Adaptive Rent Pricing and Its Consequences

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Abstract

Informed landlords adjust rent more flexibly to expand their market share, fueling rent inflation. They secure a 0.5% higher annual rental income through an additional 0.3% rent adjustment, regardless of whether the market is in a downturn or recovery. In volatile periods, this advantage grows further: they achieve a 1.7% higher annual income through an additional 0.8% rent adjustment. Although frictions in rent adjustments contribute to these outcomes, they do not fully explain the pricing patterns observed among informed landlords—pricing expertise is key. These findings suggest that informed institutional landlords lead the rental market through flexible pricing strategies, and market volatility disproportionately challenges uninformed mom-and-pop landlords, who make up the majority of the rental market.

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I Introduction

Multifamily housing is a major component of the US rental housing market, accounting for 63% of all rental units.[1] However, despite the pivotal role of pricing in the economy, economic literature has paid little attention to pricing behaviors in the multifamily rental housing sector. Understanding these behaviors is essential for economic policies, such as those on rent inflation and the welfare of landlords and renters. Given that individual landlords make up half of the US rental housing market, filling this gap can also provide valuable information for current and prospective small-scale real estate investors.

By analyzing high-frequency, unit-level asking rent data from Chicago apartments, this paper quantifies the impact of rent-pricing flexibility on rent growth and rental income. It finds that apartments with flexible rent pricing are likely owned by institutional landlords, particularly those with large, diversified real estate portfolios and significant experience. These landlords change rent 3% more than mom-and-pop landlords by adjusting rents 6.4 times more frequently. As a result, these landlords outperform less flexible landlords and earn an additional rental income: 0.5% in stable markets and 1.7% in volatile markets.

This analysis is grounded in the uniqueness of rental housing, whose returns are determined in two different markets. Like traditional financial assets, capital gains from rental properties are assessed in the asset market (i.e., the housing market). However, their rental incomes are determined in the separate rental housing market, which behaves more like a consumer product market. In this market, landlords play a role similar to firms selling consumer goods, and they sell the right to stay in their residential real estate. If the rental housing market is imperfectly competitive, rent prices will be set by landlords aiming to maximize their rental income.

The detailed high-frequency data explored in this paper, which includes information about landlords, enables the study of those rent pricing behaviors and their consequences. By collecting daily asking rents for individual apartment units, the dataset allows for the assessment of key aspects of rent-pricing flexibility, such as the frequency and magnitude of daily rent adjustments. The data

[1] Based on micro-data from the 2019 American Community Survey (ACS).

on landlords then facilitates examining why different landlords exhibit different rent pricing patterns. The granularity of this data is also key to the analysis as it leads to accurate conclusions about the relationship between rent changes and vacancy rates, which is crucial for calculating rental income. As illustrated in Figure 1, aggregate data, even when detailed to the level of census tracts, can falsely suggest that lower rents lead to increased vacancies. Therefore, by comparing similar apartment units—which already tend to be more uniform than single-family homes—within the same zip code, this paper avoids the pitfalls of broader aggregate analyses.

I begin this paper by assessing rent-pricing flexibility at the apartment unit level. Specifically, I measure the rent-pricing flexibility by quantifying the daily frequency, volatility, and magnitude of rent changes for apartments on the market. As discussed in the final section of this paper, these measures genuinely reflect the landlords' intrinsic ability to adapt to market conditions. They are not indicative of initial pricing mistakes subsequently corrected, nor do they reflect changes in property characteristics. They are also not influenced by tenants' or landlords' preferences for certain lease terms.

The rent-pricing behaviors of apartments remain consistent over time, suggesting a correlation with the characteristics of landlords. When comparing two similar apartments in the same zipcode, I find that apartments with flexible pricing are more likely to be owned by institutional landlords rather than mom-and-pop landlords. These professional landlords adjust rents 0.1 times per day more frequently and their total adjustments exceed those of mom-and-pop landlords by 0.05%. Consequently, these findings indicate that institutional landlords are primarily responsible for overall rent dynamics in the market.

Further analysis reveals that landlords' flexibility in rent pricing is linked to their expertise: a notion that encompasses their knowledge, experience, and resources that facilitate market adaptation. To address potential biases stemming from differential frictions faced by mom-and-pop and institutional landlords, I narrow the focus to apartments owned by institutional landlords. I then assess the firms' expertise with three metrics—their size, the diversification of their property portfolio, and their industry tenure—on the assumption that firms with more extensive resources (e.g., larger budgets and skilled personnel), a diversified portfolio, and longer experience are better at sophisticated rent pricing. I finally confirm that expertise significantly influences rent pricing, associating a one-standard-deviation increase in expertise with a 0.05 to 0.2 standard-deviation increase

in the flexibility of rent pricing.

Aligned with these findings, the flexibility to adjust rent prices significantly impacts rental income across different phases of the housing market cycle. Particularly, my analysis of rent and vacancy rates during the COVID-19 pandemic reveals that apartments using flexible pricing strategies outperform those with rigid rent prices, achieving an additional rental income of $470, which represents 1.7% of the average annual rent. During the first year of the pandemic—a period marked by a contracting market—apartments with flexible pricing strategies managed to decrease their vacancy rates with only minimal rent reductions of 0.5%. In the pandemic's second year, as the market started to rebound, these apartments increased their rental income by aggressively raising rents by 2.2%, without suffering from higher vacancy rates.

However, the benefits of flexible rent pricing were more modest amidst the stable market conditions of 2019. While apartments with flexible pricing strategies still outperformed those with rigid rents, the advantage was limited to 0.5% of the market's average annual rent. This observation suggests that market volatility tends to favor landlords with greater expertise in rent pricing. Since institutional landlords typically have greater flexibility in adjusting rents, this observation also implies that institutional landlords will see greater income gains than mom-and-pop landlords during times of market instability.

In the discussion section of this paper, I present evidence that established models of price rigidity do not fully explain the observed variations in rent adjustments. Specifically, Calvo's model of stochastic price adjustments does not account for the significant seasonal variations in rent-pricing flexibility. Rent-pricing flexibility explored in this paper also differs from price rigidity in Taylor's model of staggered contracts because rent adjustments are made after lease contracts have concluded. Notably, I find that while frictions in price adjustments (i.e., menu costs) are important in differentiating the pricing patterns between institutional and individual landlords, they do not fully explain differences among institutional landlords. As opposed to the menu cost models' prediction, landlords with greater expertise make more significant rent adjustments when they change rents, without necessarily adjusting rents less frequently than landlords with less expertise. Therefore, expertise still remains a crucial factor in shaping rent-pricing behavior.

Using actual contract rents, instead of asking rents, might also not alter this paper's main conclusions. To see this, I analyze rental agreement data that details contract rents and promotional

rent discounts. My analysis reveals that promotional rent discounts exhibit no correlation with rent-pricing flexibility, indicating their minimal impact on the relationship between rent-pricing flexibility and key variables like rent growth and vacancy rates. Further, I revisit the main analyses using the last asking rents, which closely match contract rents, and conclude that the primary insights into the economic benefits of rent-pricing flexibility are still valid.

I.A Related Literature and Contribution

This paper contributes to three strands of literature. First, it enhances empirical studies of the rental housing market by examining the rent-setting patterns of different landlords and their impacts on rent growth, vacancy rates, and rental income. Building on prior literature, this work extends the discussion on the unique constraints faced by mom-and-pop landlords in setting rents (Giacoletti and Parsons (2022)) and the consequences of institutional investments in the rental housing market (Gurun et al. (2022)). It also deepens our understanding of rent growth during the COVID-19 pandemic (Gupta et al. (2021)), illustrating how expert landlords maintain their competitive advantage with flexible rent pricing amid market fluctuations. In a broader sense, the findings in this paper contribute to the growing body of research on residential real-estate returns (Jordá et al. (2019), Demers and Eisfeldt (2022), Chambers et al. (2021), Eichholtz et al. (2021)).

Second, this paper offers insights into the risks of firms or price setters, clarifying why firms with rigid pricing schemes are riskier than those with flexible pricing schemes (Weber (2015), Clara (2019)). More specifically, the findings in this paper imply that firms with less flexible pricing strategies are riskier due to their lower profitability, especially during market downturns when financial stability is most crucial. According to conventional asset pricing theories, these firms require risk premiums because they provide weaker insurance against market risks.

Lastly, this study adds to the empirical macroeconomic literature by identifying a crucial factor influencing price rigidity: the expertise of price setters. This discovery goes beyond the typical explanations about price rigidity, such as menu costs and other frictions highlighted in existing research, and provides insights into why some price setters are consistently slow to adjust their

prices, being a potential source of monetary non-neutrality.[2] Moreover, this paper sheds light on the impacts of monetary policy on income distribution among price setters, a topic that has been underexplored in discussions of price rigidity.

These contributions have important policy implications. First, by highlighting that expert landlords adjust rents more flexibly and that their pricing strategies have different impacts on vacancy rates depending on market conditions, this paper informs policies concerning institutional investments in residential housing markets. In principle, the findings indicate that institutional landlords play crucial roles in rent dynamics. Further, they suggest that while these landlords can enhance welfare for both themselves and their tenants during market downturns, they may increase their income at the tenants' expense during recoveries. This insight, therefore, guides when, how, and for whom policies should be implemented to maximize welfare across the rental housing market.

Second, the paper provides critical insights into the effect of monetary policy on the rental housing market. Since half of the landlords are mom-and-pop investors likely to adhere to rigid rent-setting practices, this inflexibility acts as a barrier that delays the overall rent price response to monetary policy shocks. This tendency, therefore, likely contributes to monetary non-neutrality, amplifying the impact of monetary policy on the residential real estate market.

I.B Outline

The rest of the paper proceeds as follows: Section II describes the data used in this paper. Section III introduces the primary measures of rent-pricing flexibility explored throughout. Section IV explores what leads to the pricing flexibility, and Section V examines the implications of the pricing flexibility for rent, vacancy, and rental income. Section VI discusses the concerns about this paper's methods and findings. Lastly, Section VII discusses future research agenda related to this paper and concludes.

[2]See Calvo (1983), Taylor (1980), Caplin and Spulber (1987), Bils and Klenow (2004), Nakamura and Steinsson (2008), Golosov and Lucas (2007), Midrigan (2008), Nakamura and Steinsson (2010), and Vavra (2014) for details.

II Data

II.A Primary Data and Its Uniqueness

Apartment rental listings from Chicago comprise the primary dataset for this paper. As highlighted in the introduction, I focus on apartments because apartments tend to be more standardized than single-family homes, making it easier to compare across different units. I acquired the data from an anonymous apartment rental agency in Chicago. The data tracks the daily asking rents for apartments from the moment they are listed until they are taken off the market. The data covers the period from May 2017 to June 2022. Among the universe of apartments in Chicago, I mainly focus on the rent data for 74,106 apartment units listed before 2020.

The data provider asserts that the dataset is highly accurate, as it was constructed for their brokerage service. They also claim that their data is more detailed and comprehensive compared to datasets compiled from listings on platforms such as Zillow and Apartments.com. This is because the data provider not only utilizes Multiple Listing Services (MLS), the primary source for rental listing platforms, but also gathers information directly from numerous institutional landlords or management companies that set rent prices for these landlords.

The dataset's uniqueness, crucial for the analyses in this paper, is rooted in these business practices of the data provider. First, as the data provider collects the data at a high frequency, the data enables me to observe the essential information for assessing rent-pricing flexibility: the frequency and magnitude of daily rent adjustments. Second, as the data provider works directly with institutional landlords or management companies, the data indicates apartment units owned by institutional landlords and specifies the names of the entities responsible for setting rents. Thus, the data allows me to analyze the differences in rent-pricing behaviors between individual and institutional landlords. It also enables me to collect additional information about institutional landlords or management companies, which is essential for studies comparing rent-pricing patterns within institutional entities.

