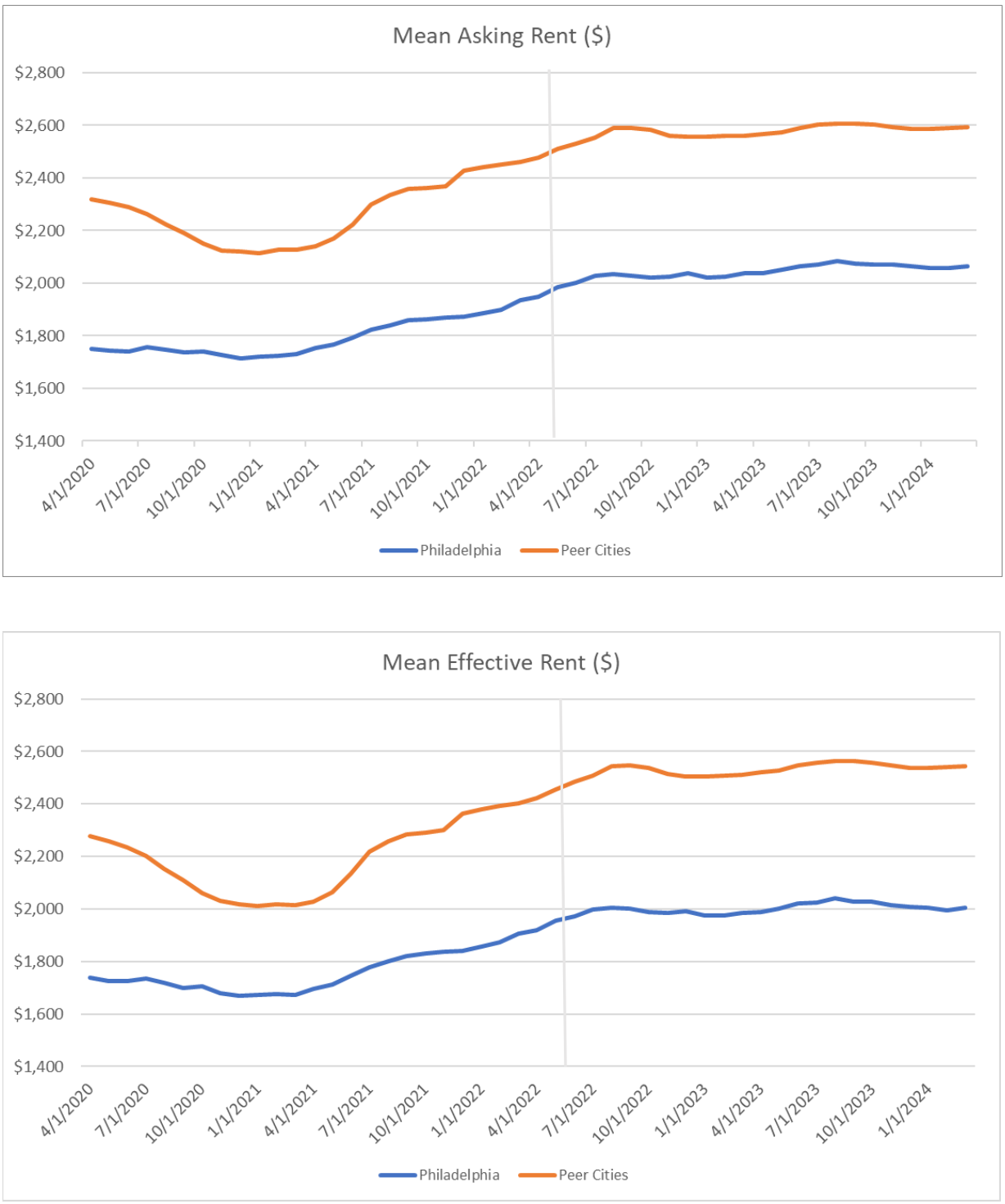


Figure A1. Mean Asking Rent (Top) and Effective Rent (Bottom) in Philadelphi and Peer Cities, Q1 2020–Q1 2024
Source: authors' calculation based on RealPage data.