II.B Caveats in Analyzing Rental Listing Data

Before moving forward, I would like to discuss the limitations of the analyses in this paper. Firstly, as the analyses rely on the rental listing data, they primarily reflect rental patterns induced by new rental agreements (i.e., extensive margin). For example, rent growth and vacancy patterns observed in the data are driven by new lease agreements rather than extensions of existing leases. The data does not capture renewals of existing leases by current tenants (i.e., intensive margin), as this information is not publicly available. Secondly, the dataset does not provide reasons for listings being removed from the market. Thus, this paper assumes that listings are taken off the market because listed apartments have been rented. This assumption is based on the rationale that landlords have little to gain from keeping a property vacant and are unlikely to withdraw an apartment listing from the rental market without attempting to lease it.

II.C Supplementary Data and Summary Statistics

To support this paper's findings, I collect additional data from multiple sources. Rent index data (i.e., ZORI) is sourced from Zillow. Zipcode-level income data is sourced from the IRS, and data on the number of establishments in the zipcode is from the Census's Zipcode Business Patterns. Zipcode-level homeownership data is also obtained from the Census.

Building permit data, which details renovation activities in Chicago at the street level, is collected from the City of Chicago. Building Footprints data, which specifies information about buildings in Chicago, is also obtained from the City of Chicago. These two datasets are combined to assess renovation frequency and extent for buildings in Chicago. Summary statistics of all these variables are reported in Table I.

III Measures of Rent-Pricing Flexibility

To understand the causes and consequences of rent-pricing flexibility, I consider the following three measures of rent-pricing flexibility:

Frequency: The number of rent adjustments per day while the property is on the market.
= Total number of rent adjustment ÷ Days on market.

Volatility: Standard-deviation-to-mean per day while the property is on the market.

$=$ (Std. Dev. of asking rent $\div$ Mean asking rent) $\times$ 100 $\div$ Days on market.

Magnitude: Range-to-mean per day while the property is on the market.

$=$ (Range of asking rent $\div$ Mean asking rent) $\times$ 100 $\div$ Days on market.

I develop these measures drawing on previous studies about price rigidity. Specifically, the first measure, termed the frequency measure, is influenced by the seminal works of Bils and Klenow (2004) and Nakamura and Steinsson (2008) on the price rigidity of non-shelter items. The idea of variability and the magnitude of rent changes comes from the research by Kackmeister (2002) and Golosov and Lucas (2007).

Given that the impact of identical price changes differs across apartment units with different rents, I normalize these measures by dividing them by the unit's average rent. Further, to account for the different durations that units remain on the market, I standardize these measures by dividing them by the total number of days each unit is listed. As higher values indicate greater flexibility in rent pricing, I will use the terms "rent-pricing flexibility" moving forward.

It is essential to note that pricing flexibility and rent changes are affected by the same confounding factors, such as market seasonality. Therefore, I calculate these measures using data before the timeframes that I am examining. Specifically, when analyzing the implications of rent-pricing flexibility during the COVID-19 pandemic, I use rent data collected until the end of 2019. Likewise, for studies on the year 2019, I base the measures on data collected before 2019. This approach ensures that the measures accurately reflect landlords' intrinsic rent pricing behaviors.

I also want to highlight that I compute those measures using rent adjustments occurring while apartments are listed (i.e., on-market rent adjustment) for three reasons. First, this method allows me to examine the frequency and volatility of rent adjustment, which are observable only while properties are listed. Second, as Figure A.1 shows, a considerable portion of apartment units (approximately 5-7%) remains listed for rental at any given time, indicating the importance of on-market rent adjustments for overall rent dynamics in the market. Indeed, the frequent use of Zillow Rent Index (ZRI) and ZORI—which rely on asking rents—in academic studies of the rental housing market supports the importance of on-market rent adjustments (Giacoletti et al. (2023), Gurun et al. (2022), Gupta et al. (2021)).

Lastly, significant adjustments landlords make to the asking rents suggests the role of the on-market rent adjustment in overall rent pricing. As depicted in Figure 2, asking rents are adjusted by approximately 6-8% from the initial asking rents. To further understand this observation, I decompose the rent adjustment from one contract to the next contract into two components: the adjustment from the previous contract rent to the initial asking rent of the next listing, and the adjustment made to the asking rent while the apartments are listed.

$$\underbrace{\frac{Rent_{contract2} - Rent_{contract1}}{Rent_{contract1}}}_{\text{From contract to contract}} = \underbrace{\frac{Rent_{initial} - Rent_{contract1}}{Rent_{contract1}}}_{\text{From contract to initial asking rent}} + \underbrace{\frac{Rent_{contract2} - Rent_{initial}}{Rent_{contract1}}}_{\text{On-market rent adjustment}}$$

When I compare the absolute values of on-market rent changes with the maximum absolute values of these components, it becomes evident that on-market rent adjustments are crucial, constituting 68% of the total adjustment in rent.[3]

IV What Drives Flexible Rent Pricing?

IV.A The Role of Landlord's Expertise

If flexibility to adjust rent for a specific apartment unit remains stable over time even when considering the features of apartments, this stability likely reflects the landlord's characteristics. To explore this idea, Panel A of Table II assesses the flexibility of rent pricing for individual apartments across multiple listings, focusing on the relationship between rent-pricing flexibility in different listings. Panel B further compares rent-pricing flexibility during different phases within the same listing.

The outcomes from both panels show that apartments that are flexible at one time tend to maintain this flexibility at other times. Since the inclusion of zipcode removes influences from geographic factors, the outcomes are not influenced by regional trends in rent prices. Controlling

[3]Table A.1 lays out the logic behind this calculation. It details twelve different scenarios for rent adjustments, categorized by (i) whether the rent change from the previous contract to the initial asking of the subsequent listing is greater in absolute terms than the on-market rent adjustment and (ii) whether these adjustments are positive or negative.

for property characteristics also ensures a fair comparison between apartments of similar types. The results thus underscore the stable nature of landlords' rent-pricing patterns.

Further analyses indicate that the landlords' flexibility in rent pricing closely correlates with their expertise: knowledge, experience, or resources that allow them to adapt to market conditions. To explore this relationship, Table III first utilizes a distinctive feature of the data: it uses an indicator variable in the data to differentiate between apartments owned by mom-and-pop landlords and those owned by institutional entities. Based on the assumption that institutional landlords possess more extensive knowledge about rent pricing, this table examines how these two groups of landlords differentially adjust rent in terms of frequency (columns (1) and (2)), volatility (columns (3) and (4)), and magnitude of adjustments (columns (5) and (6)).

The results reveal that institutional landlords change rental prices more often and more substantially than mom-and-pop landlords, even within the same zipcodes. The key findings are highly reliable, with a statistical significance of 1%, and indicate that institutional landlords adjust rental prices 0.1 times more often per day than their mom-and-pop counterparts. These daily adjustments represent 0.01% of the rental prices and cumulatively comprise 0.05% of the total rent. Given that properties are typically listed for 64 days and that rent adjustments usually move in one direction (either increasing or decreasing), this result suggests that institutional landlords make a 3% more rent adjustment than mom-and-pop landlords.

Nevertheless, institutional landlords' other unique advantages could still lead to these outcomes. For instance, institutional landlords typically incur lower costs when changing rents, as they can bypass real estate agencies for rent adjustments. Therefore, to support the findings in Table III, Table IV exclusively focuses on institutional landlords. The table then investigates how the varying levels of expertise among institutional landlords affect their rent-pricing practices.

Table IV uses three criteria to gauge the expertise of institutional landlords.[4] Firstly, the table assesses the size of the landlords, measured by the total rent of all properties owned by the firm. The underlying assumption is that larger firms, with more resources such as budget and skilled staff, are better positioned to adjust rental prices. Secondly, the table assesses how well the firm diversifies

[4]If management companies are responsible for setting rents on behalf of institutional landlords, I utilize the information about these management companies.

its rental properties, based on the premise that sophisticated firms diversify their properties across various geographical regions to reduce geographic risks. For management companies, this measure will gauge their knowledge and informational advantage across the diverse regions in which they operate. This diversification is measured using the Herfindahl-Hirschman Index (HHI), where a higher score indicates greater concentration.[5] Lastly, the table considers the age of the firm as an indicator of expertise, based on the assumption that firms gain more expertise as they age (Gilbukh and Goldsmith-Pinkham (2023)).

The results in Table IV suggest that the institutional landlords with superior expertise tend to be more flexible in setting rents. These landlords not only adjust rent more frequently (Columns (1), (4), and (7)), but also make more significant rent changes upon those adjustments (Columns (2), (5), and (6)). Furthermore, the overall adjustments they make to rents surpass those made by landlords with less expertise (Columns (3), (6), and (9)). Quantitatively, a one-standard-deviation increase in expertise level is associated with a 0.05- to 0.2-standard-deviation increase in rent-pricing flexibility. Thus, these results support and strengthen the conclusions drawn in Table III.

IV.B Understanding the Motives for Rent Pricing

Then, why do landlords with deeper expertise show more flexibility in adjusting rent prices? This section offers two pieces of evidence to argue that this flexibility is employed as a strategy to increase rental income. First, it links rent pricing to the seasonal shifts in rental housing supply and demand, emphasizing that rents are adjusted more flexibly when the market becomes less saturated and when potential renters' willingness to pay declines. Second, by analyzing landlords who manage properties in different zipcodes, this section demonstrates that they are most flexible in adjusting rents in areas with the greatest level of competition.

Unlike the seasonal patterns in consumer goods prices and wages, which are often linked to pricing schedules or product development cycles orthogonal to a company's intention to change prices (Nakamura and Steinsson (2008), Grigsby et al. (2021)), seasonal variations in house prices

[5]The firm-level property concentration measure is defined as $HHI_b = \sum_z \left(\frac{\text{Total Rent}_{bz}}{\sum_z \text{Total Rent}_{bz}}\right)^2$ where b and z indicate a firm and zipcode, respectively.

correlate with how much buyers are willing to pay for the houses they seek. In particular, Ngai and Tenreyro (2014) propose that buyers are willing to pay more for homes that better suit their needs, and the quality of these matches tends to improve during the peak buying season, a time characterized by the highest levels of demand and supply. They argue that this dynamic leads to seasonal price variations in the housing market, referring to it as the "thick-market effect."

Leveraging this insight, Figure 3 investigates whether changes in buyers' willingness to pay contributes to rent pricing patterns. Panel (a) uses the ZORI to calculate the average monthly rent growth in Chicago, aiming to understand how renters' willingness to pay changes with the seasons. Panel (b) further analyzes apartment rental listings to depict how supply and demand vary seasonally.

Panel (a) shows a negative correlation between rent-pricing flexibility and rent growth. Panel (b) also illustrates that rent-pricing flexibility correlates with seasonal market changes. In May, when demand and supply peak and the rental housing market is at its densest, landlords make minimal rent adjustments. However, as the market starts to decline afterwards, the flexibility in rent adjustments increases. Overall, the observed seasonal trends imply that rent-pricing patterns are likely induced by landlords' strategic approaches to changes in market conditions.

Geographically differentiated rent pricing by landlords operating in multiple zipcodes reinforces this conclusion. To show this, Table V evaluates competition in the local rental housing market by creating a zipcode-level HHI. The table then analyzes the correlation between the level of competition and rent-pricing flexibility. Importantly, the analysis adds landlord fixed effects in columns (2), (4), and (6) to investigate how the same landlord adjusts rents differently across different zipcodes based on the level of competition.

The results indicate that firms tend to adjust rents more flexibly in zipcodes with higher levels of competition. Across all columns, the coefficients of interest are statistically significant at the 1%–5% level, and their magnitudes are economically considerable: a one-standard-deviation increase in market competition is associated with a 0.1- to 0.5-standard-deviation increase in rent-pricing flexibility. Therefore, these findings support the argument that landlords adopt a more

flexible approach to rent pricing to stay competitive and attract potential renters.[6]

V Consequences of Flexible Rent Pricing

Aligned with Section IV which links pricing flexibility to landlords' expertise, apartments with flexible rent schemes generate higher rental incomes than those with fixed rent schemes, irrespective of market conditions. In periods of market downturn, such apartments enhance their rental yield by minimizing vacancies. During market recoveries, they increase rental revenues by adjusting rents upwardly. This pattern is particularly pronounced when the rental housing market is volatile.

Figure 4 points to this argument by illustrating the rents and vacancy rates during the pandemic. Panel (a) demonstrates that flexible apartments swiftly responded to the COVID-19 pandemic by reducing their rents more than rigid apartments. Panel (c) shows that they consequently experienced lower vacancy rates. Panel (b) reveals that flexible apartments raised their rents more aggressively than rigid apartments as the market began to recover a year later. Interestingly, Panel (d) depicts that flexible apartments did not suffer from increased vacancy rates during this period despite their significant rent increases.[7]

Table VI explores within-zipcode regression analyses to support these observations. Specifically, it uses apartment-unit-level data and investigates the relationship between apartments' rent-pricing flexibility and three key outcomes: rent growth (Panel A), the probability of being rented (Panel B), and days on the market before being rented (Panel C).

$$y_i = \beta \cdot \textit{Rent-Pricing Flexibility}_i + \alpha_c + \alpha_{t_1,t_2,t_3} + \alpha_z + \varepsilon_i. \tag{1}$$

The analyses adjust for property characteristics by including fixed effects, α_c, constructed with the

[6]The other geographical factors alone do not influence rent pricing patterns, suggesting that the level of competition in a given area reflects the cumulative impact of these characteristics. Table A.2 examines how rent-pricing flexibility correlates with specific zipcode-level characteristics, such as income levels, house prices, the number of businesses in the area, and the proportion of rental properties (i.e., one minus homeownership rates). These factors are chosen under the premise that renters' income and wealth might impact rent prices and that the availability of rental homes, along with local amenities, could influence rental housing supply and demand.

[7]Figure 4 categorizes apartments as flexible or rigid using the volatility measure of rent-pricing flexibility defined in Section III. Appendeix Figure A.2 presents rent growth and vacancy rates based on the other two measures of rent-pricing flexibility.

rent price decile before the pandemic, the number of bedrooms and bathrooms, the presence of parking lots, and the highest floor level of the apartment building. To address seasonal factors in rent price adjustments, the table incorporates fixed effects, α_{t_1,t_2,t_3}, constructed with three specific months: one month reflects the period when rent-pricing flexibility is assessed, and the other two months represent the first and last months of the observed rent listing period. Zipcode fixed effects, α_z, ensures that the analyses compare units that are located within the same zipcode.

The results confirm the findings in Figure 4, showing that flexible apartments adjusted their rents more dramatically than rigid apartments throughout the pandemic. Between March 2020 and March 2021, a period marked by the market contraction due to the pandemic, one-standard-deviation more flexible apartments lowered their rents by 0.3% to 0.8% more than their counterparts within the same zipcode. From March 2021 to March 2022, as the market began to recover, these flexible apartments increased rents by 1.7% to 2.6% more than their less flexible counterparts.

Meanwhile, during the first year of the pandemic, flexible apartments experienced significantly shorter listing periods (6–9 days) and lower vacancy rates (2–3%), thanks to their quick adaptation to the changing market conditions. More interestingly, these apartments did not witness notable increases in both vacancy rates and time on the market despite their rent hikes in the pandemic's later stages. As a result, rental incomes gains from shorter listing periods compensated for the rent decrease during the first year. In the second year, the additional rental incomes from increased rents outweighed any losses from longer vacancies. The net gains were significant, amounting to 1.7% of the average annual rents.[8]

Results in Table VII, which analyzes the financial consequence of rent-pricing flexibility in the typical year of 2019, indicates that the findings from Table VI are broadly applicable. By utilizing the rental housing market's seasonal patterns depicted in Figure 3, Table VII segments the year into peak (hot) and off-peak (cold) seasons (Ngai and Tenreyro (2014)). It then compares the rents and vacancy rates of flexible apartments against those of rigid apartments during these two periods.

[8]The rental income gain is computed as follows:

$$\left\{\frac{\text{Change in Rent (\%)}}{100} - \frac{\text{Change in Days on the Market}}{365}\right\} \cdot 12 \cdot \text{Average Monthly Rent}$$

This computation assumes that the standard length of a rental contract is one year.

The analysis shows that flexible apartments consistently earn more rental income than others throughout the year, with their gains amounting to 0.5% of the annual rents. However, the rental income gains during the regular seasons are noticeably less than those during the COVID-19 pandemic, marked by significant market fluctuations. Therefore, these findings suggest that market volatility amplifies the difference in rental income between flexible and rigid apartments, making the income gap wider during times of fluctuation. Further, because institutional landlords are more adaptable in adjusting rents (Table III), these findings also imply that income distribution in the rental housing market will be tilted toward institutional landlords, especially when the market is volatile.

VI Discussion and Robustness

VI.A Relationship with Workhorse Models for Price Rigidity

This section discusses the determinant of rent-pricing flexibility identified in this paper—landlords' expertise—from the perspective of established macroeconomic models for price rigidity: Calvo (1983), Taylor (1980), and menu cost models.

Firstly, the distinct seasonal fluctuations in rent-pricing flexibility illustrated in Figure 3 may not conform to Calvo's theory of price rigidity. In his foundational work, Calvo (1983) argues that price rigidity arises as firms adjust their prices infrequently and randomly, due to various market frictions. His model suggests that, on average, price adjustments should be evenly distributed across the year, as each firm has an equal probability of changing prices at any given time. However, the seasonal trends depicted in Figure 3 challenge this notion, suggesting the existence of other influences on rent-pricing flexibility that Calvo's model does not account for.

Furthermore, the seasonal variations in rent adjustments are unlikely to be the result of staggered contracts or regular pricing schedules, as suggested by Taylor (1980). As detailed in Section III, the measures of rent-pricing flexibility explored in this paper are based on rent adjustments for apartments on the market. Therefore, these rent adjustments occur after lease agreements have concluded and are not bound by existing lease contract terms.

Similarly, the observed seasonality in rent-pricing flexibility is unlikely to result from product renovations or product-development cycles, which can affect seasonal price changes in industries like

apparel (Nakamura and Steinsson (2010)). This is because the measures of rent-pricing flexibility in this paper are applied to consistent apartments, not apartments undergoing changes or substitutions (Section VI.D). The consistent characteristics of listed apartments depicted in Figure A.3 also support the claim that the observed seasonal variations in rent pricing are not driven by changes in the samples of apartments under study.

While frictions in rent adjustment (i.e., menu costs) are crucial in understanding the variations in rent pricing across different landlords, they do not fully explain the observed differences. Given the difficulties in quantifying the frictions, Table VIII utilizes the insights from menu cost models to investigate if the expertise metrics correlate with the frictions that landlords experience in rent adjustments. Specifically, by leveraging the intuition that firms with fewer frictions tend to adjust their prices more frequently but less significantly when economic shocks arrive (Caplin and Spulber (1987), Golosov and Lucas (2007), Midrigan (2008). Nakamura and Steinsson (2010)), Table VIII examines whether landlords with more expertise face fewer frictions in rent adjustments.

The findings in Table VIII reveal that during the COVID-19 pandemic, institutional landlords change their rent prices more frequently but with smaller increments compared to mom-and-pop landlords (Columns (1) and (5)). These results indicate that institutional landlords encounter fewer frictions than individual landlords, underscoring the relevance of menu cost models. However, the table also indicates that within the group of institutional landlords, those with more expertise make more significant rent adjustments when they change rents, without necessarily adjusting rents less frequently than landlords with less expertise (Columns (2) through (4), and columns (6) through (8)). Therefore, combined with the results in Table IV, this evidence suggests that the expertise of landlords, which significantly impacts their rent pricing patterns, extends beyond their menu costs.

VI.B Mispricing and Subsequent Adjustment?

Do the measures of rent-pricing flexibility accurately reflect landlords' adaptability to changing market conditions? Or do they merely indicate initial mispricing and subsequent adjustment? By examining the correlation between the flexibility measures and initial rent levels, Table IX addresses this question. If flexibility measures represent initial pricing errors, landlords who set higher rents at the beginning will adjust rents more frequently and significantly while their properties are on the market.

Results in Table IX show that this is not the case, supporting the claim that measures of rent-pricing flexibility reflect landlords' inherent adaptability to market conditions. The correlations between initial rental prices and flexibility measures are statistically insignificant, and their magnitudes are small. Signs of the correlations are also inconsistent across the measures. Therefore, the results suggest that flexibility measures do not merely reflect initial mispricing.

VI.C Potential Endogeneity of Primary Flexibility Measures

One potential issue with the primary measures of rent-pricing flexibility is that the denominator used in the computation of these measures—days on the market—might be influenced by rent-pricing flexibility itself. Specifically, the concern is that apartments with flexible pricing might be rented out faster, thus appearing more flexible than they actually are. To address this issue, I focus on the rent adjustment behaviors solely within the initial 30 days of listing. I reassess the outcomes previously presented in Table VI using this refined approach, and report the updated results in Table A.3.

Table A.3 confirms that the original findings remain intact, even when applying alternative ways to measure rent-pricing flexibility. Coefficients of interest are statistically significant, and their sizes are comparable to those in Table VI. As a result, the financial benefits of flexible rent pricing remain in line with the original findings, suggesting that the initial conclusions of the study are robust and not affected by potential endogeneity in the initial measures of rent flexibility.

VI.D Property Substitution and Modification

Unlike studies examining the price rigidity of non-shelter consumer items, studies on rent rigidity or rent-pricing flexibility are less exposed to biases stemming from product substitution or modification. Property renovations are rare and minor, meaning that rent-pricing flexibility can be measured for constant properties. For example, a typical building in Chicago undergoes renovations only once every 35 years, and the renovation cost is only around $37,000.

However, measuring rent-pricing flexibility and its correlation with rent growth could still be compromised if renovations are closely linked to landlord or property characteristics. For example, if properties with flexible pricing undergo more renovations than those with rigid pricing, the observed pricing flexibility could be attributed to renovations rather than the landlords' inherent pricing

flexibility. Similarly, if properties known for pricing flexibility undergo renovations after their pricing flexibility has been assessed, any trends in rent growth observed afterwards can be credited to the renovation, rather than the landlords' original willingness to adjust rent prices.

To address the potential biases caused by renovations, Table X analyzes building permit data and explores the relationship between renovation activities and the flexibility to adjust rent prices. Since building permits are issued at the building level, the table calculates the rent-pricing flexibility and total renovation costs for each building in two distinct periods: May 2017 to February 2020, and March 2020 to March 2022. The analysis of the first period aims to assess how renovation costs before the pandemic relate to rent-pricing flexibility. The analysis of the second period seeks to determine whether renovations during the pandemic could influence the conclusions drawn in Table VI.

The results in the table indicate that there is no significant correlation between the costs of renovations and the flexibility of setting rent prices. Additionally, the near-zero coefficients suggest that renovation costs have little economic significance in influencing rent-pricing flexibility. Quantitatively, a one-standard-deviation increase in rent-pricing flexibility is associated only with a 0.0005 to 0.003 standard-deviation decrease in renovation costs.

VI.E Matching with Differential Tenants

Do tenant's preferences for certain lease lengths influence their demand for apartments with different rent pricing, thereby affecting the outcomes in Table VI? If tenants looking for shorter or longer leases tend to accept more fluctuating rent prices, the observed correlation between rent-pricing flexibility and rent growth might be influenced by these tenants' preferences. The COVID-19 pandemic could also bias the analyses if it altered the matching between tenants and apartments.