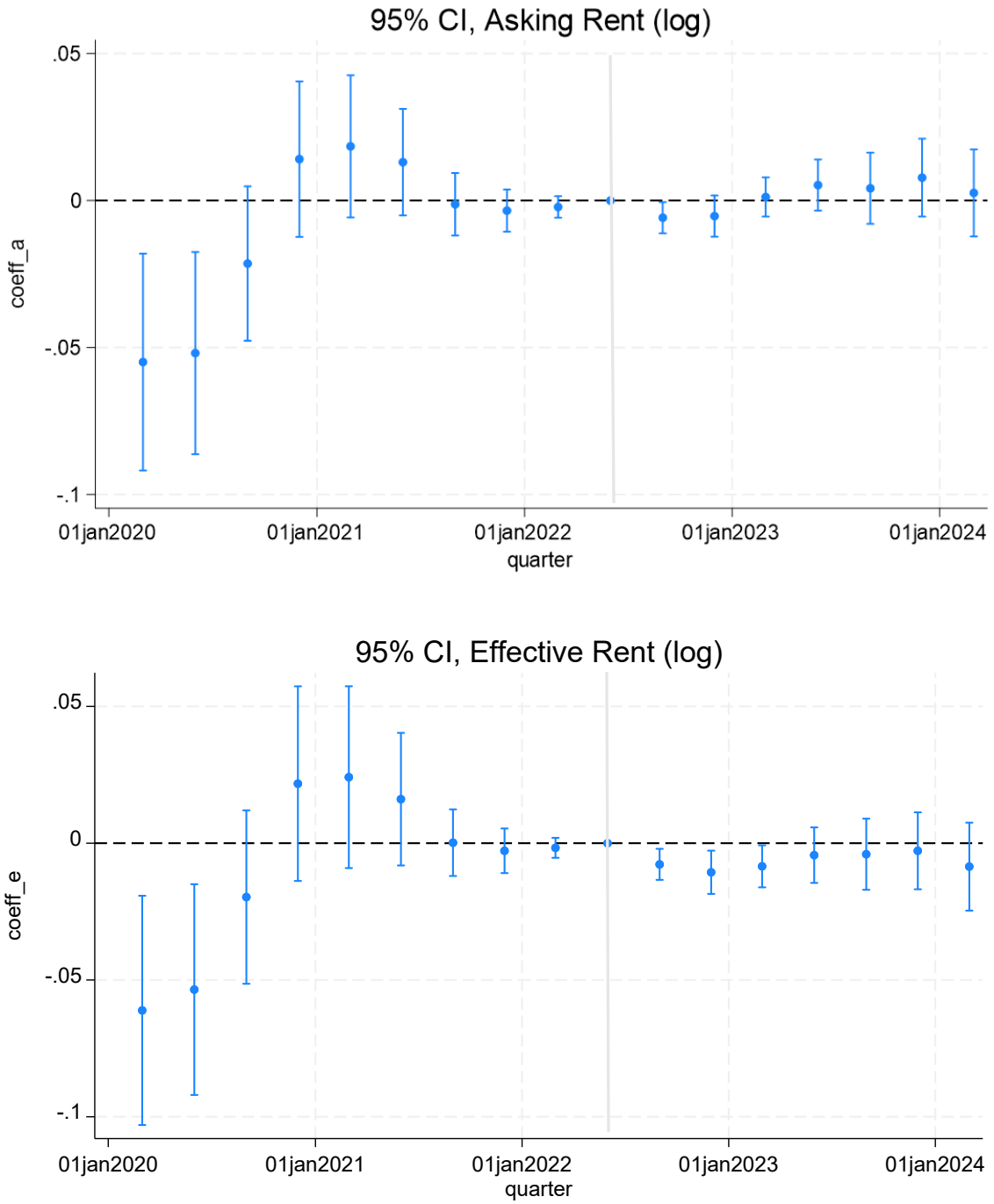
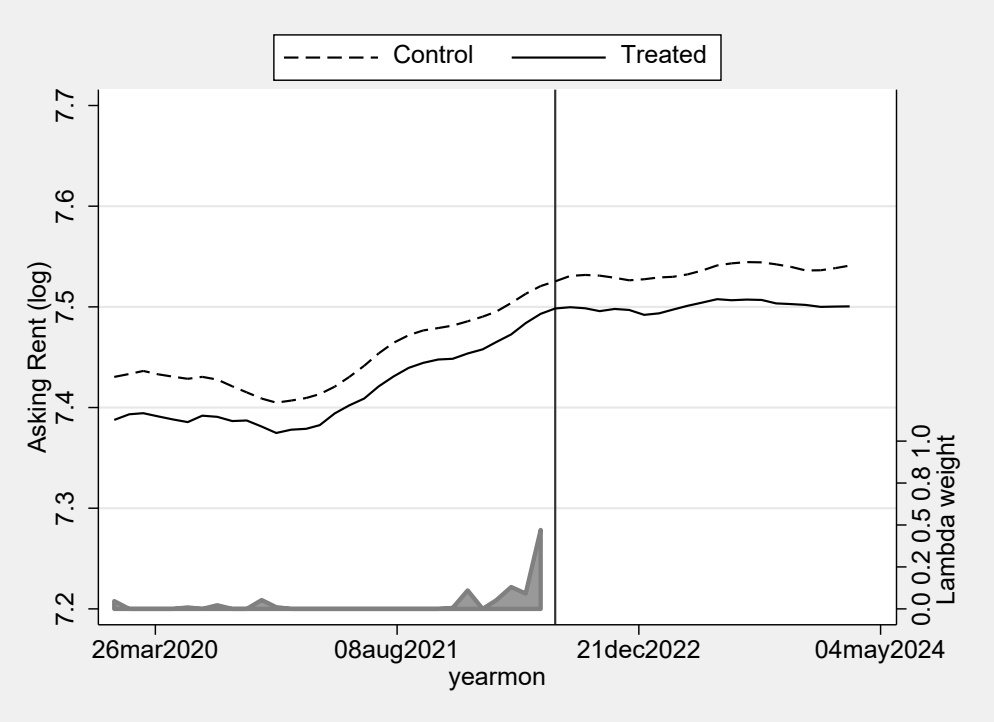