To address these issues, Figure 5 uses rental contract data and explores the average length of rental agreements over time. The figure provides two important observations. First, Panel (a) indicates that the pandemic had little impact on the average length of rental contracts; statistically, there was no significant change in contract terms during the pandemic. Second, Panel (b) demonstrates that the average length of contracts for apartments with flexible rent prices closely aligns with those for apartments with rigid rent prices. Thus, this figure shows that the nature of tenant-property matching has been consistent both over time and across the apartments with

different rent pricing strategies.

VI.F Contract Rent vs. Asking Rent

Another issue with the analyses in Table VI is that they rely on asking rents, rather than actual contract rents, to calculate rent growth. This approach stems from the nature of the primary data for this study: rental listings miss details on actual rental agreements. However, this approach could lead to biases if properties are not leased at these asking rents. In such cases, the observed differences in rent growth might reflect variations in asking rents rather than actual changes in rent that affect landlords' income and tenants' expenses.

Promotional rent discounts, frequently not included in rental listings, raise another concern. Landlords usually provide these discounts by subtracting several months' rent from the total amount due. Because these rent discounts often are not shown in rental listings, they might bias the initial analysis based on the rental listing data. This bias would become pronounced if landlords' flexibility in adjusting rents correlated with their tendency to offer promotional rent discounts.

To address these concerns, I derive estimated contract rents from the listing data and re-examine the findings in Table VI using these estimates. I specifically use the last observed asking rent for each apartment to estimate its contract rent. This approach will be reasonable if the final asking price, set just before a property is removed from the market, serves as a reference for the actual contract rent.

Figure 6 and Table XI validate this method by comparing estimated contract rents with actual contract rents in the rental agreements offered by the data provider.[9] Specifically, Figures 6 compares the estimated contract rents with two key variables in the rental agreements: nominal contract rent, which excludes promotional rent discounts, and effective contract rent, which incorporates these discounts. The figure uses an identity line ($y = x$) for reference. As shown, Panel (a) reveals a strong alignment between estimated and nominal contract rents. Panel (b) shows that estimated contract rents well approximate the effective contract rent, but it also indicates that estimated contract rents tend to be higher than effective contract rents, suggesting the importance

[9]This contract rent data cannot be directly used for the primary analyses because the sample is small and few properties repeatedly appear in the data. It was infeasible to compute rent growth from the contract rent data.

of promotional rent discounts.

However, Table XI shows that landlords offer promotional rent discounts independently of their flexibility in rent pricing, suggesting these discounts do not affect the relationship between rent flexibility and growth. Therefore, Figure 6 and Table XI together confirm that estimated contract rents are suitable for researching how rent growth correlates with rent-pricing flexibility.

Drawing on these supportive findings, Table A.4 investigates the relationship between apartments' flexibility to adjust rent and the growth of their contract rents amid the COVID-19 pandemic. Like Table VI, the table shows that apartments with greater pricing flexibility adjusted their contract rents more frequently and substantially than apartments with rigid pricing schemes throughout the pandemic. Although a smaller sample size leads to slight deviations from the original results in Table VI, the outcomes in Table A.4 consistently indicate that flexible properties yield higher rental incomes, amounting to 13.4% of their rents, regardless of prevailing market conditions.

VII Conclusion

Using daily asking-rent data for apartments in Chicago, this paper examines the causes and consequences of rent-pricing flexibility. This paper finds that apartments owned by institutional landlords adjust rent more frequently and substantially than apartments owned by mom-and-pop landlords. Among the institutional landlords, larger, more asset-diversifying, and experienced firms adjust rent more flexibly, suggesting the importance of their expertise: knowledge or resources that allow them to adapt to market conditions.

Rent-pricing flexibility results in higher rental incomes. During the market downturn, flexible apartments earn higher rental income as they experience lower vacancies. During the market recovery, they earn higher rental income because they do not suffer from higher vacancies despite their aggressive rent increases. The net gains from flexible rent pricing are more pronounced when the market is volatile. Consequently, these findings suggest that the rental housing market volatility tilts wealth or income distribution in the market toward expert institutional landlords from non-expert mom-and-pop landlords.

This paper suggests several areas for future study. Particularly, one can explore behavioral frictions that prevent individual landlords from adopting flexible rent-pricing practices. As this

paper acknowledges a gap in understanding how these constraints contribute to rent-pricing flexibility, future research could beneficially focus on the specific behavioral reasons that small or less experienced landlords tend to stick to rigid rent-pricing methods.

Another study could trace how individual landlords' rent-pricing behaviors change over time. This research would go beyond the cross-sectional analysis provided in this paper and investigate the progression of landlords' rent-adjustment strategies as they gain more knowledge and expertise. Exploring how inexperienced landlords may be influenced by more experienced ones also aligns with this research direction.

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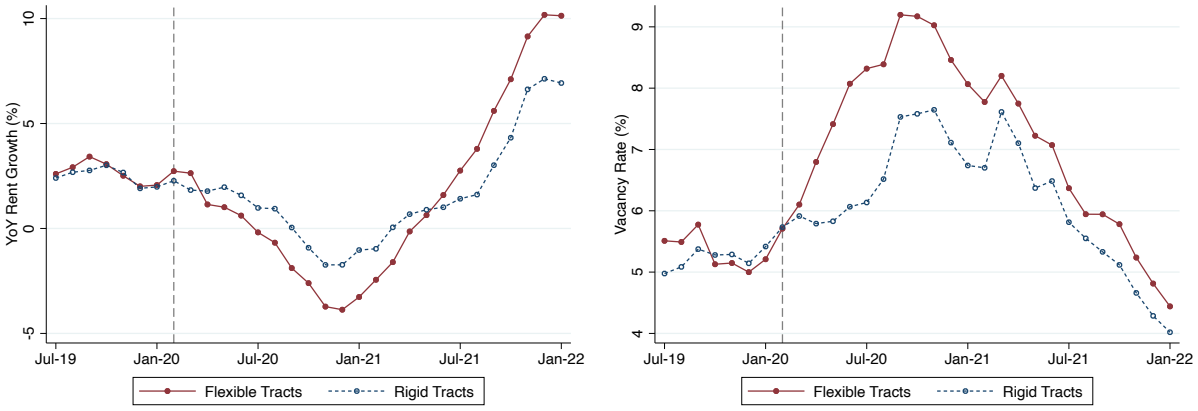
Figure 1: Rent Growth and Vacancy at the Census Tract Level

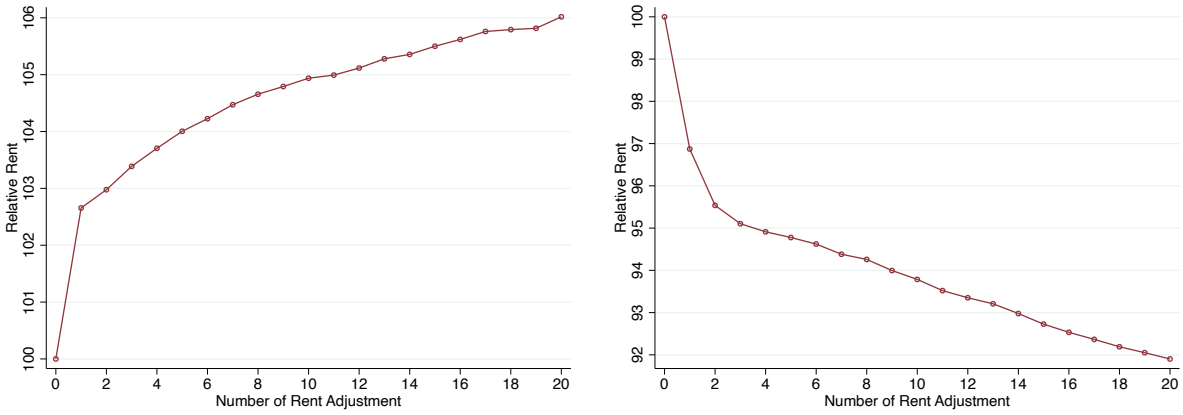


(a) Rent Growth

(b) Vacancy Rate

Notes: This figure presents rent growth and vacancy rates at the census-tract level. Panel (a) computes year-over-year rent growth using the Case-Shiller rent indexes derived from rental listing data. Panel (b) calculates the vacancy rate by dividing the number of listings by the total number of apartment units ever listed at any time. Both panels compute the tract-level rent-pricing flexibility by averaging the volatility of on-market rent adjustments for individual units, as described in Section III. Tracts are categorized as either flexible or rigid, based on whether their rent-pricing flexibility falls above or below the median value of the flexibility.

Figure 2: Typical On-Market Rent Adjustment

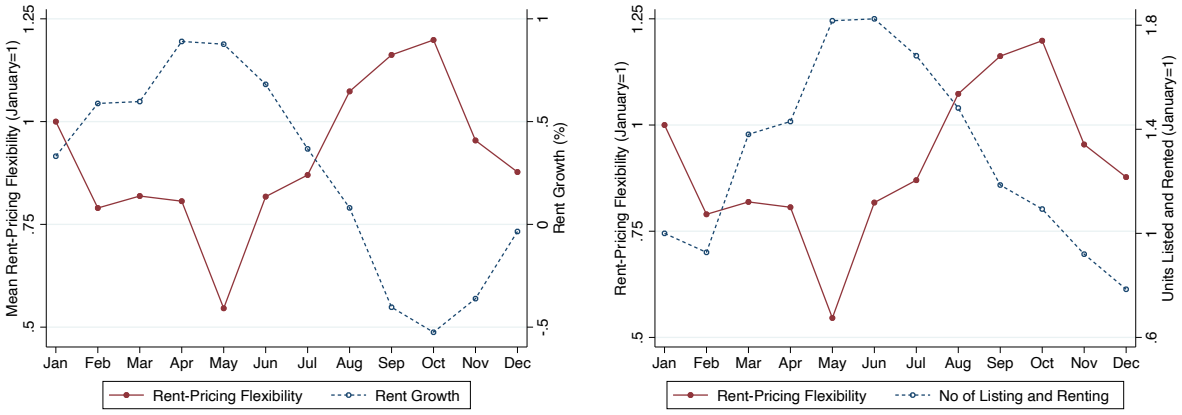


(a) Upward Adjustment

(b) Downward Adjustment

Notes: This figure displays typical patterns of rent adjustments for apartments listed on the market. It categorizes apartments into two groups: those that increase rents (Panel (a)) and those that decrease rents (Panel (b)). It plots the average rent against the frequency of rent adjustments, indexing the rent as 100 at zero adjustments.

Figure 3: Seasonality in Rent-Pricing Flexibility

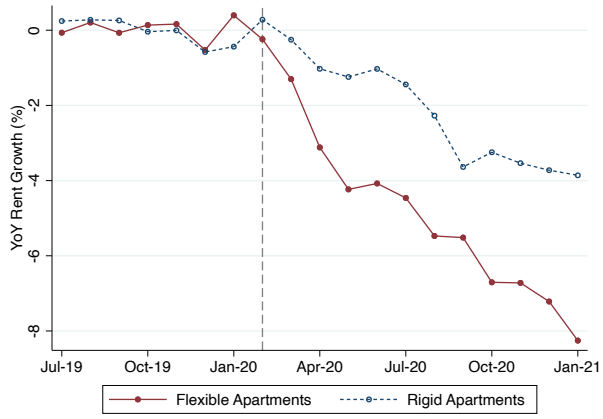


(a) Rent Growth

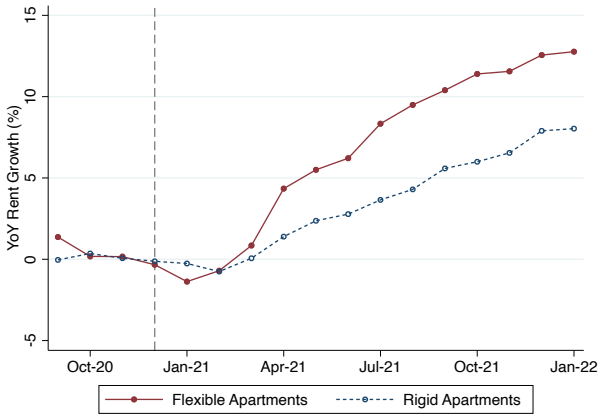
(b) Market Thickness

Notes: This figure illustrates the seasonal trends in rent-pricing flexibility, rent growth, and rental transactions. Panel (a) uses the Zillow Observed Rent Index (ZORI) to show the average monthly rent growth in Chicago. Panel (b) analyzes apartment rental listings to create separate indexes for the number of apartments listed and those rented. It then averages these indexes to create a composite index that illustrates overall activity in the rental housing market. For both panels, the measures of rent-pricing flexibility defined in Section III are indexed, and their averages are used to create a composite index. All indexes standardized to 1 in January.

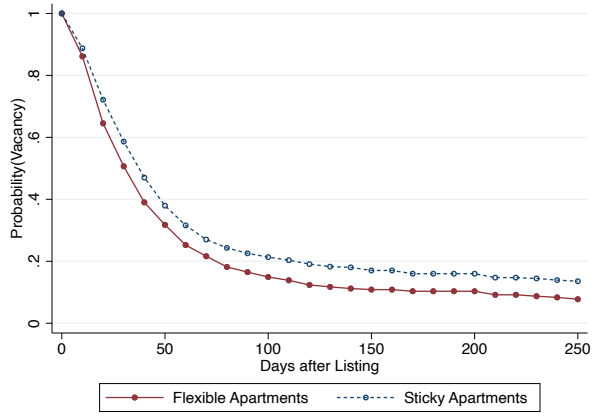
Figure 4: Rent Growth and Vacancy by Rent-Pricing Flexibility



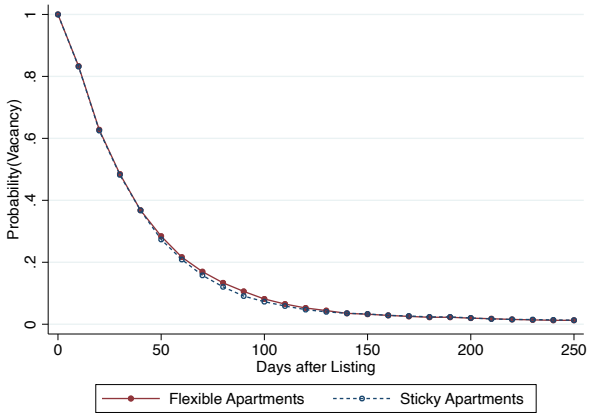
(a) Rent Growth, Early Pandemic



(b) Rent Growth, Later Pandemic



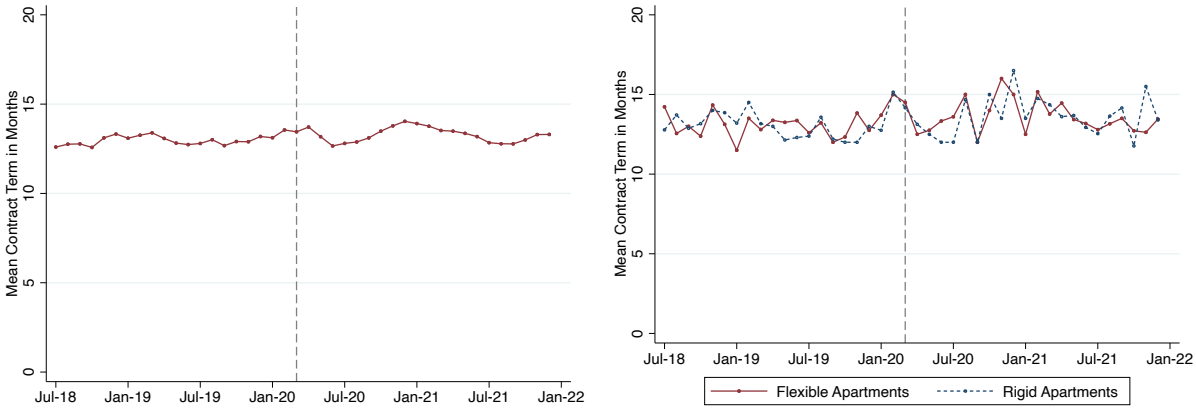
(c) Vacancy, Early Pandemic



(d) Vacancy, Later Pandemic

Notes: This figure illustrates the year-over-year rent growth (Panels (a) and (b)) and the likelihood of vacancies (Panels (c) and (d)) for two groups of apartments: flexible and rigid apartments. Flexible apartments are identified by their above-median rent-pricing flexibility, determined by the volatility of rent adjustments while listed on the market, as outlined in Section III. Rigid apartments are those that did not undergo any rent changes during their listing period. Rent-pricing flexibility is measured based on data collected up to December 2019. Rent growth is calculated from the Case-Shiller index, adjusted for the apartment's zipcode, and normalized by subtracting the average rent growth observed during the periods before the vertical dotted line. The probability of vacancies is calculated using Kaplan-Meier methods (1958), with the "early pandemic" period spanning March 2020 to March 2021 and the "later pandemic" from March 2021 to March 2022. The vacancy analysis focuses on apartments listed in the first four months of each specified period.

Figure 5: Renter's Preference for Lease Lengths

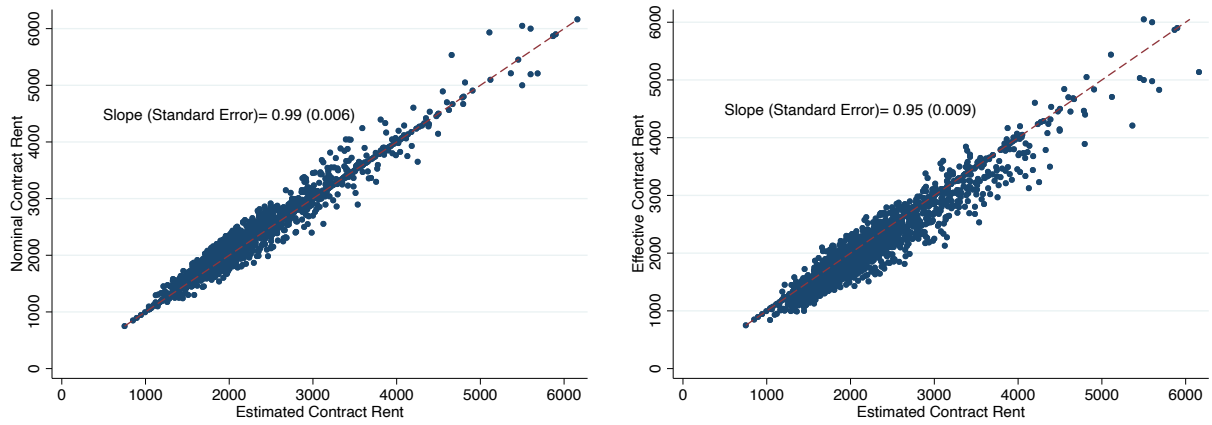


(a) Average Lease Length

(b) Average Lease Length by Pricing Flexibility

Notes: This figure uses rental agreement data to illustrate the average length of leases. Panel (a) shows the average lease length across all apartments. Panel (b) separates apartments into two categories—flexible and rigid—and presents the average lease length for each group. Flexible apartments are identified by their above-median rent-pricing flexibility, determined by the volatility of rent adjustments while listed on the market, as outlined in Section III. Rigid apartments are those that did not undergo any rent changes during their listing period.

Figure 6: Actual Contract Rents vs Estimated Contract Rents



(a) Nominal Contract Rent

(b) Effective Contract Rent

Notes: This figure analyzes rental agreement data to contrast actual contract rents with estimated contract rents. Panel (a) examines nominal contract rents—those not adjusted for promotional discounts—and compares them to estimated contract rents, which are defined as the final asking rents. Panel (b) examines effective contract rents, calculated by deducting promotional rent discounts from nominal contract rents, and compares them with the estimated contract rents. Both panels plot the identity line (i.e., $y = x$) as a benchmark for comparison.

TABLE I: Summary Statistics

	N	Mean	Std. Dev	P25	P50	P75
Apartment Unit Level						
Rent-Pricing Flexibility, Frequency	74,106	0.052	0.108	0	0	0.034
Rent-Pricing Flexibility, Volatility	74,106	0.035	0.063	0	0	0.047
Rent-Pricing Flexibility, Magnitude	74,106	0.073	0.126	0	0	0.1
Rent Growth (%), Early Pandemic	12,733	-4.68	11.67	-7.52	-1.15	0.35
Rent Growth (%), Later Pandemic	7,202	1.21	35.54	-0.71	0	7.01
Rent Growth (%), Cold Season in 2019	3,320	-2.44	5.65	-4.08	0	0
Rent Growth (%), Hot Season in 2019	9,189	3.14	6.59	0	1.38	6.06
Vacancy Status, Early Pandemic	4,268	0.116	0.321	0	0	0
Vacancy Status, Later Pandemic	4,850	0.018	0.131	0	0	0
Vacancy Status, Cold Season in 2019	2,106	0.142	0.35	0	0	0
Vacancy Status, Hot Season in 2019	1,391	0.063	0.242	0	0	0
Days on the Market, Early Pandemic	4,268	71.3	94.8	11	28	76
Days on the Market, Later Pandemic	4,850	43.9	53	12	28	55
Days on the Market, Cold Season in 2019	2,106	61	51.4	18	43	98
Days on the Market, Hot Season in 2019	1,391	42.8	40.1	14	28	58
Building Level						
Renovation Cost, May2017-Feb2020	19,762	44,329	2,270,000	0	0	0
Renovation Cost, Mar2020-Mar2022	19,762	10,847	348,000	0	0	0
Firm Level						
Total Amounts of Rent (in Millions)	177	0.424	1.165	0.004	0.01	0.252
Property Concentration (HHI)	177	0.864	0.278	1	1	1
Years Since Establishment	68	48.5	42.7	23.5	35.5	57
Zipcode Level						
Market Concentration (HHI)	57	0.769	0.316	0.521	0.981	1
Adjusted Gross Income (in Thousands), 2018	57	100.4	89.3	40.7	62.3	110.7
House Price (in Thousands), 2018	57	313.8	137.8	195.9	304.9	417.8
Number of Establishments, 2018	57	1060.4	550.0	557	981	1491
Homeownership Rate, 2010	57	0.47	0.16	0.352	0.428	0.54

Notes: This table reports the summary statistics for the variables discussed in this paper. The primary measures of rent-pricing flexibility are detailed in Section III. Rent growth for the early (later) pandemic period is defined as the annualized log difference in rent between the time before March 2020 (from March 2020 to February 2021) and the period from March 2020 to February 2021 (March 2021 to February 2022). Rent growth for the hot (cold) season in 2019 is defined as the log difference in rent between the time before January 2019 (between February 2019 and July 2019) and the period from February 2019 to July 2019 (from August 2019 to January 2020). The vacancy status for the early (later) pandemic period is an indicator variable, taking one for apartments that were listed from March 2020 to June 2020 (from March 2021 to June 2021) and remained vacant until February 2021 (February 2022). The vacancy status for the hot (cold) season in 2019 is an indicator variable, taking one for apartments that were listed from February 2019 to March 2019 (from August 2019 to September 2019) and remained vacant until July 2019 (January 2020). The days on the market for the early (later) pandemic measure the number of days until rented or until February 2021 (February 2022) for apartments listed from March 2020 to June 2020 (from March 2021 to June 2021). The days on the market for the hot (cold) season in 2019 measure the number of days until rented or until July 2019 (January 2020) for apartments listed from February 2019 to March 2019 (from August 2019 to September 2019). Firm-level statistics are derived from rental listing data collected up to December 2019. The total rent aggregates the rent from all apartment units owned by a particular firm. The property concentration measure assesses how concentrated firm's rental apartments are across different zipcodes using the Herfindahl-Hirschman Index (HHI) formula. This measure is defined as $\sum_z \left(\frac{\text{Total Rent}_{bz}}{\sum_z \text{Total Rent}_{bz}}\right)^2$, where b denotes a firm and z represents a zipcode. The market concentration measure is calculated based on rental listing data collected until December 2019. It gauges the level of competition within each zipcode and is defined as $\sum_b \left(\frac{\text{Total Rent}_{bz}}{\sum_b \text{Total Rent}_{bz}}\right)^2$.