Figure A2. Event History Model Results: Effects on Asking Rent (Top) and Effective Rent (Bottom)

Source: authors' calculation based on RealPage data.



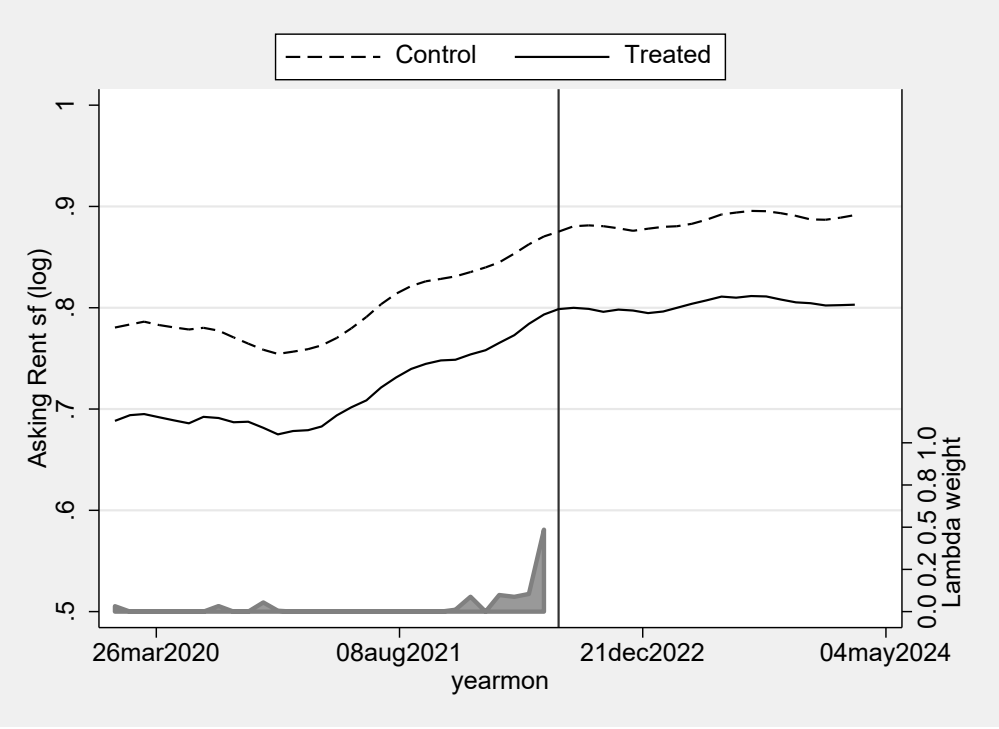


Figure A3. Synthetic Difference-in-differences Model Results: Effects on RealPage Asking Rent (Top) and Asking Rent per Square Feet (Bottom)

Source: authors' calculation based on RealPage data.