TABLE II: Persistency of Rent-Pricing Flexibility

Panel A.	Dep. Var: Rent-Pricing Flexibility during the N'th Listing					
	Frequency		Volatility		Magnitude	
	2nd Listing	3rd Listing	2nd Listing	3rd Listing	2nd Listing	3rd Listing
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility,	0.5220***	0.4427***	0.2279***	0.1637**	0.2564***	0.1766**
First Listing	(0.0366)	(0.0648)	(0.0232)	(0.0707)	(0.0255)	(0.0664)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3447	0.2825	0.09293	0.0555	0.1197	0.0928
#Obs	15,206	2,065	15,206	2,065	15,206	2,065
Panel B.	Dep. Var: Rent-Pricing Flexibility for N Days					
	Frequency		Volatility		Magnitude	
	31-60 Days	61-90 Days	31-60 Days	61-90 Days	31-60 Days	61-90 Days
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility,	0.6994***	0.5820***	0.1950***	0.1839***	0.3329***	0.3258***
First 30 Days	(0.0191)	(0.0300)	(0.0199)	(0.0271)	(0.0287)	(0.0365)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.6327	0.4946	0.1787	0.1445	0.2947	0.2652
#Obs	8,195	6,273	8,195	6,273	8,195	6,273

Notes: This table examines the consistency of rent-setting flexibility across different listings (Panel A) and within a single listing (Panel B). Panel A computes the rent-pricing flexibility for the first, second, and third listings and compares the flexibility during the first listing to those in subsequent listings. To account for temporal variations, all analyses in Panel A incorporate time fixed effects constructed with the pair of listing months. Panel B evaluates rent flexibility over three consecutive 30-day periods—the initial 30 days, the subsequent 30 days, and the following 30 days after that—compares the flexibility during the initial 30 days with those in the subsequent two periods. All analyses in Panel B adjust for the temporal variations by including listing-month fixed effects. In both panels, columns (1) and (2) explore the frequency of rent adjustments, columns (3) and (4) examine the volatility of adjustments, and columns (5) and (6) investigate the magnitude of adjustments. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE III: Institutional Ownership and Rent-Pricing Flexibility

	Dep. Var: Rent-Pricing Flexibility					
	Frequency		Volatility		Magnitude	
	(1)	(2)	(3)	(4)	(5)	(6)
I(Institutional Landlords)	0.1083***	0.0984***	0.0164***	0.0132***	0.0622***	0.0514***
	(0.0108)	(0.0117)	(0.0058)	(0.0042)	(0.0167)	(0.0119)
Zipcode FEs		Yes		Yes		Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.2524	0.2860	0.0261	0.0442	0.0663	0.1017
#Obs	57,476	57,476	57,476	57,476	57,476	57,476

Notes: This table compares the rent-pricing flexibility of institutional landlords to that of individual landlords. As the left-hand-side variables, it explores the different flexibility metrics across different columns: the frequency of rent adjustments in columns (1) and (2), the volatility of adjustments in columns (3) and (4), and the magnitude of adjustments in columns (5) and (6). The key right-hand-side variable is an indicator variable that identifies apartments owned by institutional landlords. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, the presence of parking facilities, and the highest floor level of the apartment building. It also controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. Additionally, the table explores zipcode fixed effects in columns (2), (4), and (6) to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE IV: Institutional Landlords' Expertise and Rent-Pricing Flexibility

	Dep. Var: Rent-Pricing Flexibility, Standardized								
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Expertise, Standardized	0.0520*	0.0349**	0.0534***	-0.2082***	-0.0454**	-0.0877***	0.1376	0.1054**	0.1452*
	(0.0299)	(0.0141)	(0.0190)	(0.0445)	(0.0170)	(0.0226)	(0.1468)	(0.0486)	(0.0835)
Measures of Expertise	Size	Size	Size	Asset HHI	Asset HHI	Asset HHI	Experience	Experience	Experience
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1462	0.0709	0.1173	0.1621	0.0680	0.1138	0.1337	0.0556	0.0904
#Obs	30,261	30,261	30,261	30,261	30,261	30,261	28,278	28,278	28,278

Notes: This table examines the impact of institutional landlords' expertise on their flexibility to adjust rents. It assesses landlords' expertise based on three aspects: (i) the size of the landlord, represented by the total rent from all owned properties (columns (1) to (3)); (ii) the extent of their properties' geographic diversification across different zipcodes (columns (4) to (6)) defined as $HHI_b = \sum_z \left(\frac{\text{Total Rent}_{bz}}{\sum_z \text{Total Rent}_{bz}}\right)^2$, where b stands for the firm and z for the zipcode; and (iii) the firm's age (columns (7) to (9)). A higher HHI value indicates greater geographic concentration, or conversely, less diversification. The left-hand-side variables in the table measure the frequency (columns (1), (4), and (7)), volatility (columns (2), (5), and (8)), and magnitude (columns (3), (6), and (9)) of rent adjustments, as detailed in Section III. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, and the presence of parking facilities. It also controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE V: Competition and Rent-Pricing Flexibility

	Dep. Var: Rent-Pricing Flexibility, Standardized					
	Frequency		Volatility		Magnitude	
	(1)	(2)	(3)	(4)	(5)	(6)
Market Concentration,	-0.5364***	-0.2988***	-0.2617***	-0.1280**	-0.3825***	-0.1904**
Standardized	(0.1002)	(0.1082)	(0.0658)	(0.0634)	(0.0908)	(0.0877)
Firm FEs		Yes		Yes		Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0782	0.2695	0.0336	0.1111	0.0537	0.1708
#Obs	30,261	30,261	30,261	30,261	30,261	30,261

Notes: This table examines the patterns of rent adjustment by the same institutional landlords across different zipcodes with varying competition intensities. As the left-hand-side variable, it explores the frequency of rent adjustments in columns (1) and (2), the volatility of adjustments in columns (3) and (4), and the magnitude of adjustments in columns (5) and (6). The right-hand-side variable of interest is the zipcode-level Herfindahl–Hirschman Index (HHI), which measures the market concentration within specific zipcodes. This index is defined as $\sum_b \left(\frac{\text{Total Rent}_{bz}}{\sum_b \text{Total Rent}_{bz}}\right)^2$, where b represents a firm and z a zipcode. A higher HHI value indicates greater market concentration—or conversely, less competition—within a zipcode. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, and the presence of parking facilities. It also controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. Additionally, the table includes firm fixed effects in columns (2), (4), and (6) to analyze how a firm varies its property pricing across different zipcodes based on the level of competition within the zipcode. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE VI: Consequences of Rent-Pricing Flexibility

Panel A.	Dep. Var: Rent Growth (%)					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.8237***	-0.2787**	-0.4497***	2.6150***	1.7564***	2.3572***
	(0.1883)	(0.1209)	(0.1465)	(0.7832)	(0.6144)	(0.7700)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3220	0.3178	0.3185	0.0799	0.0761	0.0776
#Obs	12,733	12,733	12,733	7,202	7,202	7,202
Panel B.	Dep. Var: Vacancy					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.0193***	-0.0304***	-0.0314***	0.0018	0.0001	0.0005
	(0.0057)	(0.0046)	(0.0049)	(0.0024)	(0.0022)	(0.0024)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
#Obs	4,268	4,268	4,268	4,850	4,850	4,850
Panel C.	Dep. Var: Days on the Market					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-6.3178***	-8.9607***	-8.9903***	2.5706***	-0.1191	0.7164
	(1.4896)	(0.9271)	(1.0634)	(0.6774)	(0.7666)	(0.8404)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1433	0.1471	0.1474	0.0573	0.0549	0.0550
#Obs	4,268	4,268	4,268	4,850	4,850	4,850

Notes: This table applies the model specified in Equation (1) to assess how rent-pricing flexibility influences rent growth (Panel A), vacancy rates (Panel B), and days on the market (Panel C) throughout the COVID-19 pandemic. The coefficients βs from this equation are presented in Panels A and C. Panel B reports the marginal effect of rent-pricing flexibility on the likelihood of an apartment being vacant, calculated from a logit model. Rent growth in Panel A for the early (later) pandemic period is defined as the annualized log difference in rent between the time before March 2020 (from March 2020 to February 2021) and the period from March 2020 to February 2021 (March 2021 to February 2022). The vacancy status in Panel B for the early (later) pandemic period is an indicator variable, taking one for apartments that were listed from March 2020 to June 2020 (from March 2021 to June 2021) and remained vacant until February 2021 (February 2022). The days on the market in Panel C for the early (later) pandemic measure the number of days until rented or until February 2021 (February 2022) for apartments listed from March 2020 to June 2020 (from March 2021 to June 2021). As the right-hand-side variable, the table explores the frequency of rent adjustments in columns (1) and (4), the volatility of adjustments in columns (2) and (5), and the magnitude of adjustments in columns (3) and (6). The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, the presence of parking facilities, and the highest floor level of the apartment building. It also controls for seasonal variations in rent-setting flexibility, rent growth (Panel A), vacancy status (Panel B), and days on the market (Panel C) by including fixed effects constructed with three specific months: one month reflects the period when rent-pricing flexibility is assessed, and the other two months represent the first and last months of the observed rent listing period. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE VII: Consequences of Rent-Pricing Flexibility in 2019

Panel A.	Dep. Var: Rent Growth (%)					
	Cold Season			Hot Season		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibilty, Standardized	-0.2606*	-0.3841***	-0.4199***	0.8066***	1.0034***	1.2135***
	(0.1304)	(0.1118)	(0.1057)	(0.1189)	(0.0761)	(0.0763)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.2499	0.2512	0.2522	0.2507	0.2526	0.2613
#Obs	3,320	3,320	3,320	9,189	9,189	9,189
Panel B.	Dep. Var: Vacancy					
	Cold Season			Hot Season		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibilty, Standardized	-0.0036	-0.0124	-0.0128	0.0098	-0.0090	-0.0012
	(0.0083)	(0.0106)	(0.0092)	(0.0071)	(0.0092)	(0.0074)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
#Obs	2,106	2,106	2,106	1,391	1,391	1,391
Panel C.	Dep. Var: Days on the Market					
	Cold Season			Hot Season		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibilty, Standardized	-0.4870	-2.1419*	-2.1384**	1.3140	-0.5649	0.2899
	(1.0817)	(1.0539)	(0.9429)	(1.2613)	(1.5947)	(1.5514)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0726	0.0740	0.0740	0.0975	0.0965	0.0964
#Obs	2,106	2,106	2,106	1,391	1,391	1,391

Notes: This table applies the model specified in Equation (1) to assess how rent-pricing flexibility influences rent growth (Panel A), vacancy rates (Panel B), and days on the market (Panel C) in 2019. The coefficients βs from this equation are presented in Panels A and C. Panel B reports the marginal effect of rent-pricing flexibility on the likelihood of an apartment being vacant, calculated from a logit model. Rent growth in Panel A for the hot (cold) season in 2019 is defined as the log difference in rent between the time before January 2019 (between February 2019 and July 2019) and the period from February 2019 to July 2019 (from August 2019 to January 2020). The vacancy status in Panel B for the hot (cold) season in 2019 is an indicator variable, taking one for apartments that were listed from February 2019 to March 2019 (from August 2019 to September 2019) and remained vacant until July 2019 (January 2020). The days on the market in Panel C for the hot (cold) season in 2019 measure the number of days until rented or until July 2019 (January 2020) for apartments listed from February 2019 to March 2019 (from August 2019 to September 2019). As the right-hand-side variable, the table explores the frequency of rent adjustments in columns (1) and (4), the volatility of adjustments in columns (2) and (5), and the magnitude of adjustments in columns (3) and (6). The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, the presence of parking facilities, and the highest floor level of the apartment building. It also controls for seasonal variations in rent-setting flexibility, rent growth (Panel A), vacancy status (Panel B), and days on the market (Panel C) by including fixed effects constructed with three specific months: one month reflects the period when rent-pricing flexibility is assessed, and the other two months represent the first and last months of the observed rent listing period. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE VIII: Landlord's Expertise and Frictions in Rent Adjustments

Dep. Variables:	Days until Subsequent Adjustment				Rent Changes Conditional on Adjustment (%)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(Institutional Landlords)	-32.9489***				-0.6911***			
	(1.8399)				(0.1358)			
Expertise, Size		0.1038				0.1090**		
		(0.1244)				(0.0410)		
Expertise, Asset Concentration			0.4238				-0.1996**	
			(0.2695)				(0.0797)	
Expertise, Experience				-0.3039				0.3167***
				(0.5813)				(0.0749)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.2947	0.0400	0.0406	0.0400	0.0443	0.0410	0.0385	0.0400
#Obs	265,537	217,993	217,993	217,993	265,537	217,993	217,993	217,993

Notes: This table examines rent-pricing patterns throughout the COVID-19 pandemic, testing the hypothesis that landlords with more expertise experience fewer frictions (i.e., lower menu costs). The right-hand-side variable, I(Institutional Landlords), is an indicator variable that identifies apartments owned by institutional landlords. The other right-hand-side variables assess institutional landlords' expertise based on three aspects: (i) the size of the landlord, represented by the total rent from all owned properties (columns (2) and (4)); (ii) the extent of their properties' geographic diversification across different zipcodes (columns (3) and (7)) defined as $HHI_b = \sum_z \left(\frac{\text{Total Rent}_{bz}}{\sum_z \text{Total Rent}_{bz}}\right)^2$, where b stands for the firm and z for the zipcode; and (iii) the firm's age (columns (4) and (8)). A higher HHI value indicates greater geographic concentration, or conversely, less diversification. As the left-hand-side variables, columns (1) to (4) examine the number of days until the next rent adjustment occurs. Columns (5) to (8) focus on the size of rent changes, conditional on a rent adjustment. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, and the presence of parking facilities. It also controls for seasonal variations in rent adjustment by including year-month fixed effects. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE IX: Initial Asking Rents and Rent-Pricing Flexibility

	Dep. Var: Rent-Pricing Flexibility, Standardized					
	Frequency		Volatility		Magnitude	
	(1)	(2)	(3)	(4)	(5)	(6)
Initial Asking Rent, Standardized	-0.0036	-0.0578	0.0767	0.0765	0.0930	0.0766
	(0.0511)	(0.0368)	(0.0571)	(0.0512)	(0.0679)	(0.0590)
Zipcode FEs		Yes		Yes		Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0853	0.1959	0.0151	0.0371	0.0278	0.0775
#Obs	96,576	96,576	96,576	96,576	96,576	96,576

Notes: This table examines whether rent-pricing flexibility represents initial pricing errors followed by corrections. As the left-hand-side variable, it explores the frequency of rent adjustments in columns (1) and (2), the volatility of adjustments in columns (3) and (4), and the magnitude of adjustments in columns (5) and (6). The right-hand-side variable is the level of initial rents. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, and the presence of parking facilities. It also controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. Additionally, the table includes zipcode fixed effects in columns (2), (4), and (6) to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE X: Property Substitution and Modification

	Dep. Var: Renovation Costs, Standardized					
	Before the Pandemic			During the Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.0005	-0.0009	-0.0010	-0.0037	-0.0012	-0.0012
	(0.0015)	(0.0011)	(0.0011)	(0.0048)	(0.0016)	(0.0017)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0346	0.0346	0.0340	0.0132	0.0132	0.0132
#Obs	19,761	19,761	19,761	19,761	19,761	19,761

Notes: This table examines building permit data from the City of Chicago to explore how renovations influence rent-pricing flexibility, altering the findings presented in Table VI. The left-hand-side variable represents the total renovation costs before the pandemic (from May 2017 to February 2020) and during the pandemic (from March 2020 to March 2022). As the right-hand-side variable, this table explores the frequency of rent adjustments in columns (1) and (4), the volatility of adjustments in columns (2) and (5), and the magnitude of adjustments in columns (3) and (6). Since building permits are issued for entire buildings, the table computes rent-pricing flexibility at the building level by averaging the rent-pricing flexibility across all the units within a building. The table controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. It also includes zipcode fixed effects to compare apartment buildings within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE XI: Promotional Rent Discount and Rent-Pricing Flexibility

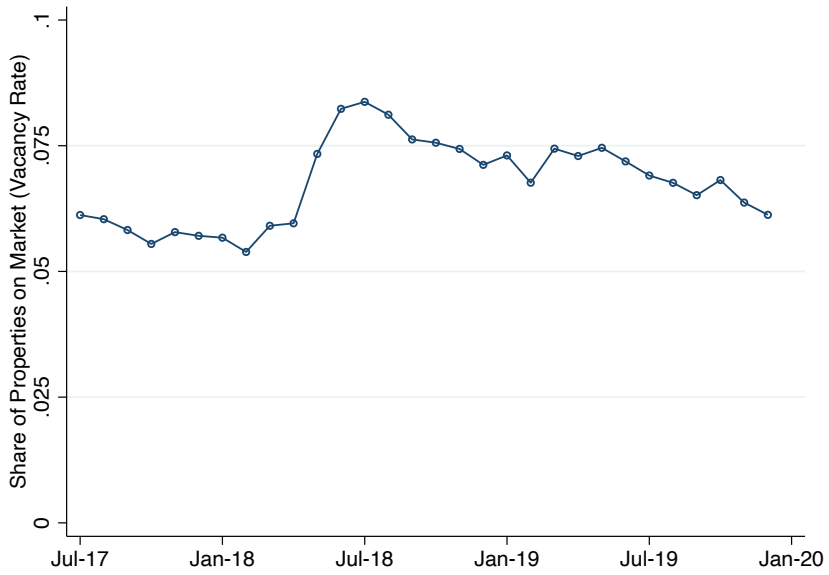
	Dep. Var: Promontional Rent Discount (%)					
	Frequency		Volatility		Magnitude	
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	0.0221	0.1355	-0.1079	-0.0523	-0.1280	-0.0537
	(0.1578)	(0.1768)	(0.1356)	(0.1355)	(0.1177)	(0.1094)
Zipcode FEs		Yes		Yes		Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3264	0.3493	0.3267	0.3487	0.3270	0.3487
#Obs	914	914	914	914	914	914

Notes: This table examines rental agreement data, specifically focusing on promotional rent discounts, to investigate if these discounts are associated with rent-pricing behaviors. The left-hand-side variable, promotional rent discount, is defined as the ratio of the total rent discount to the nominal contract rent, where the nominal contract rent has not yet been adjusted for the discount. As the right-hand-side variable, it explores the frequency of rent adjustments in columns (1) and (2), the volatility of adjustments in columns (3) and (4), and the magnitude of adjustments in columns (5) and (6). The table controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects across all columns. Additionally, it includes zipcode fixed effects in columns (2), (4), and (6) to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

Online Appendix

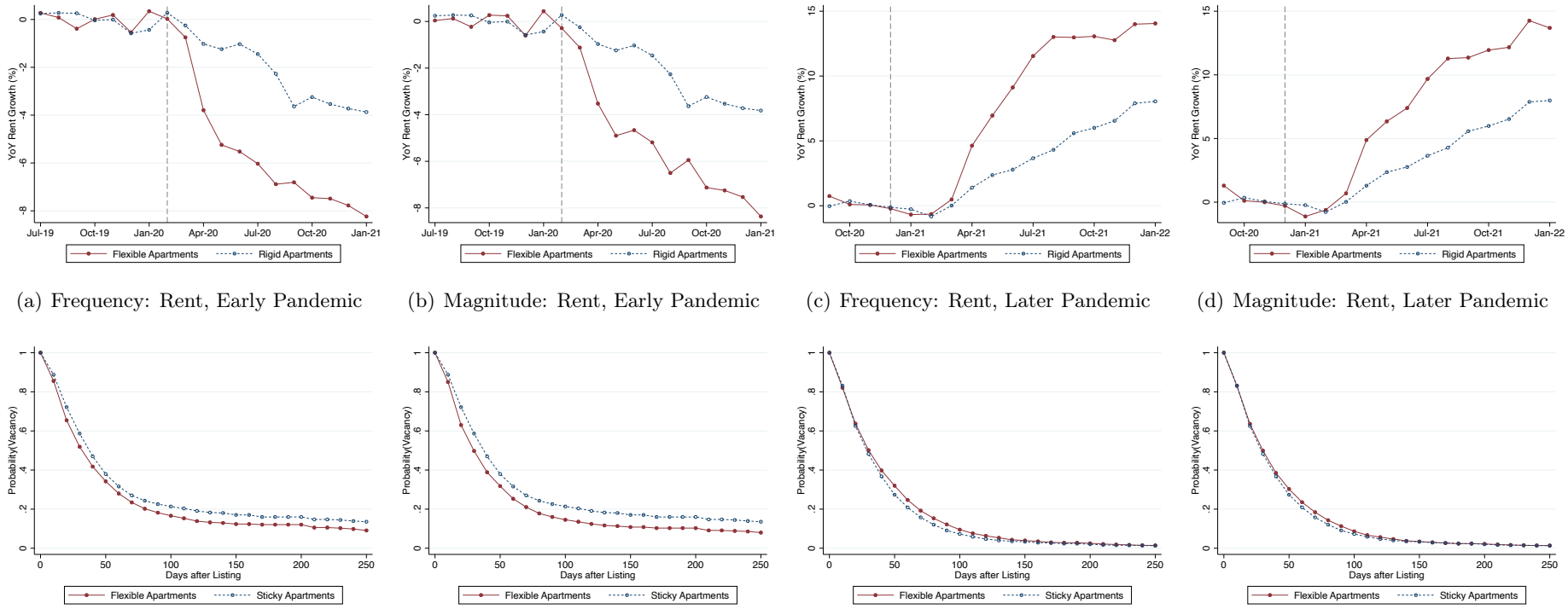
Appendix A Figures and Tables

Figure A.1: Share of Apartment Units on the Market



Notes: This figure illustrates the proportion of apartments listed for rent each month from July 2017 to December 2019. This proportion is calculated by dividing the number of apartments on the market by the total number of apartments that have ever been listed.

Figure A.2: Rent Growth and Vacancy by Rent-Pricing Flexibility, Other Measures

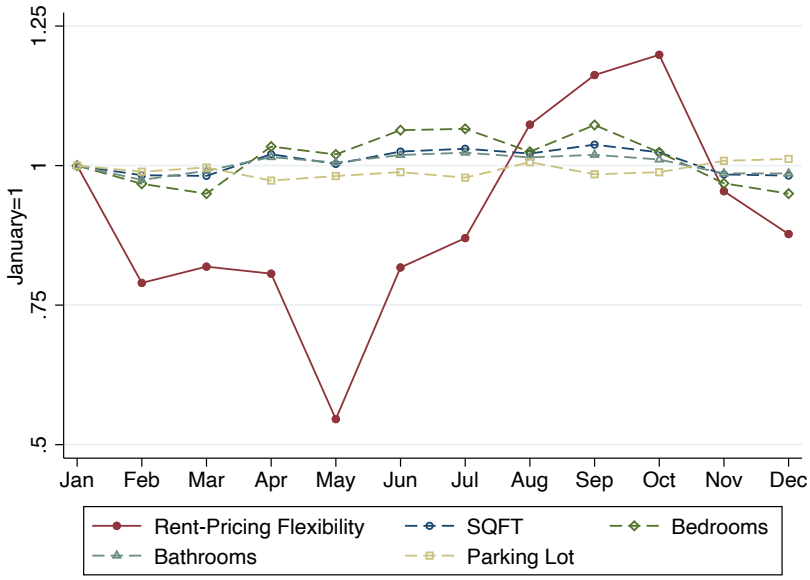


(a) Frequency: Rent, Early Pandemic (b) Magnitude: Rent, Early Pandemic (c) Frequency: Rent, Later Pandemic (d) Magnitude: Rent, Later Pandemic

(e) Frequency: Vacancy, Early Pandemic (f) Magnitude: Vacancy, Early Pandemic (g) Frequency: Vacancy, Later Pandemic (h) Magnitude: Vacancy, Later Pandemic

Notes: This figure illustrates the year-over-year rent growth (Panels (a) through (d)) and the likelihood of vacancies (Panels (e) and (h)) for two groups of apartments: flexible and rigid apartments. Flexible apartments are identified by their above-median rent-pricing flexibility, determined by the frequency (Panels (a), (c), (e), and (g)) or magnitude (Panels (b), (d), (f), and (h)) of rent adjustments while listed on the market, as outlined in Section III. Rigid apartments are those that did not undergo any rent changes during their listing period. Rent-pricing flexibility is measured based on data collected up to December 2019. Rent growth is calculated from the Case-Shiller index, adjusted for the apartment's zipcode, and normalized by subtracting the average rent growth observed during the periods before the vertical dotted line. The probability of vacancies is calculated using Kaplan-Meier methods (1958), with the "early pandemic" period spanning March 2020 to March 2021 and the "later pandemic" from March 2021 to March 2022. The vacancy analysis focuses on apartments listed in the first four months of each specified period.

Figure A.3: Stability of Property Characteristics



Notes: This figure illustrates the monthly indexed values for average rent-pricing flexibility, square footage (SQFT), number of bedrooms and bathrooms, and the availability of parking lots. The rent-pricing flexibility metrics, as outlined in Section III, are indexed and averaged to form a composite index. All indexes are standardized to a baseline value of 1 in January.

TABLE A.1: Importance of On-Market Rent Adjustment

Case	Contract to Contract (%)	Previous Contract to initial asking rent (%)	On-Market Rent Adjustment (%)	Share of On-Market Rent Adjustment
1	3	1	2	0.67
2	1	-1	2	1.00
3	-1	1	-2	1.00
4	-3	-1	-2	0.67
5	3	2	1	0.33
6	-1	-2	1	0.50
7	1	2	-1	0.50
8	-3	-2	-1	0.33
9	2	1	1	0.50
10	0	-1	1	-
11	0	1	-1	-
12	-2	-1	-1	0.50

Notes: This table lays out twelve different scenarios for rent adjustments and decomposes the rent adjustment from one contract to the next contract into two components: the adjustment from the previous contract rent to the initial asking rent of the next listing, and the adjustment made to the asking rent while the apartments are listed.

$$\underbrace{\frac{Rent_{contract2} - Rent_{contract1}}{Rent_{contract1}}}_{\text{From contract to contract}} = \underbrace{\frac{Rent_{initial} - Rent_{contract1}}{Rent_{contract1}}}_{\text{From contract to initial asking rent}} + \underbrace{\frac{Rent_{contract2} - Rent_{initial}}{Rent_{contract1}}}_{\text{On-market rent adjustment}}$$

The scenario is categorized by (i) whether the rent change from the previous contract to the initial asking of the subsequent listing is greater in absolute terms than the on-market rent adjustment and (ii) whether these adjustments are positive or negative. The share of on-market rent adjustments, reflecting their significance within overall rent changes, is defined as the ratio of the absolute values of changes in on-market rents to the maximum absolute value among all rent adjustment components:

$$\frac{\left|\frac{Rent_{contract2} - Rent_{initial}}{Rent_{contract1}}\right|}{max\left\{\left|\frac{Rent_{contract2} - Rent_{contract1}}{Rent_{contract1}}\right|, \left|\frac{Rent_{initial} - Rent_{contract1}}{Rent_{contract1}}\right|, \left|\frac{Rent_{contract2} - Rent_{initial}}{Rent_{contract1}}\right|\right\}}$$

TABLE A.2: Geographic Characteristics and Rent-Pricing Flexibility

	Dep. Var: Rent-Pricing Flexibility, Standardized					
	Frequency		Volatility		Magnitude	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A.						
Adjusted Gross Income in 2018,	-0.0060	0.0339	0.0020	0.0127	0.0004	0.0218
Standardized	(0.0349)	(0.0304)	(0.0175)	(0.0157)	(0.0252)	(0.0223)
R^2	0.03850	0.2690	0.01883	0.1153	0.02689	0.1740
Panel B.						
Mean House Prices in 2018,	-0.1642*	0.0128	-0.0249	0.0131	-0.0488	0.0159
Standardized	(0.0863)	(0.0618)	(0.0381)	(0.0374)	(0.0512)	(0.0473)
R^2	0.04396	0.2676	0.01903	0.1150	0.02755	0.1733
Panel C.						
Number of Establishments in 2018,	-0.0371	0.0428	0.0104	0.0228	0.0092	0.0373
Standardized	(0.0660)	(0.0718)	(0.0261)	(0.0283)	(0.0373)	(0.0428)
R^2	0.03909	0.2681	0.01890	0.1152	0.02695	0.1738
Panel D.						
Homeownership Rate in 2010,	-0.1247	-0.1533	-0.0475	-0.0610	-0.0843	-0.1095
Standardized	(0.1004)	(0.1490)	(0.0438)	(0.0713)	(0.0606)	(0.1076)
R^2	0.04086	0.2693	0.01940	0.1154	0.02838	0.1744
Firm FEs		Yes		Yes		Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
#Obs	30,081	30,081	30,081	30,081	30,081	30,081

Notes: This table examines the patterns of rent adjustment by the same institutional landlords across different zipcodes with varying characteristics, such as income (Panel A), house prices (Panel B), the number of businesses (Panel C), and homeownership rates (Panel D). As the left-hand-side variable, it explores the frequency of rent adjustments in columns (1) and (2), the volatility of adjustments in columns (3) and (4), and the magnitude of adjustments in columns (5) and (6). The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, and the presence of parking facilities. It also controls for seasonal variations in rent-setting flexibility by including listing year-month fixed effects. Additionally, the table includes firm fixed effects in columns (2), (4), and (6) to analyze how a firm varies its property pricing across different zipcodes, depending on the zipcode's characteristics. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE A.3: Consequences of Rent-Pricing Flexibility, Alternative Measures

Panel A.	Dep. Var: Rent Growth (%)					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.6669***	-0.4251**	-0.6221***	3.4904***	2.4180***	3.1053***
	(0.2329)	(0.1649)	(0.2109)	(0.9633)	(0.8776)	(0.9565)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.2542	0.2528	0.2536	0.0667	0.0626	0.0643
#Obs	12,978	12,978	12,978	7,330	7,330	7,330
Panel B.	Dep. Var: Vacancy					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.0146***	-0.0159***	-0.0180***	0.0020	-0.0000	0.0007
	(0.0045)	(0.0050)	(0.0040)	(0.0020)	(0.0019)	(0.0021)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
#Obs	4,268	4,268	4,268	4,850	4,850	4,850
Panel C.	Dep. Var: Days on the Market					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-4.3949***	-5.5443***	-5.6851***	2.7314***	0.3689	1.2638
	(1.4044)	(1.2967)	(1.0915)	(0.9331)	(1.0726)	(1.1772)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1718	0.1723	0.1728	0.0794	0.0767	0.0771
#Obs	4,268	4,268	4,268	4,850	4,850	4,850

Notes: This table applies the model specified in Equation (1) to assess how rent-pricing flexibility influences rent growth (Panel A), vacancy rates (Panel B), and days on the market (Panel C) throughout the COVID-19 pandemic. The coefficients βs from this equation are presented in Panels A and C. Panel B reports the marginal effect of rent-pricing flexibility on the likelihood of an apartment being vacant, calculated from a logit model. Rent growth in Panel A for the early (later) pandemic period is defined as the annualized log difference in rent between the time before March 2020 (from March 2020 to February 2021) and the period from March 2020 to February 2021 (March 2021 to February 2022). The vacancy status in Panel B for the early (later) pandemic period is an indicator variable, taking one for apartments that were listed from March 2020 to June 2020 (from March 2021 to June 2021) and remained vacant until February 2021 (February 2022). The days on the market in Panel C for the early (later) pandemic measure the number of days until rented or until February 2021 (February 2022) for apartments listed from March 2020 to June 2020 (from March 2021 to June 2021). As the right-hand-side variable, the table explores the frequency of rent adjustments in columns (1) and (4), the volatility of adjustments in columns (2) and (5), and the magnitude of adjustments in columns (3) and (6), computed based on the rent adjustments during the initial 30 days of a listing. The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, the presence of parking facilities, and the highest floor level of the apartment building. It also controls for seasonal variations in rent-setting flexibility, rent growth (Panel A), vacancy status (Panel B), and days on the market (Panel C) by including fixed effects constructed with three specific months: one month reflects the period when rent-pricing flexibility is assessed, and the other two months represent the first and last months of the observed rent listing period. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.

TABLE A.4: Consequences of Rent-Pricing Flexibility, Estimated Contract Rent

	Dep. Var: Rent Growth (%)					
	Early Pandemic			Later Pandemic		
	Frequency	Volatility	Magnitude	Frequency	Volatility	Magnitude
	(1)	(2)	(3)	(4)	(5)	(6)
Pricing Flexibility, Standardized	-0.3310*	-0.3512**	-0.4252***	0.8663***	0.5040***	0.6731***
	(0.1835)	(0.1329)	(0.1377)	(0.2714)	(0.1728)	(0.1831)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics Control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.5586	0.5585	0.5594	0.6379	0.6328	0.6344
#Obs	1,956	1,956	1,956	1,932	1,932	1,932

Notes: This table applies the model specified in Equation (1) to assess how rent-pricing flexibility influences rent growth throughout the COVID-19 pandemic. Rent growth for the early (later) pandemic period is defined as the annualized log difference in estimated contract rents or the final asking rents between the time before March 2020 (from March 2020 to February 2021) and the period from March 2020 to February 2021 (March 2021 to February 2022). As the right-hand-side variable, the table explores the frequency of rent adjustments in columns (1) and (4), the volatility of adjustments in columns (2) and (5), and the magnitude of adjustments in columns (3) and (6). The table accounts for property characteristics by including fixed effects constructed based on rent price decile, the number of bedrooms and bathrooms, the presence of parking facilities, and the highest floor level of the apartment building. It also controls for seasonal variations in rent-setting flexibility and rent growth by including fixed effects constructed with three specific months: one month reflects the period when rent-pricing flexibility is assessed, and the other two months represent the first and last months of the observed rent listing period. Additionally, the table includes zipcode fixed effects to compare apartments within the same geographic area. Standard errors reported in parentheses are clustered at the zipcode level. *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively.