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Do new housing units in your backyard raise your rents?

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Abstract

There is a growing debate about whether new housing units increase rents for immediately surrounding apartments. Some argue new market-rate development produces a supply effect, which should alleviate the demand pressure on existing housing units and decrease their rents. Others contend that new development will attract high-income households and new amenities, generating an amenity effect and driving up rents. I contribute to this debate by estimating the impact of new high-rises on nearby residential rents, residential property sales prices and restaurant openings in New York City. To address the selection bias that developers are more likely to build new high-rises in fast-appreciating areas, I restrict the sample to residential properties near approved new high-rises and exploit the plausibly exogenous timing of completion conditional upon the timing of approval. I provide event study evidence that within 500 ft, for every 10% increase in the housing stock, rents decrease by 1%; and for every 10% increase in the condo stock, condo sales prices decrease by 0.9%. In addition, I show that new high-rises attract new restaurants, which is consistent with the hypothesis about amenity effects. However, I find that the supply effect dominates the amenity effect, causing net reductions in the rents and sales prices of nearby residential properties.

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1. Introduction

As cities across the US experience rising residential rents, the debate about the impact of new market-rate housing units on the affordability of surrounding apartments has intensified.[1] Many affordable housing advocates and community members oppose new market-rate development, especially new high-rises. They fear that new market-rate development signals a booming neighborhood and invites high-income households and new amenities, ultimately driving up residential rents in the local neighborhood (amenity effects; Atta-Mensah, 2017; Chew, 2018). However, others argue that increasing housing supply should

1 Recently, the argument whether increasing market-rate housing supply results in lower housing prices has been the most controversial among the urbanist community (Florida, 2019; Gray, 2019). Influential researchers Rodríguez-Pose and Storper (2019) kicked off a war by arguing that increasing the market-rate housing supply will only exacerbate gentrification within prosperous areas. Manville et al. (forthcoming) responded by asserting that construction of taller and denser residential buildings is necessary to relieve the housing affordability crisis.

absorb demand and alleviate growing pressure on residential rents (supply effects; Glaeser and Gyourko, 2018). To inform this debate, I conduct event studies to estimate the impact of new high-rise completions on nearby residential rents, residential property sales prices and new restaurants in New York City (NYC) between 2003 and 2013.

Any study of the impact of new market-rate development on surrounding rents must contend with the reality that new market-rate development is more likely to be built in fast-appreciating areas (DiPasquale, 1999; Mayer and Somerville, 2000; Green et al., 2005). This endogeneity makes it challenging to identify a causal relationship between new high-rises and nearby residential rents. I address this selection bias by restricting the sample to residential properties within 500 ft of new high-rises with approved building permits and exploiting the plausibly exogenous timing of construction completion. I document that controlling for the timing of approval, residential rents and sales prices near completed new high-rises and not-yet-completed new high-rises exhibit parallel trends prior to the completion year.[2]

The existing literature is hindered by a lack of panel data for residential rents at the property level, in addition to the endogeneity challenge. This article introduces a longitudinal dataset covering 2003–2013 annual income for NYC rental buildings. This dataset shows actual income from rents by property and so incorporates any discounts or concessions offered by owners, as well as vacancies.[3]

I find that for every 10% increase in the housing stock within a 500-ft buffer, residential rents decrease by 1%. The rent reduction is caused by the completion of new high-rises rather than the approval. Across neighborhoods, the negative impact is bigger in gentrifying neighborhoods than established high-income areas, presumably because 500-ft buffers in high-income areas have more substitutes, in turn, more elastic demand and smaller price responses to supply shocks. Within neighborhoods, the negative impact is significant for high-end and mid-range existing rental buildings, because they are closer substitutes to new high-rises.[4] Finally, the negative impact appears to be driven by supply effects rather than disamenity effects, like changes in neighborhood physical features, blocked views or shadows.

Residential property sales prices also decrease when new high-rises within 500 ft are completed. I find little evidence of anticipatory reductions in sales prices, presumably because of the difficulty in predicting the completion timing of new high-rises, which further suggests that the completion timing is exogenous conditional upon the approval timing. There are four types of residential properties in NYC—rental buildings, condos, co-ops and 1–5 family houses.[5] New high-rises only decrease sales prices of condos, presumably because co-ops and 1–5 family homes do not compete with new high-rises directly in the real estate market. In other words, the negative impact is bigger for closer substitutes, further confirming the negative impact is due to supply effects instead of disamenity effects. For every 10% increase in condo stocks, condo sales prices decrease by 0.9%, which is not significantly different from the estimated rent elasticity.

2 It is important to note that approval timing controls capture anticipated behavior that rents and sales prices might be changed when people realize an approved new high-rise is nearby.

3 Given the competition pressure, property owners of existing rental buildings might hold apartment units empty rather than decrease unit rents. However, it is highly unlikely that property owners hold out for a long period.

4 This could also be explained by the migration chain, that high-income households move to new buildings, which leave behind older housing stock for their middle-class neighbors.

5 The condo is a multifamily building where each unit has a separate owner. The co-op is a multifamily building owned by a corporation where each unit has a separate owner holding shares of the corporation.

To address the hypothesis about amenity effects, I find new high-rises and their high-income tenants bring in or attract new full-service restaurants, cafes and coffee shops. These consumption amenities likely make neighborhoods more attractive and potentially increase rents and sales prices (Couture and Handbury, 2017). However, the amenity effect is dominated by the supply effect, given that rents and sales prices still fall on net.

Existing empirical evidence mostly focuses on the impact of new housing units on broader housing markets rather than immediately surrounding neighborhoods and suggests that increasing supply reduces housing prices. Glaeser and Ward (2009) estimate housing price elasticity with respect to town density as between −0.16 and 0.02 for Greater Boston. Anenberg and Kung (2020) estimate the rent elasticity with respect to new supply by PUMA between 0 and −0.1 in large metropolitan areas in the USA.[6] Gyourko and Molloy (2015) conclude from their literature review that restricting housing supply raises housing prices on broader housing markets (Glaeser et al., 2005a; Gyourko and Saiz, 2006).[7] However, due to amenity effects, the impact of new housing units on immediately surrounding neighborhoods might be different. Hankinson (2018) documents that renters in expensive cities despite supporting increases in the housing supply citywide, view new market-rate housing in their neighborhoods as a threat.

A number of researchers find a positive correlation between new market-rate housing units and nearby housing prices (Oliva, 2006; Pearsall, 2010; Zahirovich-Herbert and Gibler, 2014). However, this correlation does not necessarily imply causation, as developers tend to build new market-rate developments in areas with growing housing prices. Boustan et al. (2019) document a strong positive correlation between new condos and resident income, and find it is entirely driven by the fact that developers build condos in areas that are attractive to high-income households. One closely related paper is Asquith et al. (2021), finding new luxury buildings in low-income census tracts decrease monthly rents 5–7% within 250 meters (inner circle), compared to rents 250–600 m away (outer ring). They use fixed effect for the inner circle in each year to address the endogeneity that rents in the inner circle are trending upwards than rents in the outer ring. In addition, Singh (2019) find new tax-exempt development in low-income neighborhoods generates amenity effects and increases nearby rents using a natural experiment—change in 421-a Tax Exemption Rules.

As noted, many renters fear that new market-rate housing units and their high-income tenants generate amenity effects, leading to higher rents, gentrification and displacement in local neighborhoods (Monkkonen, 2016; Been et al., 2019). In addition, affordable housing advocates argue that new market-rate development is mostly luxury housing, which does not meaningfully increase housing supply for low-income and working-class households nearby (Aguirre et al., 2016). There is also debate about the pace at which new market-rate housing deteriorates and filters down to become a viable long-term source of lower-income housing (Rosenthal, 2014; Mast, 2018). To contribute to this debate, this article shows that new high-rises lower rents not only for nearby high-end rental buildings, but for mid-range rental buildings as well.

6 Public Use Microdata Areas (PUMA) are a collection of tracts within counties with around 100,000 people. There are 55 PUMAs in NYC.

7 In terms of welfare, researchers show that restricting housing supply has a serious adverse effect on US GDP and welfare (Turner et al., 2014; Bunten, 2017; Hsieh and Moretti, 2019). Researchers also find restricting housing supply exacerbates spatial inequality by deterring migration (Ganong and Shoag, 2017) and forcing low-income households to leave neighborhoods with high-quality amenities (Lens and Monkkonen, 2016).

This article is related to a literature examining the negative impact of foreclosures on immediately surrounding housing prices (Schuetz et al., 2008; Campbell et al., 2011; Hartley, 2014; Anenberg and Kung, 2014; Gerardi et al., 2015). There are two mechanisms to explain this negative impact: (i) Foreclosures increase local housing supply when they are listed (supply effect); and (ii) foreclosed properties are poorly maintained, which generates negative externalities (disamenity effect). Anenberg and Kung (2014) document that sellers are more likely to reduce listing prices in the exact week that a foreclosed property enters the market than they are in the week before or after the entry, which they argue shows that the supply effect is the main mechanism.[8] However, Gerardi et al. (2015) find that the estimated negative effect highly depends on the reported maintenance condition of the foreclosed property, suggesting that the dis-amenity effect plays a critical role.

This article also relates to literature estimating the spillover effect of new affordable housing. For example, the Low-Income Housing Tax Credit (LIHTC)[9] increases nearby property values by 3.8–6.5% in low-income neighborhoods due to housing investment and incoming middle-class households (amenity effect; Diamond and McQuade, 2019; Baum-Snow and Marion, 2009; Ellen et al., 2007) and decreases nearby property values by 2.5% in high-income areas because it brings in neighbors with relatively-low income (dis-amenity effect; Diamond and McQuade, 2019).

This article is structured as follows: Section 2 describes the data source. Section 3 discusses the research design. In Section 4, I present the estimated impact of new high-rises on residential rents, robustness checks and heterogeneity analysis. Sections 5 and 6 discuss the impact on sales prices and restaurant openings respectively. Section 7 concludes the article.

2. Data Source

2.1. New High-rises

I focus on the impact of new high-rises, because they are mostly luxury and offer many new market-rate housing units within a small area. In this article, new high-rises are defined as newly built, market-rate residential properties with seven or more floors (Hall, 2005).

I use the 2000–2017 NYC Building Permit dataset provided by NYC Department of Buildings (DOB) to identify the timing and location of Building Permit approval. The dataset includes characteristics of the approved new development (e.g. job number, height, the number of residential units, applicant information, approval date, latitude and longitude, etc.).[10] I also rely on the 2000–2017 NYC Certificate of Occupancy dataset from Department of City Planning (DCP), which includes job number, borough-block-lot, completion date, etc., to identify the completion timing of new

8 Two other papers suggest the negative effect of foreclosure is mainly caused by the supply effect. Hartley (2014) finds foreclosures of multifamily properties do not affect nearby single-family properties because they are not substitutes. Mian et al. (2015) document that foreclosures cause local housing supply to increase.

9 'The LIHTC program provides a dollar-for-dollar reduction in federal income tax liability for investors in rental housing that serves very low-income and low-income households.' Details can be found here: http://furmancenter.org/coredata/directory/entry/low-income-housing-tax-credit

10 The DOB assigns each project a job number when the developer applies for a Building Permit. The Building Permit dataset can be downloaded here: https://data.cityofnewyork.us/Housing-Development/DOB-Permit-Issuance/ipu4-2q9a

development.[11] I merge the Building Permit and Certificate of Occupancy datasets using the job number, and keep only new residential properties that are seven floors or higher as new high-rises. In addition, since this article focuses only on new market-rate high-rises, I exclude new affordable housing development using the 2017 Subsidized Housing Dataset (SHD) from NYU Furman Center.[12] In this article, I categorize new high-rises with only the 421-a Tax Incentive subsidy, with only the Inclusionary Housing subsidy, or with no subsidy as market-rate.[13]

From 2000 to 2010, 1141 new high-rises received approved Building Permits.[14] Figure 1 shows their locations—they are either in central areas or along major transportation routes. Among approved new high-rises, 80.3% were completed before 2013, 12.1% were completed between 2014 and 2017, and 7.6% had not been completed by the end of 2017.[15] Appendix A.1 shows these percentages by approval years. As for the construction length (the completion year minus the approval year), the range is between 0 and 15 years, and the average and median is 3-year; see Appendix A.2 for the distribution.

Among the 916 new high-rises that completed before 2013, 638 are condos, 10 are co-ops, and others are rental buildings; 712 received only the 421-a subsidy, 6 received only the Inclusionary Housing subsidy and the remainder received no subsidy. I show that the 421-a Tax Incentive and Inclusionary Housing subsidies do not affect the impact of new high-rises in the robustness check section.[16]

In addition, I use the 2015 Map Primary Land Use Tax Lot Output (MapPLUTO) shapefile from the DCP to draw buffers around new high-rises using ArcGIS.[17]

2.2. Residential rents

This article introduces a panel dataset covering 2003–2013 annual rents for NYC rental buildings by property.[18] The dataset also includes property locations and characteristics. This information is extracted from the 2005–2015 Notice of Property Value (NOPV).[19] See Appendix A.3 for an NOPV statement. The NOPV reports estimated gross rental income with a 2-year lag (e.g. the NOPV from 2005 reports rent information from 2003). The Department of Finance (DOF) issues the NOPV annually to inform homeowners of

11 Every NYC property is identified by a 10-digit borough-block-lot code. The Certificate of Occupancy dataset is sent from DCP to NYU Furman Center.

12 The SHD dataset covers borough-block-lot, subsidy program, and other characteristics for subsidized housing in NYC. I merge the SHD and Certificate of Occupancy data using borough-block-lot.

13 The 421-a Tax Incentive subsidy offers a partial real estate tax exemption for new residential properties. Some of these properties are required to have 20% of their units affordable to low-income households. For NYC residential properties that benefited from the 421-a Tax Incentive subsidy in 2016, 78.5% did not have affordable units, 4.4% had off-site affordable units, and 14.8% had on-site affordable units (Furman Center, 2016a). The Inclusionary Housing subsidy offers additional permitted floor area for new development, substantial rehabilitation or persistently affordable housing. Some developers are required to include 20% of the building floor area as affordable units within the market-rate residential property (Satow, 2014).

14 According to the Building Permit dataset, 85% of new high-rise pre-filing applications were approved by DOB.

15 Some of the new high-rises not completed by the end of 2017 may contain affordable units. The SHD dataset does not cover subsidized housing in construction.

16 Those new high-rises provided 59,148 units. From 2003 to 2013, around 210,000 new housing units were added to NYC, 21% of them belonging to affordable housing projects.

17 I use the 2015 MapPLUTO because properties that were demolished or changed use by the end of 2013 will not be included in the sample of residential rents and residential property sales prices. The MapPLUTO can be downloaded here: https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-pluto-mappluto.page

18 For researchers who are interested in this dataset, please reach out to NYU Furman Center for the access.

19 NOPV website: https://nycprop.nyc.gov/nycproperty/nynav/jsp/selectbbl.jsp

Figure 1. Approved new high-rises in NYC.
Notes: The figure shows locations for new high-rises that received approved Building Permits from 2000 to 2010 in NYC. Dots are approved new high-rises and lines are major transportation routes.

market and assessed values of their properties. The estimated gross rental income reported in the NOPV is based on the Real Property Income and Expense (RPIE), filed by property owners. Residential properties that are not required to file the RPIE include those with (i) an actual assessed value of $40,000 or less, (ii) 10 or fewer dwelling units, (iii) six or fewer dwelling units and no more than one commercial unit or (iv) a special franchise.[20] For those properties, the DOF estimates their gross income using comparable rental buildings. Since those estimates might be less accurate than gross income filed by property owners, I restrict the sample to rental buildings required to file the RPIE as a robustness check.

This residential rent dataset has three caveats. First, it only covers rental buildings with more than five units, which account for approximately 70% of NYC residential rental units (Lee, 2013). Compared to the rest of NYC, households in rental buildings are smaller, younger and have a lower income on average (Furman Center, 2010). Estimated gross rental income is only reported on NOPVs for rental buildings with more than five units, because the DOF values those properties on the basis of their income and expenses. Residential properties with five or fewer units are valued using recent comparable sales

20 See 'RPIE Worksheet and Instructions' for details, https://www1.nyc.gov/assets/finance/downloads/pdf/rpie/2017_forms/rpie-2017_worksheet.pdf

prices.[21] Condos and co-ops are valued using incomes and expenses of comparable rental properties. Second, it is an unbalanced panel. Some NOPVs do not include line items for the estimated gross income for multiple years, because NOPVs have several form types and some form types do not contain detailed income information. Approximately 80% of NOPVs report estimated gross income for more than 7 years from 2005 to 2015. Third, for rental buildings with commercial units, their estimated gross income covers commercial rents. However, on average, only 2.5% of units in rental buildings are commercial. I address the second and the third caveats in the robustness checks section and show that neither affects the main finding.

This residential rents dataset is novel in two ways. First, it offers reliable property-level rents by year. The median residential rents from the NOPV at the census tract level are consistent with median gross rents at the census tract level reported by the Census; see Appendix A.4 for details. Second, this dataset incorporates the change in concessions and vacancy rates. It is important to note that the decrease of property-level rents could be driven by the decline of unit-level rents, the increase of vacancy rates, or the combination of these two channels.

2.3. Sales prices

I use 2003–2013 NYC sales transactions information for residential properties from the NYC DOF and Automated City Register Information System.[22] To obtain building (unit for condo/co-op) characteristics, such as building class, built year, height, gross square feet and number of units, I merge this sales dataset with the 2003–2013 Real Property Assessment Dataset (RPAD) from the DOF. The following residential property transactions are removed from the dataset: (i) those with prices per unit that are outliers; (ii) those that are not arms-length[23]; (iii) those for which the building (unit for condo) characteristics are not consistent with RPAD information.

2.4. New restaurant establishments

I use the 2002–2013 Infogroup US Historical Business Database to identify new restaurants and coffee shops.[24] Infogroup gathers location-related establishment information from 6000 sources, including Secretaries of State and the US Postal Service; and incorporates phone verification for the entire database. Infogroup diligently identifies new establishments and adds them to the dataset as quickly as possible. This dataset provides the full street address for each establishment, and reports North American Industry Classification System (NAICS) codes. I identify a food service opening in year t if an establishment with NAICS code 7225 (restaurants and other eating places) appears in the database for the first time in that year.

21 After 2010, residential rental properties with four/five units are valued using an income-producing approach, and only residential properties with three or fewer units are valued using comparable recent sales prices. See 'NYC Property Tax Guide for Tax 2 Properties' https://www1.nyc.gov/assets/finance/downloads/pdf/brochures/class_2_guide.pdf and 'NYC Property Tax Guide for Tax 1 Properties' https://www1.nyc.gov/assets/finance/downloads/pdf/brochures/class_1_guide.pdf for details.

22 For researchers who are interested in this dataset, please reach out to NYU Furman Center for the access.

23 An arms-length transaction assures that the buyer and the seller are acting in their own self-interests. In other words, the seller aims to make the most, while the buyer tries to pay the least. In this dataset, the NYC DOF identifies whether a sales transaction is arm's length.

24 The dataset can be downloaded through Wharton Research Data Services.

Table 1. Summary statistics for dependent variables

Variable	# of observations	Mean	Std. Dev.	P10	P50	P90
Annual rents per observation in NYC	127,680	16734.85	11988.35	7600	13,700	28,990
Annual rents per observation in Manhattan	83,511	19474.07	13511.92	8227	16,700	32,920
Annual rents per observation in other boroughs	44,169	11555.75	5408.786	7070	10566	16,629
Sales prices per observation in NYC	65,380	954,130	1,097,592	212,500	640,479	1,985,500
Sales prices per observation in Manhattan	48,195	1,134,389	1,207,576	296,698	780,000	2,300,000
Sales prices per observation in other boroughs	17,185	441,865	359835.2	125,000	355,000	845,147
# of new food services per property in NYC	69,938	0.192	0.535	0	0	1
# of new food services per property in Manhattan	49,984	0.207	0.574	0	0	1
# of new food services per property in Other boroughs	19,954	0.153	0.413	0	0	1

2.5. Summary statistics

Table 1 shows summary statistics for residential rents, sales prices and new food services using in the main empirical analysis. About 70% of samples are from Manhattan, which is the most established borough in NYC.

3. Research design

As required by the NYC DOB, there are multiple steps a developer must take before a new high-rise is completed. The first step is to apply for a Building Permit. After the Building Permit is approved by the DOB, the developer can start construction.[25] Once construction is complete, the developer arranges for the required inspections and applies for a Certificate of Occupancy. The new high-rise is available for new tenants after the Certificate of Occupancy is issued.[26] An approved Building Permit shows that the developer is allowed to begin construction, and a Certificate of Occupancy indicates that the construction is completed.

As illustrated in Figure 2, I restrict the sample to rental buildings within 500 ft of new high-rises that received approved Building Permits between 2000 and 2010, and examine the rent changes for rental buildings within 500 ft of completed new high-rises. Residential rents are available from 2003 to 2013, and so I examine new high-rise completions during this period. I set the buffer radius at 500 ft because that is the average length of NYC block.[27] Rental buildings with any part touching the 500-ft buffers belong to the

25 As discussed in Freemark (2020), the building permit is not issued right after the rezoning. Instead, the whole planning and negotiation process takes more than 5 years, because it is arduous. Though this article indicates that upzoning can decrease residential rents, the impact might not be observed when the upzoning happens.
26 See ‘Permit Process’ for details: https://www1.nyc.gov/site/buildings/business/building-permits.page
27 I also restrict the sample to rental buildings inside the block of new high-rises, and regression results are consistent with main findings.

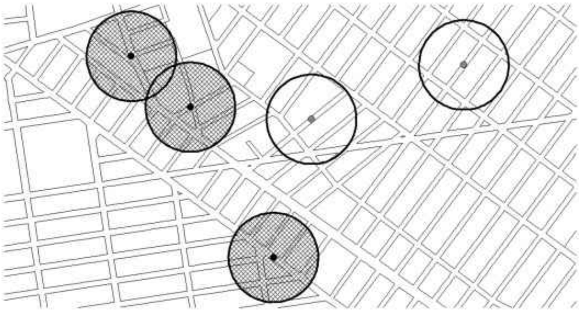

Figure 2. Five hundred-feet buffers.
Notes: Black dots are completed new high-rises, and gray dots are approved new high-rises which have not yet been completed. The event study sample includes rental buildings within shadowed and hollow circles.

sample. In NYC, blocks adjacent to each other could be very different real estate markets.[28] I document that new high-rises insignificantly decrease rents for rental buildings that are 500–1000 ft away in the robustness checks section. I set the approved Building Permit period as 2000–2010, because I analyze completions from 2003 to 2013, and the average and median construction length is 3 years, as shown in Appendix A.2. Then, I remove rental buildings completed after 2002 to focus on the impact of new high-rises on existing rental buildings.

I estimate Equation (1) to measure the impact of new high-rise completions conditional upon the timing of approval:

$$\begin{aligned} ln(Rent_{it}) = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion_{it}(\tau) + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \\ + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it} \end{aligned} \tag{1}$$

$ln(Rent_{it})$ is the natural logarithm of annual rent per unit for property i and year t. $YearSinceCompletion(\tau)$Z(HTMLtranslationfailed) is an indicator for τ years since the completion of nearby new high-rises, and the set $T = \{-3, -2, -1, 0, 1, 2, 3, 4, 5+\}$.[29] $YearSinceCompletion(\tau)$ dummies are variables of interests. $YearSinceApproval(\kappa)$ is an indicator for κ years since the approval of nearby new high-rises, and the set $K = \{-3, -2, -1, 0, 1, 2, 3, 4, 5+\}$.[30] $Borough \times Year$ dummies control for housing market trends.[31] μ_i is the fixed effect for property i.

Since developers are more likely to apply and receive approved Building Permits when the local housing markets experience fast appreciation, $YearSinceApproval(\kappa)$ dummies control for this trend. In addition, $YearSinceApproval(\kappa)$ dummies capture anticipated behavior that landlords and tenants may change their rents when they know an approved new high-rise is nearby, and rent changes related to construction.

28 For example, the block on West 37th Street between 10th and 9th Avenues has one of the highest crime rate in NYC. Hudson Yards, the most expensive real estate development, is right next to it.

29 If a property is within 500 feet of multiple new high-rises, *before* is treated as before the earliest completion year, and *after* is treated as after the latest completion year.

30 If a property is within 500 feet of multiple new high-rises, *before* and *after* are treated as before and after the earliest approval year.

31 There are five boroughs in NYC: Manhattan, Brooklyn, Queens, Bronx and Staten Island.

Because the research compares rents close to completed and not-yet-completed new high-rises, it is critical to understand what factors predict whether the new high-rises were completed before 2013, and the construction length. As shown in Appendix B.1, new high-rises features, like building characteristics, location and developer features, are hardly predictive.

According to interviews and news articles, some new high-rises take a long time to complete or fail to be completed for the following reasons: (i) infighting between partners; (ii) labor, construction equipment or materials shortages; (iii) unexpected site conditions or building violations; (iv) 2008 financial crisis[32]; (v) financing problems unrelated to the local housing market; or (vi) weakening of the local housing market (Hughes, 2016; Solomont and Bockmann, 2017; Been, E-mail interview, 31 October 2018).[33] The first five reasons are exogenous to local housing market growth when *Borough* × *Year* dummies are included as controls, but the sixth is not. It is possible that some delayed constructions are located in neighborhoods where housing markets grow at slower paces. If that is the case, the completion of new high-rises will positively correlate with growing residential rents. Therefore, the estimation in this article offers a lower boundary for the negative impact of new high-rises.

To reduce this bias, I remove rental buildings belonging to census tracts with no rental building within 500 ft of new high-rises completed by the end of 2013.[34] After this removal, all rental buildings close to not-yet-completed new high-rises share census tracts with some rental buildings close to new high-rises completed by the end of 2013.[35] This leaves me with 578 census tracts in the sample, and NYC has 2168 census tracts in total. Appendix B.2 compares neighborhood characteristics of those census tracts and other NYC census tracts. Median income for census tracts in the sample experienced faster growth rate. They also had a 6 percentage points decrease in terms of the percentage of Black and Hispanic populations. According to the classification from Furman Center (2016b), 57.31% of those census tracts are high-income, 36.14% are gentrifying and only 6.54% are non-gentrifying.

4. The impact on residential rents

4.1. Main finding

4.1.1. Rents before and after completions

Following the research design, Figure 3 shows the regression results for Equation (1).[36] Rents for rental buildings within 500 ft of completed new high-rises decrease by 2%

32 On average, new high-rises approved between 2000 and 2007 took 2 years to complete, and those approved between 2008 and 2010 took 4 years. Much fewer new high-rises received approved Building Permit after 2008, as shown in Appendix A.1. However, the impact of new high-rises on rental buildings before and after 2008 is not significantly different.

33 In the email interview, Vicki Been highlighted that new high-rise buildings in faster improving areas might be more contentious, and so they take a longer time to be approved rather than built.

34 Census tracts generally encompass a population between 1200 and 8000, and their boundaries mostly follow visible and identifiable features. There are 2168 census tracts in NYC.

35 This procedure removes 5658 observations from the residential rents dataset and 2388 observations from the sales prices dataset.

36 I try controling for *SubBorough* × *Year* and *Zipcode* × *Year* dummies rather than *Borough* × *Year* dummies separately, and the results are consistent. The US Census Bureau divides NYC into 55 SubBorough areas and 180 Zipcodes.

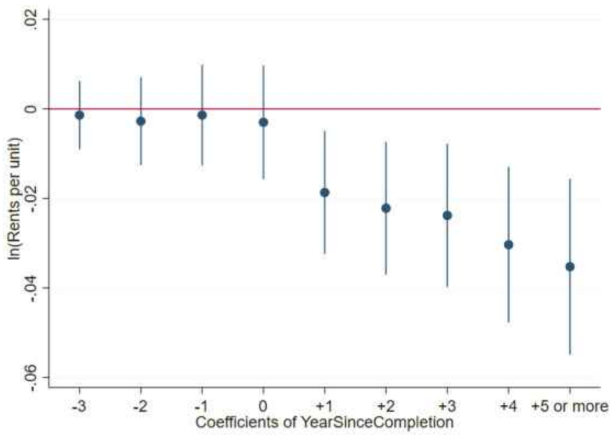

Figure 3. Rents before and after the completion year.
Notes: The figure shows regression results for Equation (1), indicating estimated rent changes before and after the completion year conditional upon the number of years since approval. Property fixed effects and *Borough* × *Year* dummies are controlled. Standard errors are clustered by census tract.

1 year after the completion significantly and persistently.[37] In following years, rents experience a gradual decline, presumably because residential rents are sticky (Gallin and Verbrugge, 2019).[38] After the completion of new high-rises, more housing units are added to the local market, competing with existing rental buildings and reducing their rents. There is an expected time lag of up to 1 year, as rents cannot change immediately due to leases.[39]

It is important to note that after controlling for the timing of approval and *Borough* × *Year* dummies, residential rents close to completed new high-rises and not-yet-completed new high-rises share parallel trends prior to the completion, as shown in Figure 3. In other words, the completion of approved new high-rises does not depend on the rents growth within 500 ft.

On the contrary, Figure 4 shows the estimated rent changes for rental buildings within 500 ft of completed new high-rises when I compare those rental buildings to the rest of NYC.[40] The positive correlation between completed new high-rises and nearby residential rents is driven by the selection bias that new high-rises are located in areas with rising residential rents. According to the residential rents dataset, nominal rent growth rate is 4% for rental buildings within 500 ft of new high-rises, which is a significant 1 percentage point higher than the rest of NYC from 2003 to 2013.[41]

37 Standard errors are clustered by census tract. When standard errors are clustered by SubBorough, the magnitude of standard errors become bigger, but the rent reduction is still significant.

38 Gallin and Verbrugge (2019) point out that first search and bargaining with incomplete information generates stickiness. Second, different tenants have different valuations of apartment units. Third, landlords of rental buildings are able to exploit tenant moving costs and set rents higher than the market level.

39 In Appendix C.1, I present the regression result weighted by the number of unit for rental buildings, which is consistent with Figure 3.

40 I estimate the following equation using the whole sample of NYC rental buildings.
$$ln(Rent_{it}) = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion(\tau) I_i + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it}$$

41 When I restrict the sample to rental buildings within 1000 feet of completed new high-rises, residential rents within 500 feet (inner circle) of new high-rises still grow faster than residential rents that are 500–1000 feet away (outer ring) before the completion of new high-rises; as shown in Appendix C.2. This evidence confirms that developers choose specific locations with the fastest-growing rents to build new high-rises. Therefore,

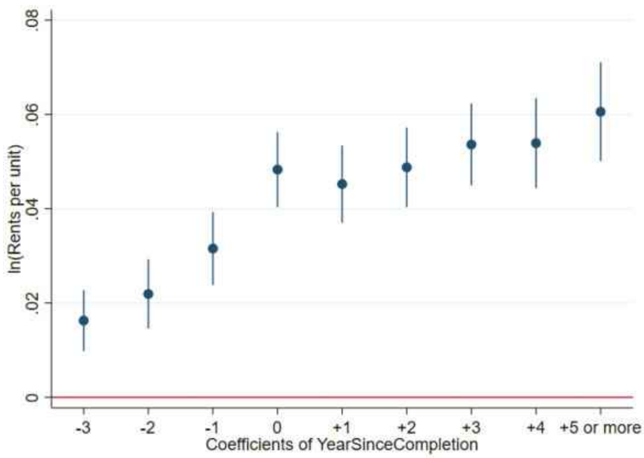

Figure 4. Compare the 500-ft buffer to the rest of NYC.
Notes: The figure shows estimated rent changes before and after the completion year using the whole sample. The number of observations is 488,328; the number of properties is 53,273; and the R^2 is 0.242. Property fixed effects and *Borough* × *Year* dummies are controlled. Standard errors are clustered by census tract.

This article uses rental incomes at the building level rather than rents at the unit level as the dependent variable. Therefore, the vacancy increase might play a role in the estimated building-level rent decrease. Appendix C.3 shows that given reasonable vacancy increase, rents at the unit level still decrease, though the magnitude is much smaller. Landlords might keep units off-market rather than decrease unit-level rents in the short run, though they are motivated to lease-up all units. Under the pressure of rising vacancy, they are most likely to decrease unit-level rents in the long run.

4.1.2. Elasticity regarding new housing units

To better interpret the magnitude of new high-rise impacts within 500-ft buffers, I estimate the residential rent elasticity with respect to new housing units. I use $YearSinceCompletion_{it}$ (τ) × $PrecentageChange_i$ as variables of interest. $PercentageChange_i$ is the percentage change in housing quantity, calculated by dividing the number of residential units in completed new high-rises within 500 ft of property *i* by the number of existing residential units within 500 ft of property *i*.[42] I also use $YearSinceApproval_{it}\kappa$ × $ProposedPrecentageChange_i$ to control for residential rent changes related to the approval. $ProposedPercentageChange_i$ is calculated by dividing the proposed number of residential units in approved new high-rises within 500 ft of property *i* by the number of existing residential units within 500 ft of property *i*.[43] It is important to control for $YearSinceApproval_{it}\kappa$ × $ProposedPrecentageChanges_i$, because developers

restricting the sample to rental buildings within 500 feet of new high-rises is needed to address the endogeneity issue.

42 I use 2002 MapPLUTO to measure the existing housing stock, and the average percentage change is 9.4%.

43 Proposed number of residential units are number of units in approved new high-rises, and the information is from Building Permit.

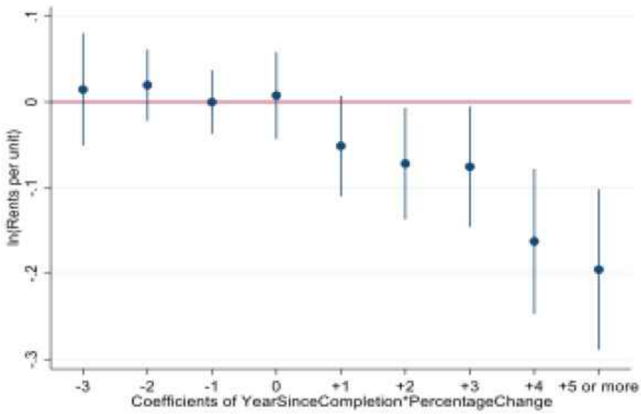

Figure 5. Rents before and after the completion year in terms of *PercentageChange.*
Notes: The figure shows regression results for Equation (2), indicating estimated rent changes before and after the completion year in terms of *PercentageChange*. Property fixed effects, *Borough* × *Year* and *YearSinceApproval* × *ProposedPercentageChange* are controlled. Standard errors are clustered by census tract. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.

propose to build more housing units (relative to existing housing stock) in areas with faster-growing rents, as shown in Appendix C.4.

$$ln(Rent_{it}) = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion_{it}(\tau) \times PercentageChange_i$$
$$+ \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \times ProposedPercentageChange_i \quad (2)$$
$$+ \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it}$$

Figure 5 shows regression results for Equation (2). One year after the new high-rise completion, residential rents in the 500-ft buffer with more new housing units (relative to the existing housing stock) decrease by more. The negative impact experience gradual increase afterward, presumably because rents are sticky.[44]

Given the persistent negative effect, I summarize the impact of new high-rise completions by combining the five *YearSinceCompletion* dummies for 1, 2, 3, 4 and 5+ years after the completion year, into one dummy *Post*, and estimate Equation (3).

$$ln(Rent_{it}) = \alpha + \beta Post_{it} \times PercentageChange_i$$
$$+ \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \times ProposedPercentageChange_i \quad (3)$$
$$+ \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it}$$

Column (1) of Table 2 shows regression results for Equation (3). For every 10% increase in the housing stock within a 500-ft buffer, residential rents decrease by 1%. Changing the trend control does not significantly affect the coefficient, as shown in other

44 Regression results controlling for *SubBorough* × *Year* and *Zipcode* × *Year* are consistent with Figure 5.

Table 2. Elasticity regarding new housing units

ln(Rents)	(1)	(2)	(3)
Post × PercentageChange	−0.0991**	−0.0862**	−0.111**
	(0.0448)	(0.0387)	(0.0402)
Constant	−2.229	−1.310	−3.083
	(14.17)	(14.24)	(14.19)
Trend control	Borough × Year	SBA × Year	Zipcode × Year
# of observations	126,113	126,113	126,098
R^2	0.279	0.326	0.338
# of properties	13,512	13,512	13,500

Notes: The table shows regression results for Equation (3). Property fixed effects and *YearSinceApproval* × *ProposedPercentageChange* are controlled. Standard errors are clustered by census tract. *ProposedPercentage Change* outliers (the cutoff is 100%) are dropped.Clustered standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

columns of Table 2.[45] Therefore, following robustness checks and heterogeneity analysis are based on Equation (3).

4.2. Robustness checks of main findings

4.2.1. Rents before and after approvals

When landlords and tenants become aware that there is an approved new high-rise nearby, they might change their rents in anticipation. To test whether this anticipatory behavior exists, I focus on coefficients of *YearSinceApproval*(κ) dummies (1, 2 and 3 years before the approval year, and 0, 1, 2, 3, 4 and 5+ years after the approval year) when I estimate Equation (1).

As shown in Figure 6, residential rents do not change significantly after the nearby new high-rise is approved. The anticipatory behavior is not observed in residential rents, supposedly because landlords do not have motivation to reduce rents before new units are added to the local housing market. This finding also implies that the construction process does not significantly decrease nearby residential rents, presumably because NYC has very strict construction hours and noise regulation.[46]

4.2.2. Outer ring

To explore what happens to rental buildings slightly further away, I estimate Equation (1) using rental buildings that are 500–1000 ft away from new high-rises that received approved Building Permits between 2000 and 2010, as illustrated in Appendix C.5. Appendix C.5 also presents coefficients of *YearSinceCompletion*. For rental buildings that are 500–1000 ft away from new high-rises, their residential rents do decrease but not significantly after the new high-rise completion. This result indicates the rents' response from an increase in market-rate housing units is very local. Most of the negative impact comes from rental buildings within 500 ft of new high-rises.

45 To address the concern that the relationship between *ln*(*Rent*) and *PercentageChange* might be nonlinear, I add in *Post* × *PercentageChange*^{2} as an independent variable. The coefficient of the squared term is not significant.

46 See http://insidesquad.com/new-york-city-construction-hours-and-noise-code/ for details.

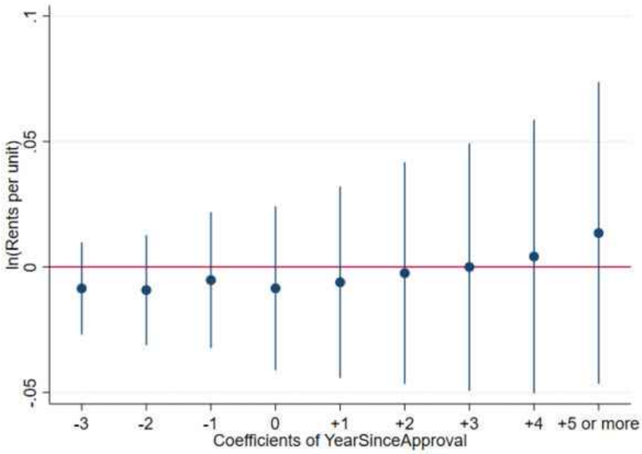

Figure 6. Rents before and after the approval year.
Notes: This figure shows regression results for Equation (1), indicating estimated rent changes before and after the approval year, controlling for the timing of completion. Property fixed effects and *Borough* × *Year* dummies are controlled. Standard errors are clustered by census tract.

4.2.3. Different new high-rise types

In the existing rental building sample, 61% have a single completed new high-rise nearby, 31% experience multiple completed new high-rises nearby, and 8% have zero new high-rise completion nearby. As shown in Column (1) of Appendix C.6, the elasticity regarding new housing units for a single completed new high-rise and multiple completed new high-rises is not significantly different.

Next, I explore different new high-rise types using rental buildings within 500 ft of a single approved new high-rise. As shown in Column (2) of Appendix C.6, the impact of new high-rises does not depend on whether the new high-rise is a condo/co-op or rental building. Though condos are for sale rather than rent, they offer rental units to the housing market. If the homeowner lives in the condo unit, she is both renter and homeowner.[47] If the homeowner or developer rents out the condo unit, it is the same as a unit in rental buildings. In addition, Column (3) shows that whether the new high-rise received a 421-a/Inclusionary Housing subsidy or no subsidy does not affect the estimated impact of new high-rises.

4.2.4. Residential rent dataset caveats

First, when I estimate Equations (1) and (2), the 2003–2013 residential rents dataset does not allow me to observe 3 years before the completion of new high-rises completed between 2003 and 2005. Similarly, the dataset does not allow me to observe 4 years after the completion of new high-rises completed between 2010 and 2013. Therefore, I further restrict the sample to rental buildings within 500 ft of new high-rises that received approved Building Permits between 2003 and 2006 and examine new high-rise completions between 2006 and 2009. Rental buildings within 500 ft of new high-rises completed during 2003–2005 and 2010–2013 are removed from the dataset. I estimate Equation (1) using 2003–2013 residential rents for

47 If the homeowner does not buy and live in a condo/co-op unit, she will rent a housing unit to live. Therefore, this condo/co-op unit absorb the demand for a rental unit.

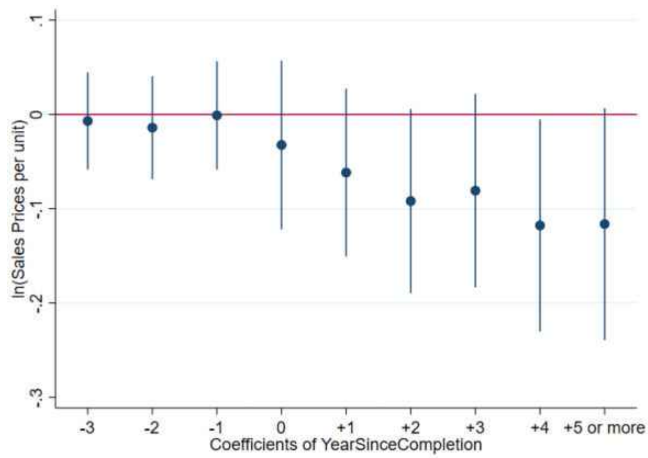

Figure 7. Sales prices before and after completions.
Notes: This figure shows regression results for Equation (4), indicating estimated sales price changes before and after the completion year. Census tract dummies, building class dummies, building age, gross square feet, the number of floors, *Borough* × *Year* dummies and *YearSince Approval* are controlled. Standard errors are clustered by census tract.

properties belonging to the restricted sample. Appendix C.7 presents the regression result, which is consistent with Figure 3 where I examine new high-rises completions between 2003 and 2013 using the unbalanced sample.

Second, as discussed in the data description section, the residential rent dataset has some limitations. In this section, I address three issues: (i) The estimated gross income for rental buildings not required to file the RPIE might be less accurate than for rental buildings that are required to file. (ii) The estimated gross income for some rental buildings is missing from the NOPVs for various years due to format changes. And (iii) the estimated gross income for rental buildings with commercial units includes commercial rents. As shown in Appendix C.8, none of those data caveats affects the finding that new high-rises decrease nearby residential rents.

4.2.5. Vacancy deregulation

One possible explanation of main findings is High-Rent Vacancy Deregulation for rent-controlled and rent-stabilized units. Rent control and rent stabilization are generally applied to rental buildings with more than five units constructed before 1974 in NYC, covering around 60% of housing units in rental buildings (Lee, 2013). Based on the Vacancy Deregulation, if a regulated housing unit is vacant and the regulated rent is above the deregulation threshold, such a unit is qualified to be deregulated and converted to a market-rate unit.[48] Therefore, owners of regulated housing units within 500 ft of completed new high-rises might be incentivized to harass their tenants or neglect housing maintenance until tenants leave (Rosenthal, 2015). This will increase the property vacancy

48 On 14 June 2019, New York State Governor Andrew Cuomo signed off on the ‘Housing Stability and Tenant Protection Act of 2019’. After that, it is virtually impossible to deregulate rent-stabilized units (Smith, E-mail interview, 27 October 2019)

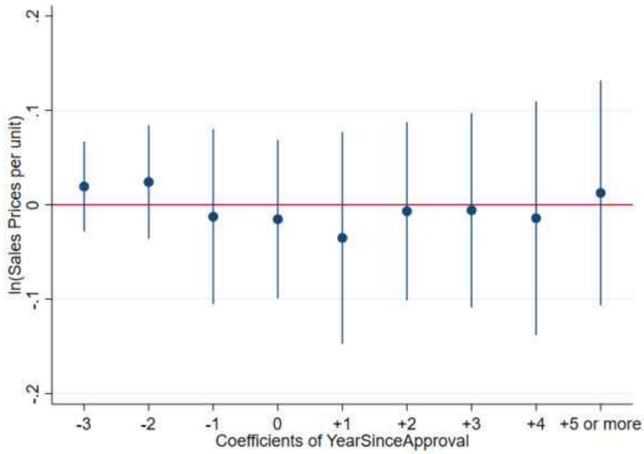

Figure 8. Sales prices before and after approvals.
Notes: This figure shows regression results for Equation (4), indicating estimated sales price changes before and after the approval year. Census tract dummies, building class dummies, building age, gross square feet, the number of floors, *Borough* × *Year* dummies and *YearSince Completion* are controlled. Standard errors are clustered by census tract.

rate and decrease the gross rental income in the short run. However, since the goal of this behavior is earning higher gross income, we should expect the residential rents to climb back after the drop rather than stay at the lower level in the following years. Therefore, the Vacancy Deregulation does not explain the finding that the completion of new high-rises causes a persistent negative impact on nearby residential rents.

It is important to note that time-variant property characteristics, such as alteration, are not controlled for in the regression. If alteration is exogenous, it is not necessary to control for it. If new high-rise completions incentivize nearby property owners to renovate their properties, their tenants live in better places paying lower rent. It is highly unlikely that new high-rise completions disincentivize nearby property owners from renovating their properties, unless they neglect maintenance to force their tenants to leave. However, as discussed above, the empirical evidence contradicts this hypothesis.

4.3. Heterogeneity analysis

4.3.1. Negative spillover effects

One possible explanation for the estimated negative impact of new high-rises is that they cause negative spillover effects. Specifically, new high-rises may change neighborhood physical features, block views or cast shadows, reducing nearby residential rents (Glaeser et al., 2005b; Hankinson, 2018; Goodman, 2019). I adopt heterogeneity analysis by neighborhood *Density*, existing rental building height and new high-rise height to address those concerns.

First, to focus on neighborhood physical features, I consider *Density*, calculated at the borough-block level by dividing the number of residential units by the total land area in

Table 3. Regression results for sales prices

ln (Sales Prices)	(1) Residential properties	(2) Residential properties	(3) Residential properties	(4) 1–5 families	(5) Rental buildings	(6) Co-ops	(7) Condos
After	−0.0586***	−0.0644***	−0.0690***	−0.00674	0.0380	−0.00733	−0.0559*
	(0.0203)	(0.0209)	(0.0197)	(0.0225)	(0.0544)	(0.0174)	(0.0306)
Constant	12.24***	12.01***	12.96***	11.02***	7.025*	15.46***	13.24***
	(0.143)	(0.157)	(0.188)	(2.638)	(3.739)	(1.169)	(0.261)
Trend Control	Borough × Year	SBA × Year	Zipcode × Year	Borough × Year	Borough × Year	Borough × Year	Borough × Year
# of observations	65,380	65,380	65,380	9,347	4,023	12,920	39,090
R^2	0.325	0.334	0.355	0.416	0.193	0.328	0.167
# of census tracts	575	575	575	475	447	216	283

Notes: This table shows regression results for Equation (5). Census tract dummies, building class dummies, building age, gross square feet and the number of floors are controlled. Standard errors are clustered by census tract.Clustered standard errors in parentheses.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

square feet (Forsyth, 2003).[49] Households in low-density neighborhoods are more sensitive to the changes in neighborhood physical features brought by new high-rises, as they are accustomed to low-density neighborhoods. If these changes reduce nearby residential rents, the negative impact is expected to be more prominent in lower-density neighborhoods. As shown in the left two columns of Appendix C.9, the negative impact of new high-rises does not vary by *Density*. Therefore, it is highly unlikely that the negative impact of new high-rises is caused by changes in neighborhood physical features.

Second, I address the concern that new high-rises decrease nearby residential rents because they eliminate views from existing apartments. NYC views are mostly associated with skylines, prominent buildings, bridges, parks, Hudson and East Rivers, etc. (Toy, 2007; Bonislawski, 2017). Mid-rise and low-rise existing rental buildings are highly unlikely to have those views that could be blocked by new high-rises. Therefore, I estimate Equation (3) using mid-rise and low-rise existing rental buildings. As shown in Columns (3) and (4) of Appendix C.9, the coefficients of *Post* × *PercentageChange* are significantly negative, and blocked views do not explain this negative impact for mid-rise and low-rise rental buildings.

Third, I explore the heterogeneity by new high-rise heights, because taller new high-rises are more likely to cast shadows on existing rental buildings. Using rental buildings within 500 ft of a single approved new high-rise, I show that the negative impact of new high-rises does not depend on their heights, as shown in the right two columns of Appendix C.9. Therefore, it is highly implausible that shadows explain the negative impact of new high-rises.

49 I use 2002 MapPLUTO to calculate *Density*.

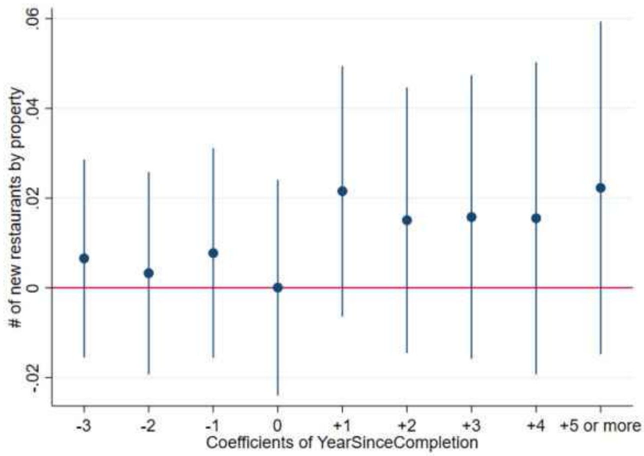

Figure 9. New restaurants regression results.
Notes: This figure shows regression results for Equation (6), indicating the estimated count of new restaurant before and after the completion year. The number of observations is 69,938, and the number of properties is 6358. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* are controlled. Standard errors are clustered by census tract.

Table 4. Regression results for restaurants

ln(Rents)	(1)	(2)	(3)
Post	0.0154*	0.0159*	0.0201**
	(0.00878)	(0.00843)	(0.00969)
Constant	0.104	0.112*	0.119*
	(0.0657)	(0.0693)	(0.0731)
Trend control	Borough × Year	SBA × Year	Zipcode × Year
# of observations	69,938	69,938	69,938
R^2	0.013	0.017	0.028
# of properties	6358	6358	6358

Notes: This table shows regression results for Equation (7). Property fixed effects and *YearSinceApproval* are controlled. Standard errors are clustered by census tract.Clustered standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

4.3.2. Compare high-income and gentrifying neighborhoods

I explore how the impact of new high-rises varies in high-income and gentrifying neighborhood.[50] As shown in the left two columns of Appendix C.10, the negative impact of new high-rises on nearby residential buildings is significantly bigger in gentrifying neighborhoods, compared to established high-income neighborhoods. One possible explanation is established neighborhoods are more integrated with each other's due to the convenience of access to work and consumption. Therefore, they have more

50 As discussed in Section 3, Furman Center (2016b) divides NYC neighborhoods into three categories—high-income, gentrifying and non-gentrifying based on their 1990 median income and rents growth during 1990–2014. Only 6.54 percent of census tracts in the sample are non-gentrifying.

substitutes, in turn, more elastic demand and smaller responses to shocks (Piazzesi et al., 2019).[51] On the contrary, gentrifying neighborhoods are mostly unique culturally and less integrated with each other's in terms of transportation. Therefore, fewer substitutes lead to bigger responses to supply shocks. Right two columns show in Manhattan, NYC's most established borough, new high-rises do not significantly decrease nearby rents, controlling for the borough trend.

4.3.3. By high-end, mid-range and low-end existing rental buildings

New high-rises are mostly luxury buildings. Rents for new high-rises are 60% higher than the average rents in their census tracts, and 29% higher than the average of the upper quartile in their census tracts; see Appendix C.11 for details. To test whether those luxury buildings can meaningfully decrease rents for low-end and mid-range rental buildings, I consider existing rental buildings' percentiles in their SubBoroughs based on their 2003 annual rents per unit. In this article, a low-end rental building is categorized as an existing rental building with relatively low rents per unit in its SubBorough in the beginning of the research period.

As shown in Appendix C.12, within SubBorough, new high-rises significantly decrease rents for mid-range and high-end rental buildings. High-end rental buildings are closer substitutes to new high-rises. As for mid-range rental buildings, it is presumably because of migration chain that as high-income neighbors move into new high-rises, leaving behind older housing stock for middle-class households and increasing mid-range housing supply indirectly. However, the rent decrease for low-end rental buildings is not significant in the medium term.[52]

5. The impact on sales prices

Following the research design for rents analysis, I restrict the sample to sales transactions for residential properties (condo/co-op units) within 500 ft of new high-rises that received approved Building Permits between 2000 and 2010. Then I remove sales transactions for residential properties completed after 2002, and residential properties belonging to a census tract with no residential property within 500 ft of a new high-rise completed by the end of 2013. I estimate Equation (4):

$$\begin{aligned} ln(Price_{it}) = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion_{it}(\tau) I_i + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \\ + \delta Borough_i \times Year_t + \sigma I_i + \theta X_i + \varepsilon_{it} \end{aligned} \tag{4}$$

$ln(Price_{it})$ is the natural logarithm of sales price per unit for property (condo/co-op unit) i and year t. I_i is 1 if the property (condo/co-op unit) i is within 500 ft of new high-rises completed by 2013. Since the sales transaction dataset is not panel data, property fixed effects cannot be controlled for as they are added in rents analysis. I add in X_i controlling census tract dummies, building class dummies, building age, gross square feet and the number of floors for property/

51 For example, renters who are interested in Upper West are highly likely to be interested in Upper East and Chelsea as well. Housing units in those neighborhoods could be substitutes.

52 Comparing the impact of new high-rises on rent-controlled/rent-stabilized units and market-rate units is important but not applicable using this dataset. Residential rents at the property level do not allow me to distinguish rents for rent-controlled/rent-stabilized units and market-rate units within one property. Theoretically, the negative impact of new high-rises should be smaller for rent-controlled/rent-stabilized units than for market-rate units.

unit *i*. Definitions of *YearSinceCompletion*, *YearSinceApproval* and *Borough* × *Year* are the same as their counterparts in rent estimates.

Figure 7 present the sales prices before and after completions. The sales prices gradually decline right after nearby new high-rises complete.[53] Two years after the completion, the negative impact becomes significant, and persists at this lower level in the following years.

Figure 8 presents the sales prices before and after approvals. Sales prices do not experience significant changes when new high-rises receive approved Building Permits. The fact that sales prices do not change until nearby new high-rises complete confirms the difficulty in predicting the completion timing. Otherwise, sales prices are forward-looking, and so should reflect anticipated price reduction before the completion. Because the exact timing of completions is not clear, property owners do not have motivations to reduce sales prices in anticipation.[54]

To summarize the impact of new high-rises on sales prices and explore the heterogeneity by residential property type, I combine the four *YearSinceCompletion* dummies for 2, 3, 4 and 5+ years after the completion year, into one dummy *After*, and estimate Equation (5) by property type:

$$ln(Price_{it}) = \alpha + \beta After_{it} I_i + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \\ + \delta Borough_i \times Year_t + \sigma I_i + \theta X_i + \varepsilon_{it} \tag{5}$$

Regression results for Equation (5) are shown in Column (1) of Table 3. Two years after completion, nearby residential property sales prices decrease by 5.86%. Columns (2) and (3) show that changing the trend control to *SubBourough* ×*Year* and *Zipcode* × *Year* does not affect regression results. Appendix D.1 shows the regression results using repeat sales, which are consistent with Table 3.

Columns (4)–(7) in Table 3 show heterogeneity analysis by property type—only condos experience price reductions. Among 916 new high-rises completed between 2003 and 2013, 70% are condos, 29% are rental buildings and only 1% are co-ops. Because new high-rises barely increase the supply of 1–5 family homes and co-ops, more housing units in new high-rises do not significantly affect sales prices for 1–5 family homes and co-ops.[55] As for rental buildings, the number of transactions (4023) is too small to estimate the impact accurately, as there are 532 independent variables in the regression. This finding that negative price effects are stronger for closer substitutes confirms that negative spillover effects do not explain the price reduction. Otherwise, condos would not be the only type of residential properties negatively affected by new high-rises.[56]

To better interpret the magnitude of new condo impacts within 500-ft buffers on condo sales prices. I estimate the condo sales price elasticity with respect to new condo units in

53 The gradual decline could be explained by loss aversion, that the homeowner sets a higher asking price and spends a longer time on the market rather than realizing the financial loss when the current housing price is lower than what she paid (Genesove and Mayer, 2001). Alternatively, the homeowner overestimates the property value when housing prices fall, and adjust her estimation slowly (Chan et al., 2016).

54 Some new condos get sold before the completion, but pre-sale condos are not substitutes for existing condos.

55 For condo sales transactions within 500 feet of new rental buildings, the completion of new rental buildings do not significantly decrease their sales prices.

56 Since only 283 out of 578 census tracts have condo sales transactions, I restrict sales transactions to those 283 census tracts and re-estimate Equation (5). As shown in Appendix D.2, after I restrict the samples, the results are consistent with Table 3.

Appendix D.3. For every 10% increase in condo stocks, condo sales prices decrease by 0.9%, which is not significantly different from the estimated rent elasticity.

6. The impact on restaurant openings

To address the hypothesis that new high-rises attract new amenities, I analyze the impact of new high-rise completions on restaurant openings. The empirical evidence that new high-rises decrease residential rents and sales prices does not necessarily indicate they do not increase consumption amenities. In this article, restaurants include full-service restaurants, cafes and coffee shops, whose NAICS codes are 7225.

Following the research design, I restrict the sample to new restaurants within 500 ft of new high-rises that received approved Building Permits between 2000 and 2010, and remove new restaurants belonging to census tracts without any new restaurant within 500 ft of new high-rises completed by the end of 2013. From 2003 to 2013, there are 13,269 new restaurants in the sample. I then estimate Equations (6) and (7):

$$\begin{aligned} Openings_{it} = \alpha + \textstyle\sum_{\tau \in T} \beta_{\tau} YearSinceCompletion(\tau) \\ + \textstyle\sum_{\kappa \in K} \gamma_{\kappa} YearSinceApproval_{it}(\kappa) + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it} \end{aligned} \tag{6}$$

$$Openings_{it} = \alpha + \beta Post_{it} + \sum_{\kappa \in K} \gamma_{\kappa} YearSinceApproval_{it}(\kappa) + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it} \tag{7}$$

$Openings_{it}$ is the count of new restaurants in property i and year t. I use a property as a unit to count the number of new restaurants. Definitions of *YearSinceCompletion*, *YearSinceApproval*, *Post* and *Borough* × *Year* are the same as their counterparts in the previous analysis.

Figure 9 presents regression results for Equation (6) and Table 4 present the results for Equation (7). One year after the completion of new high-rises, 0.016 more restaurants open per property every year on average, accounting for a 9% increase. In other words, a new high-rise brings in or attracts 0.11 new restaurants within 500 ft.[57] Columns (2)–(3) show that after changing the trend control, the results are consistent.

I present that new high-rises do not affect the probability of closures for existing restaurants using a hazard model in Appendix E.1. Appendix E.2 shows that the completion of new high-rises does not significantly change the number of jobs in accommodations and food services by census block, perhaps due to data limitation. LEHD Origin-Destination Employment Statistics (LODES) only reports jobs by two-digit NAICS code at the census block level. I also analyze the impact on groceries. Some Trader Joe's and Whole Foods open right after the new high-rise completion, though the number of openings or closures of groceries does not change significantly.[58]

New high-rises and their tenants attract new restaurants, which increase neighborhoods' attractiveness to young college graduates and potentially drive up rents and sales prices

57 I calculate 0.11 as the treatment effect (0.016) × Number of properties (6358)/Number of completed new high-rises (916).

58 In addition, new high-rises do not change the number of Coin-Operated Laundries and Drycleaners significantly.

(Couture and Handbury, 2017; Meltzer and Capperis, 2017; Glaeser et al., 2018).[59] However, residential rents and residential property sales prices still fall on net, presumably because the supply effect dominates the amenity effect.

7. Conclusion

I restrict the sample to residential properties within 500 ft of approved new high-rises and use the event study to estimate the impact of new high-rise completions conditional upon the timing of approval. I find that new high-rises cause nearby high-end and mid-range rental buildings' rents, as well as condo sales prices, to decrease. However, supply skeptics are right that new high-rises and their tenants attract amenities, and in particular new restaurants. Nonetheless, the supply effect is larger, causing nearby rents and sales prices decline on net. These findings suggest that new market-rate development reduces (or slows the growth of) residential rents and residential property sales prices in the immediately surrounding area, while increasing neighborhood consumption amenities. Opposing such development may exacerbate the housing affordability crisis and increase housing cost burdens for local renters.

One caveat to these findings is the sample does not include many observations from low-income and nongentrifying neighborhoods, because developers are not observed to build new high-rises in these areas. In addition, as for external validity, the magnitude of negative impacts could be bigger in other cities, due to their relatively low density. This article does not find new high-rises generate negative spillover effects on nearby rents in NYC, presumably because New Yorkers are used to high density. For residents in low-density areas, new high-rises might significantly negatively affect neighborhood features and views. Addressing these issues could be the direction for future research.

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Reference

Asquith, B. J., Mast, E., Reed, D. (2021). Local effects of large new apartment buildings in low-income areas. *The Review of Economics and Statistics*, 1–46.

59 If new restaurants generate negative spillover effects, condos will not be the only type of residential properties negatively affected by new high-rises. Also, according to the literature, restaurant openings are highly unlikely to decrease nearby residential rents and sales prices.

Aguirre, A., Benke, D., Neugebauer, M., Santiago, R. (2016) CityView: for East New York's Housing Crunch, supply is not the solution. *CityLimits*. 18 February, 2016.
Anenberg, E., Kung, E. (2020) Can more housing supply solve the affordability crisis? Evidence from a neighborhood choice model. *Regional Science and Urban Economics*, 80: 103363.
Anenberg, E., Kung, E. (2014) Estimates of the size and source of price declines due to nearby foreclosures. *American Economic Review*, 104: 2527–51.
Atta-Mensah, A. (2017) CityViews: major community group rejects de Blasio's East Harlem Rezoning. *CityLimits*. 23 August, 2017.
Baum-Snow, N., Marion, J. (2009) The effects of low income housing tax credit developments on neighborhoods. *Journal of Public Economics*, 93: 654–666.
Been, V., Ellen, I. G., O′Regan, K. (2019) Supply skepticism: housing supply and affordability. *Housing Policy Debate*, 29: 25–40.
Bonislawski, A. (2017) These homes have the best views in New York City. *New York Post.*
Boustan, L. P., Margo, R. A., Miller, M. M., Reeves, J. M., Steil, J. P. (2019) Does condominium development lead to gentrification? NBER Working Papers No. 26170.
Bunten, D. (2017) Is the rent too high? Aggregate implications of local land-use regulation.
Chan, S., Dastrup, S., Ellen, I.G. (2016) Do homeowners mark to market? A comparison of self-reported and estimated market home values during the housing boom and bust. *Real Estate Economics*, 44: 627–657.
Campbell, J. Y., Giglio, S., Pathak, P. (2011) Forced sales and house prices. *American Economic Review*, 101: 2108–2131.
Chew, A. (2018) Here is what we actually know about new development and displacement. *Shelterforce*.
Couture, V., Handbury, J. (2017) Urban revival in America, 2000 to 2010. No. w24084. National Bureau of Economic Research.
Diamond, R., McQuade, T. (2019). Who wants affordable housing in their backyard? An equilibrium analysis of low-income property development. *Journal of Political Economy*, 127: 1063–1117.
DiPasquale, D. (1999) Why don't we know more about housing supply? *The Journal of Real Estate Finance and Economics*, 18: 9–23.
Ellen, I. G., Schwartz, A. E., Voicu, I., Schill, M. H. (2007) Does federally subsidized rental housing depress neighborhood property values? *The Journal of the Association for Public Policy Analysis and Management*, 26: 257–280.
Florida, R. (2019) How housing supply became the most controversial issue in urbanism. *Citylab.*
Freemark, Y. (2020) Upzoning Chicago: impacts of a zoning reform on property values and housing construction. *Urban Affairs Review*, 56: 758–789.
Furman Center. (2010) New York City multi-family rental housing and the market downturn.
Furman Center. (2016a) Mapping affordable housing supported by the 421-a tax exemption program.
Furman Center. (2016b) Focus on Gentrification.
Forsyth, A. (2003) Measuring density: working definitions for residential density and building intensity. *Design Brief*, 9: 2–8.
Gallin, J., Verbrugge, R. J. (2019) A theory of sticky rents: search and bargaining with incomplete information. *Journal of Economic Theory*, 183: 478–519.
Ganong, P., Shoag, D. (2017) Why has regional income convergence in the US declined? *Journal of Urban Economics*, 102: 76–90.
Genesove, D., Mayer, C. (2001) Loss aversion and seller behavior: evidence from the housing market. *The Quarterly Journal of Economics*, 116: 1233–1260.
Gerardi, K., et al. (2015) Foreclosure externalities: new evidence. *Journal of Urban Economics*, 87: 42–56.
Glaeser, E. L., Kim, H., Luca, M. (2018) Nowcasting gentrification: using yelp data to quantify neighborhood change. *AEA Papers and Proceedings* vol. 108, pp. 77–82.
Glaeser, E. L., Gyourko, J., Saks, R. E. (2005a) Why have housing prices gone up? *American Economic Review*, 95: 329–333.
Glaeser, E. L., Gyourko, J., Saks, R. (2005b) Why is Manhattan so expensive? Regulation and the rise in housing prices. *The Journal of Law and Economics*, 48: 331–369.
Glaeser, E., Gyourko, J. (2018) The economic implications of housing supply. *Journal of Economic Perspectives*, 32: 3–30.

Glaeser, E. L., Ward, B. A. (2009) The causes and consequences of land use regulation: evidence from Greater Boston. *Journal of Urban Economics* 65: 265–278.

Goodman, J. D. (2019) How much is a view worth in Manhattan? Try 11 million. *The New York Times*.

Green, R. K., Malpezzi, S., Mayo, S. K. (2005) Metropolitan-specific estimates of the price elasticity of supply of housing, and their sources. *American Economic Review*, 95: 334–339.

Gyourko, J., Molloy, R. (2015) Regulation and housing supply. In G. Duranton, J. V. Henderson, W. C. Strange (eds) *Handbook of Regional and Urban Economics*, Vol. 5. pp. 1289–1337. Elsevier.

Gyourko, J., Saiz, A. (2006) Construction costs and the supply of housing structure. *Journal of Regional Science*, 46: 661–680.

Hall, Jr., J. R. (2005) *Manufactured Home Fires*. Quincy, MA: National Fire Protection Association.

Hankinson, M. (2018) When do renters behave like homeowners? High rent, price anxiety, and NIMBYism. *American Political Science Review*, 112: 473–493.

Hartley, D. (2014) The effect of foreclosures on nearby housing prices: supply or dis-amenity? *Regional Science and Urban Economics*, 49: 108–117.

Hsieh, C.-T., Moretti, E. (2019) Housing constraints and spatial misallocation. *American Economic Journal: Macroeconomics*, 11: 1–39.

Hughes, C. J. (2016) New York's stalled residential construction. *The New York Times*. 5 August, 2016.

Lee, M. W. (2013) Housing New York City 2011.

Lens, M. C., Monkkonen, P. (2016) Do strict land use regulations make metropolitan areas more segregated by income? *Journal of the American Planning Association*, 82: 6–21.

Manville, M., Lens, M., Monkkonen, P. (2020). Zoning and affordability: A reply to Rodríguez-Pose and Storper. *Urban Studies*, 0042098020910330.

Mast, E. (2018) The effect of new luxury housing on regional housing affordability. Working paper.

Mayer, C. J., Somerville, C. T. (2000) Residential construction: using the urban growth model to estimate housing supply. *Journal of Urban Economics*, 48: 85–109.

Meltzer, R., Capperis, S. (2017) Neighbourhood differences in retail turnover: evidence from New York City. *Urban Studies*, 54: 3022–3057.

Mian, A., Sufi, A., Trebbi, F. (2015) Foreclosures, house prices, and the real economy. *The Journal of Finance*, 70: 2587–2634.

Monkkonen, P., and UC Center Sacramento. (2016) Understanding and challenging opposition to housing construction in California's urban areas. Housing, Land Use and Development Lectureship and White Paper.

Oliva, S. (2006) *The effects of waterfront development on housing prices: the case of Eastern Baltimore*. University of Maryland, College Park.

Pearsall, H. (2010) From brown to green? Assessing social vulnerability to environmental gentrification in New York City. *Environment and Planning C: Government and Policy*, 28: 872–886.

Piazzesi, M., Schneider, M., Stroebel, J. (2019) Segmented housing search. *American Economic*.

Rodríguez-Pose, A., Storper, M. (2019) Housing, urban growth and inequalities: the limits to deregulation and upzoning in reducing economic and spatial inequality. *Urban Studies*, 57, 223–248.

Rosenthal, S. S. (2014) Are private markets and filtering a viable source of low-income housing? Estimates from a 'repeat income' model. *American Economic Review*, 104: 687–706.

Rosenthal, L. (2015) Why we must end vacancy decontrol to save rent-regulated housing. *Citylimits*. 4 May, 2015.

Satow, J. (2014) Living in the mix. *The New York Times*. 31 August, 2014.

Singh, D. (2019) Do property tax incentives for new construction spur gentrification? Evidence from New York City. In *112th Annual Conference on Taxation*. NTA.
Schuetz, J., Been, V., Ellen, G. I. (2008) Neighborhood effects of concentrated mortgage foreclosures. *Journal of Housing Economics*, 17: 306–319.
Solomont, E. B., Bockmann, R. (2017) The dirt gathers rust: All over NYC, projects are in limbo. *The Real Deal*. 10 April, 2017.
Toy, V. S. (2007) Views you won't lose. *The New York Times*.
Turner, M. A., Haughwout, A., van der Klaauw, W. (2014) Land use regulation and welfare. *Econometrica*, 82: 1341–1403.
Zahirovich-Herbert, V., Gibler, K. M. (2014) The effect of new residential construction on housing prices. *Journal of Housing Economics*, 26: 1–18.

Appendix

A. Data Sources

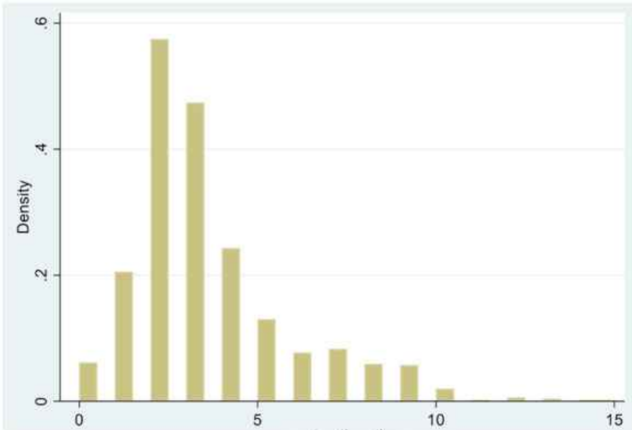
A.1. Completion percentages by year

Using the 2000–2010 NYC Building Permit dataset and 2000–2017 NYC Certificate of Occupancy dataset, this table shows completion percentages by the approval year.

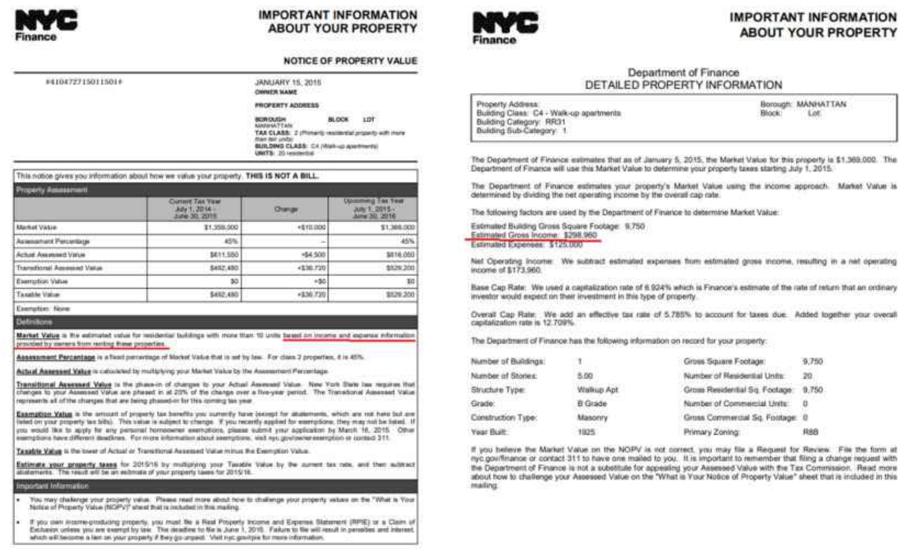
Approval Year	# of New High-rise Buildings	completed before 2013	completed between 2014 and 2017	have not completed by 2017
2000	18	16	0	2
(%)		88.89%	0.00%	11.11%
2001	51	44	2	5
(%)		86.27%	3.92%	9.80%
2002	69	65	2	2
(%)		94.20%	2.90%	2.90%
2003	95	83	4	8
(%)		87.37%	4.21%	8.42%
2004	121	107	2	12
(%)		88.43%	1.65%	9.92%
2005	163	144	4	15
(%)		88.34%	2.45%	9.20%
2006	193	174	8	11
(%)		90.16%	4.15%	5.70%
2007	177	134	28	15
(%)		75.71%	15.82%	8.47%
2008	205	125	70	10
(%)		60.98%	34.15%	4.88%
2009	33	16	14	3
(%)		48.48%	42.42%	9.09%
2010	16	8	4	4
(%)		50.00%	25.00%	25.00%
Total	1,141	916	138	87
		80.28%	12.09%	7.62%

A.2. Construction length

Construction length is calculated as the completion year minus the approval year. The completion year is from 2000 to 2017 Certificate of Occupancy, and the approval year is from 2000 to 2010 Building Permit.



A.3. *NOPV*



NYC Finance

IMPORTANT INFORMATION ABOUT YOUR PROPERTY

NOTICE OF PROPERTY VALUE

#4104727150115014

JANUARY 15, 2015
OWNER NAME
PROPERTY ADDRESS
BOROUGH BLOCK LOT
MANHATTAN
TAX CLASS: 2 (Primarily residential property with more than ten units)
BUILDING CLASS: C4 (Walk-up apartments)
UNITS: 20 residential

This notice gives you information about how we value your property. **THIS IS NOT A BILL.**

Property Assessment

	Current Tax Year July 1, 2014 - June 30, 2015	Change	Upcoming Tax Year July 1, 2015 - June 30, 2016
Market Value	$1,359,000	+$10,000	$1,369,000
Assessment Percentage	45%	–	45%
Actual Assessed Value	$611,550	+$4,500	$616,050
Transitional Assessed Value	$492,480	+$36,720	$529,200
Exemption Value	$0	+$0	$0
Taxable Value	$492,480	+$36,720	$529,200

Exemption: None

Definitions

Market Value is the estimated value for residential buildings with more than 10 units based on income and expense information provided by owners from renting these properties.

Assessment Percentage is a fixed percentage of Market Value that is set by law. For class 2 properties, it is 45%.

Actual Assessed Value is calculated by multiplying your Market Value by the Assessment Percentage.

Transitional Assessed Value is the phase-in of changes to your Actual Assessed Value. New York State law requires that changes to your Assessed Value are phased in at 20% of the change over a five-year period. The Transitional Assessed Value represents all of the changes that are being phased-in for this coming tax year.

Exemption Value is the amount of property tax benefits you currently have (except for abatements, which are not here but are listed on your property tax bills). This value is subject to change. If you recently applied for exemptions, they may not be listed. If you would like to apply for any personal homeowner exemptions, please submit your application by March 16, 2015. Other exemptions have different deadlines. For more information about exemptions, visit nyc.gov/ownerexemption or contact 311.

Taxable Value is the lower of Actual or Transitional Assessed Value minus the Exemption Value.

Estimate your property taxes for 2015/16 by multiplying your Taxable Value by the current tax rate, and then subtract abatements. The result will be an estimate of your property taxes for 2015/16.

Important Information

- You may challenge your property value. Please read more about how to challenge your property values on the "What is Your Notice of Property Value (NOPV)" sheet that is included in this mailing.
- If you own income-producing property, you must file a Real Property Income and Expense Statement (RPIE) or a Claim of Exclusion unless you are exempt by law. The deadline to file is June 1, 2015. Failure to file will result in penalties and interest, which will become a lien on your property if they go unpaid. Visit nyc.gov/rpie for more information.

NYC Finance

IMPORTANT INFORMATION ABOUT YOUR PROPERTY

Department of Finance
DETAILED PROPERTY INFORMATION

Property Address:
Building Class: C4 - Walk-up apartments
Building Category: RR31
Building Sub-Category: 1
Borough: MANHATTAN
Block: Lot:

The Department of Finance estimates that as of January 5, 2015, the Market Value for this property is $1,369,000. The Department of Finance will use this Market Value to determine your property taxes starting July 1, 2015.

The Department of Finance estimates your property's Market Value using the income approach. Market Value is determined by dividing the net operating income by the overall cap rate.

The following factors are used by the Department of Finance to determine Market Value:

Estimated Building Gross Square Footage: 9,750
Estimated Gross Income: $298,960
Estimated Expenses: $125,000

Net Operating Income: We subtract estimated expenses from estimated gross income, resulting in a net operating income of $173,960.

Base Cap Rate: We used a capitalization rate of 6.924% which is Finance's estimate of the rate of return that an ordinary investor would expect on their investment in this type of property.

Overall Cap Rate: We add an effective tax rate of 5.785% to account for taxes due. Added together your overall capitalization rate is 12.709%.

The Department of Finance has the following information on record for your property:

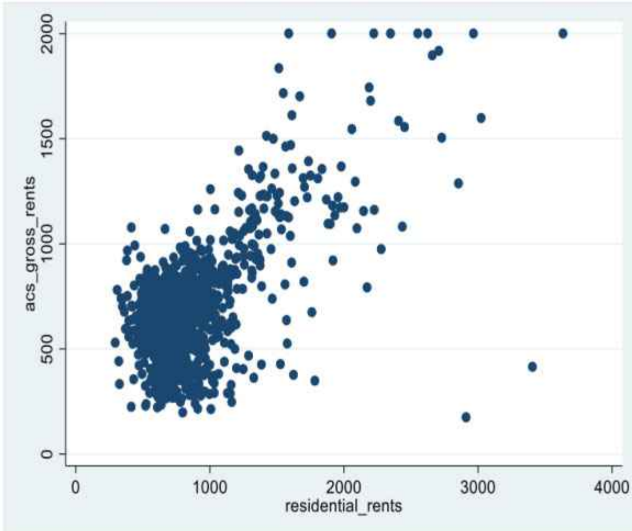
Number of Buildings:	1	Gross Square Footage:	9,750
Number of Stories:	5.00	Number of Residential Units:	20
Structure Type:	Walkup Apt	Gross Residential Sq. Footage:	9,750
Grade:	B Grade	Number of Commercial Units:	0
Construction Type:	Masonry	Gross Commercial Sq. Footage:	0
Year Built:	1925	Primary Zoning:	R8B

If you believe the Market Value on the NOPV is not correct, you may file a Request for Review. File the form at nyc.gov/finance or contact 311 to have one mailed to you. It is important to remember that filing a change request with the Department of Finance is not a substitute for appealing your Assessed Value with the Tax Commission. Read more about how to challenge your Assessed Value on the "What is Your Notice of Property Value" sheet that is included in this mailing.

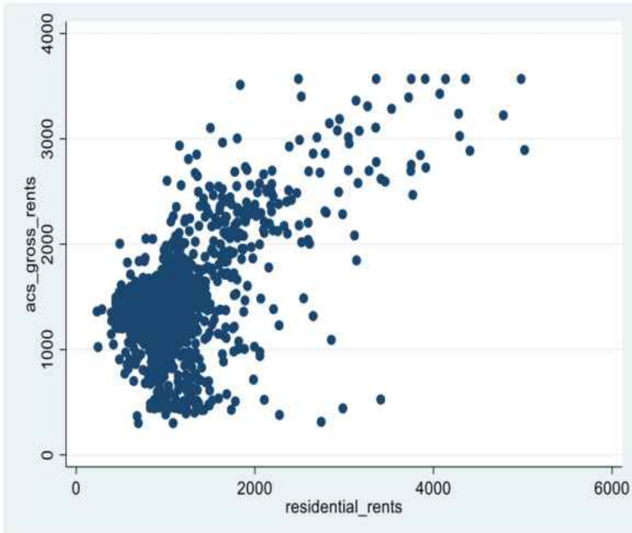
Notes: Address and owner information is erased due to privacy reasons. The NOPV is mailed in January by the DOF, informing the property owner of the property assessment for the coming tax year.

A.4. Comparison with ACS median rents

I first compare 2003 median residential rents (per month) from NOPVs at the census tract level with median gross rents from the ACS Decennial Census of 2000. The following figure shows the scatter plot; the correlation is 0.62.



Then, I compare 2013 median residential rents (per month) from NOPVs at the census tract level with median gross rents from ACS 2013–2017 5-year estimates. The following figure shows the scatter plot; the correlation is 0.63.



B. Research design

B.1. Predicting new high-rise completion and construction length

The table shows that new high-rises features hardly predict completion and construction length. Condos/co-ops take less time to complete because they can be sold before completion and their developers bear fewer financial burdens. In addition, approval-year dummies play a critical role in predicting whether a new high-rise was completed before 2013 because new high-rises approved later have less time to be completed before 2013.

	(1) not completed by 2013	(2) not completed by 2013	(3) construction length	(4) construction length
# of floors	0.00337***	0.00281**	-0.0144**	-0.0144**
	(0.00130)	(0.00125)	(0.00601)	(0.00606)
Condo/Co-op	-0.196***	-0.155***	-0.325***	-0.353***
	(0.0245)	(0.0243)	(0.114)	(0.117)
Subway	-0.00963	-0.0262	-0.129	-0.172
	(0.0328)	(0.0319)	(0.148)	(0.150)
Distance	0.00277	0.00595	-0.000206	-0.00252
	(0.00472)	(0.00459)	(0.0212)	(0.0215)
Manhattan	0.0343	0.0718	-0.693**	-0.713**
	(0.0633)	(0.0616)	(0.286)	(0.290)
Brooklyn	0.0547	0.104*	0.187	0.178
	(0.0581)	(0.0565)	(0.262)	(0.266)
Queens	0.0448	0.0483	-0.227	-0.239
	(0.0606)	(0.0588)	(0.272)	(0.275)
Registered architects	-0.0113	0.00962	0.256	0.215
	(0.0400)	(0.0388)	(0.180)	(0.182)
Corporation	0.0785	0.0398	0.122	0.156
	(0.0708)	(0.0685)	(0.298)	(0.301)
Individual	0.0662	0.0305	0.404	0.431
	(0.0752)	(0.0727)	(0.318)	(0.320)
Partnership	0.0820	0.0281	0.0824	0.110
	(0.0713)	(0.0691)	(0.300)	(0.303)
Approved in 2001		0.0581		0.931**
		(0.103)		(0.455)
Approved in 2002		-0.0365		0.829*
		(0.0992)		(0.435)
Approved in 2003		0.0383		0.906**
		(0.0962)		(0.425)
Approved in 2004		0.0573		0.946**
		(0.0949)		(0.419)
Approved in 2005		0.0421		0.954**
		(0.0931)		(0.412)
Approved in 2006		0.0182		0.862**
		(0.0923)		(0.407)
Approved in 2007		0.158*		0.976**
		(0.0928)		(0.414)
Approved in 2008		0.271***		0.916**
		(0.0920)		(0.413)
Approved in 2009		0.425***		0.826
		(0.110)		(0.552)
Approved in 2010		0.393***		0.171
		(0.128)		(0.677)
Constant	0.170	0.0299	3.287***	2.482***
	(0.108)	(0.134)	(0.476)	(0.612)
Observations	1,141	1,141	917	917
R-squared	0.061	0.140	0.103	0.111

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Subway is a dummy variable indicating whether the new high-rise is within a 1/2 mile of subway stations; *Distance* measures the distance to the Empire State Building in miles; *Registeredarchitects* is a dummy variable indicating whether the Building Permit applicant is a registered architect or a professional engineer; *Corporation*, *Individual* and *Partnership* are dummy variables indicating the developer's company structure.

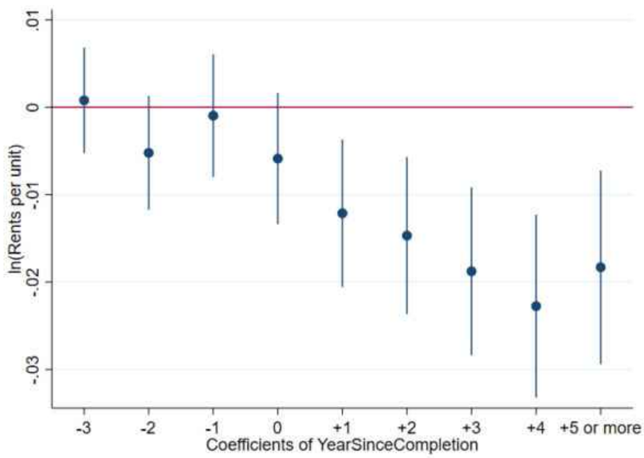
B.2. Neighborhood characteristics comparison

The census tract characteristics are from 2000 Decennial Census and 2013–2017 American Community Survey.

C. The impact on residential rents

C.1. Weighted least squares regression results

The following figure shows the coefficients for *YearSinceCompletion* when I estimate Equation (1) weighted by the number of units for rental buildings. The result is consistent with the ordinary least squares regression result.

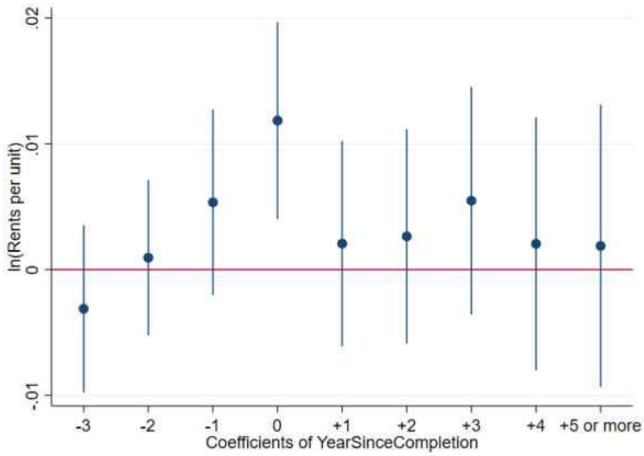


Notes: The figure shows regression results for Equation (1) weighted by the number of units for rental buildings. The number of observations is 125,727; the number of properties is 13,459; and the R-square is 0.34. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* are controlled. The number of unit outliers (the cutoff is 200) are dropped.

C.2. Compare the inner circle to the outer ring

I estimate the following equation using rental buildings within 1000 ft of completed new high-rises, except for rental buildings completed after 2002. I_i is 1 if the existing rental building i is within 500 ft of new high-rises completed by 2013. The figure shows the regression result and confirms that residential rents in the inner circle (500 ft) grow faster than residential rents in the outer ring (500–1000 ft) before the completion of new high-rises.

$$ln(Rent_{it}) = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion(\tau) I_i + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it}$$



Notes: The figure shows estimated rent changes before and after the completion year using residential properties within 1000 ft of completed new high-rises. The number of observations is 218,121; the number of properties is 23,107; and the R^2 is 0.281. Property fixed effects and *Borough* × *Year* dummies are controlled.

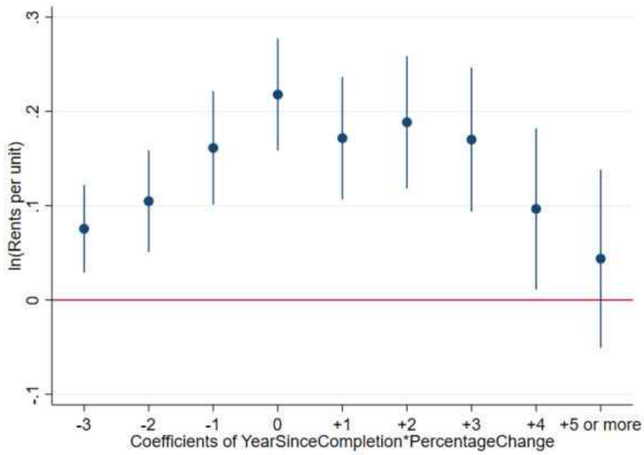
C.3. Exercise regarding the vacancy increase

In this exercise, I assume the vacancy rate before the completion of nearby new high-rises is 3%. According to NYC Housing Vacancy Survey, the average vacancy rate from 2003 to 2013 was 3%. Based on the estimated coefficients in Figure 3, rents at the building level decrease 2.5% after the completion of nearby new high-rises. As shown in the following table, when vacancy rates increase to 5%, which was the historical high level for NYC vacancy rates, rents at the unit level still decrease.

C.4. *Not controlling for* YearsSinceApproval × ProposedPercentageChange

The following figure shows the coefficients of *YearsSinceCompletion* × *PercentageChange* when I estimate Equation (2) without controlling for *YearsSinceApproval* × *ProposedPercentageChange*. It confirms that developers propose to build more housing units (relative to existing housing stock) in areas with faster-growing rents, and so controlling for *YearsSinceApproval* × *ProposedPercentageChange* is important.

Year	2000	2013
	Average median income	
Census tracts in the sample	40,278	65,020
Other census tracts in NYC	40,050	56,139
	Percent of Black and Hispanic	
Census tracts in the sample	46.13	40.10
Other census tracts in NYC	53.09	54.77

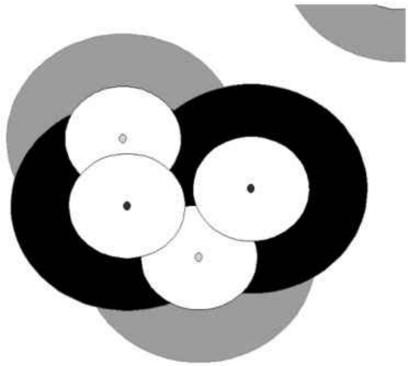


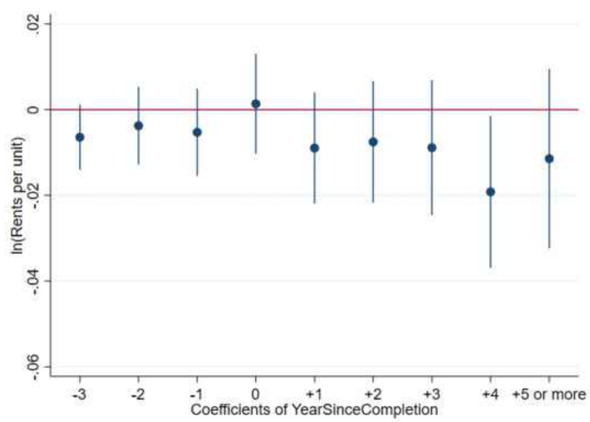
Notes: The number of observations is 126,113; the number of properties is 13,512; and the R^2 is 0.28. Property fixed effects and *Borough* × *Year* dummies are controlled. *PercentageChange* outliers (the cutoff is 100%) are dropped.

C.5. Robustness checks about the outer ring

The first figure shows the outer ring sample, including rental buildings that are 500–1000 ft away from new high-rises that receive approved Building Permits between 2000 and 2010. Black dots are completed new high-rises, and gray dots are approved new high-rises which have not yet been completed. The outer ring sample includes rental buildings within black and gray areas.

The second figure shows estimated rent changes before and after the completion year for rental buildings that are 500–1000 ft away from new high-rises. Their residential rents do decrease but not significantly after the new high-rise completion.





Notes: The number of observations is 106,634; the number of properties is 11,130; and the R^2 is 0.30. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* dummies are controlled.

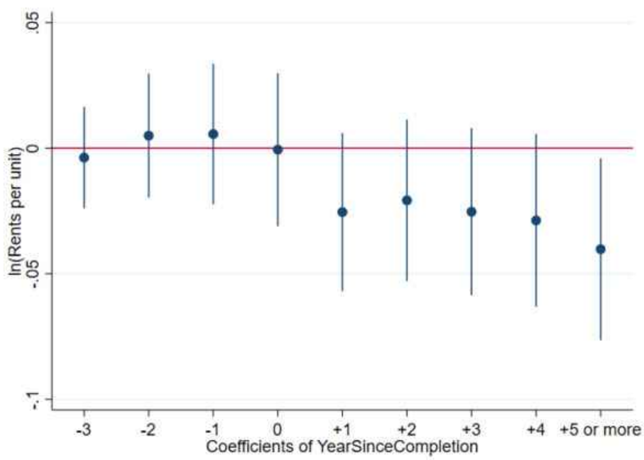
Vacancy rates after the completion of nearby new high-rises, %	Unit-level rents percentage change
3.0	−2.50
3.5	−1.99
4.0	−1.48
4.5	−0.97
5.0	−0.45

C.6. Robustness checks using different new high-rise types

Column (1) shows the elasticity regarding new housing units for a single completed new high-rise and multiple completed new high-rises is not significantly different. Columns (2) and (3) use only rental buildings within 500 ft of a single approved new high-rise. Column (2) shows the impact of new high-rises does not depend on whether the new high-rise is a condo/co-op or rental building. Column (3) shows that whether the new high-rise received a 421-a/Inclusionary Housing Subsidy does not significantly affect the elasticity.

C.7. Robustness checks using the balanced sample

To address the unbalanced data issue, I restrict the sample to rental buildings within 500 ft of new high-rises that received approved Building Permits between 2003 and 2006 and examine new high-rise completions between 2006 and 2009. I estimate Equation (1) using the restricted sample. As shown in the following figure, the results are consistent with the main findings.



Notes: The figure shows estimated rent changes before and after the completion year for rental buildings within 500 ft of new high-rises completed between 2006 and 2009. The number of observations is 67,925; the number of properties is 7,313; and the R^2 is 0.277. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* dummies are controlled.

C.8. Robustness checks regarding three data caveats

I estimate Equation (3) using only (i) rental buildings required to file the RPIE (see Column (1)); (ii) rental buildings that have eight or more years' estimated gross income from 2003 to 2013 (see Column (2)); and (iii) rental buildings with zero commercial units (see Column (3)). The coefficients of $Post \times PercentageChange$ are all significantly negative, as shown in the following table.

C.9. *Regarding negative spillover effects*

This table aims to test whether the negative impact of new high-rises is driven by negative spillover effects, like changes in neighborhood physical features, blocking views, or casting shadows.

C.10. High-income and gentrifying neighborhoods

This table compares the impact of new high-rises in established high-income and gentrifying neighborhoods, as well as Manhattan and other boroughs.

C.11. Residential rents for new high-rises

To compare residential rents between new high-rises and existing rental buildings, I estimate the following equation. New high-rises' rents are 60% higher than the average in their census tracts, 40% higher than the average of the upper half in their census tracts, and 29% higher than the average of the upper quartile in their census tracts. The percentile is based on the ranking of a rental building's 2003 rent per unit in its census tract.

$$ln(Rent_{it}) = \alpha + \beta NewBuilding_{it} + \delta Borough_i \times Year_t + \theta CensusTract_i + \varepsilon_{it}$$

ln(Rents)	(1)	(2)	(3)
Post × *PercentageChange*	−0.131***	−0.156***	−0.112**
	(0.0365)	(0.0535)	(0.0521)
Multiple × *Post* × *PercentageChange*	0.0447		
	(0.0424)		
Rental × *Post* × *PercentageChange*		0.0389	
		(0.0803)	
NoSubsidy × *Post* × *PercentageChange*			−0.0857
			(0.0805)
Constant	6.309	21.42	21.56
	(13.42)	(17.70)	(17.70)
# of observations	126,113	76,030	76,030
R^2	0.279	0.285	0.285
Number of properties	13,512	8,109	8,109

Notes: Multiple is 1 if the property *i* is within 500 ft of multiple new high-rise completions, and 0 otherwise. Columns (2) and (3) use rental buildings within 500 ft of a single approved new high-rise. *Rental* is 1 if the new high-rise is a rental building, and 0 if it is a condo/co-op. *NoSubsidy* is 1 if the new high-rise received no subsidy, and 0 if it received a 421-a/Inclusionary Housing subsidy. Property fixed effects, *Borough* × *Year* dummies and *YearsSinceApproval* × *ProposedPercentageChange* are controlled. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.
Robust standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

ln(Rents)	(1) The wholes sample	(2) >50%	(3) >75%
New high-rise buildings	0.602***	0.404***	0.291***
	(0.0107)	(0.0293)	(0.0299)
Constant	9.100***	9.465***	8.092***
	(0.339)	(0.504)	(0.661)
Observations	129,156	66,526	35,109
R-squared	0.132	0.233	0.263
# of census tracts	578	578	578

Clustered errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: NewBuilding is 1 if property *i* is a new high-rise rental building. The *Percentile* is based on the property's 2013 rent per unit ranking in its census tract. Column (1) uses the whole sample and new high-rise rental buildings, Column (2) uses the upper half and new high-rise rental buildings, and Column (3) uses the upper quartile and new high-rise rental buildings. *Borough* × *Year* and *CensusTract* dummies are controlled.

C.12. High-end, mid-range and low-end rental buildings

This table shows that new high-rises significantly decrease rents for high-end (≥75 percentile) and mid-range (25–75 percentile) existing rental buildings.

D. The impact on sales prices

D.1. Regression results for sales prices using repeat sales

I estimate Equation (5) using properties (condo/co-op units) experienced repeat sales during the research period. Instead of using census tract fixed effects, I use properties (condo/co-op units) fixed effects. As shown in the following table, the results are consistent with the main sales prices regression results.

	(1)	(2)	(3)
ln(Rents)	RPIE required	Eight or more available years	Zero commercial unit
Post	-0.0545^{**}	-0.102^{***}	-0.141^{***}
× *PercentageChange*	(0.0263)	(0.0223)	(0.0296)
Constant	23.64^{*}	17.69	−2.876
	(13.88)	(13.49)	(20.96)
# of observations	89,494	120,449	69,836
R^2	0.298	0.288	0.274
Number of properties	9,336	12,011	7,691

Notes: This table shows robustness checks for Equation (3). Property fixed effects, *Borough* × *Year* dummies and *YearsSinceApproval* × *ProposedPercentageChange* are controlled. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.
Robust standard errors in parentheses.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

D.2. Regression results for sales prices using the restricted sample

I estimate Equation (5) using sales transactions in census tracts with condo sales transactions. The results are consistent with the results when I use the whole sample.

	By neighborhood density		Low/mid-rise rental buildings		By new high-rise height	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Rents)	Continuous variable	Dummy variable	≤4 floors	≤5 floors	Continuous variable	Dummy variable
Post × Percentage Change	−0.109***	−0.102***	−0.110***	−0.0902***	−0.202***	−0.118**
	(0.0295)	(0.0229)	(0.0283)	(0.0231)	(0.0667)	(0.0487)
Density × Post × PerccentageChange	5.975					
	(12.96)					
High-density × Post × PercentageChange		0.0167				
		(0.0552)				
Height × Post × PercentageChange					0.00459	
					(0.00394)	
Tall × Post × PercentageChange						−0.0769
						(0.0891)
Constant	15.78	15.78	20.38	22.80	4.922	5.480
	(13.58)	(13.58)	(29.98)	(17.30)	(17.94)	(17.94)
# of observations	126,113	126,113	48,252	92,021	76,030	76,030
R^2	0.279	0.279	0.267	0.259	0.285	0.285
# of properties	13,512	13,512	5505	10,014	8109	8109

Notes: This table shows heterogeneity analysis for Equation (3). *Density* is the number of residential units to the total land area by borough-block in 2002. *High-density* is 1 if *density* is above the median, 0 otherwise. Columns (5) and (6) use rental buildings within 500 ft of a single approved new high-rise. *Height* is the new high-rise's number of floors. *Tall* is 1 if the new high-rise is taller than or equal to 15 floors, 0 otherwise. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* × *ProposedPercentageChange* are controlled. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.Robust standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

D.3. Condo sales price elasticity regarding new condo units

I estimate the following equation. $CondoPercentageChange_i$ is the percentage change in condo quantity, calculated by dividing the number of completed new condo units within 500

ln(Rents)	(1) High-income	(2) Gentrifying	(3) Manhattan	(4) Other Borough
Post × *PercentageChange*	−0.0633**	−0.170***	−0.0428	−0.139***
	(0.0264)	(0.0336)	(0.0330)	(0.0269)
Constant	9.562***	9.096***	9.469***	9.049***
	(0.0211)	(0.0297)	(0.0226)	(0.0329)
# of observations	62,287	59,611	82,923	43,190
R^2	0.373	0.222	0.260	0.330
# of properties	6477	6564	8651	4861

Notes: This table shows the heterogeneity analysis for Equation (3). Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* × *ProposedPercentageChange* are controlled. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.
Robust standard errors in parentheses.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

ft of condo unit *i* by the number of existing condo units within 500 ft of condo unit *i*.[60] $CondoProposedPercentageChange_i$ is calculated by dividing the proposed number of condo units within 500 ft of condo unit *i* by the number of existing condo units within 500 ft of condo unit *i*.

$$\begin{aligned} ln(Price_{it}) = \alpha + \beta After_{it} \times CondoPercentageChange_i \\ + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) \times CondoProposedPercentageChange_i \\ + \delta Borough_i \times Year_t + \eta CondoPercentageChange_i \\ + \sigma CondoProposedPercentageChange_i + \theta X_i + \varepsilon_{it} \end{aligned}$$

The estimated β is −0.09 with the clustered standard error of 0.03 (clustered by census tract). For every 10% increase in the condo stock within a 500-ft buffer, condo sales prices decrease by 0.9%.

E. The impact on restaurant openings

E.1. The probability of closures for existing food services

I analyze whether the time until closure changes after the completion of nearby new high-rises using a Cox model with nonproportional hazards. A restaurant is categorized as closed if it changes location or disappears from the database. I estimate the following equation stratified by year and census tract. The sample includes 5245 restaurants operating in 2002 that

60 I use 2002 PLUTO to measure the existing condo stock, and the average percentage increase is 20%.

are within 500 ft of new high-rises that received approved Building Permits between 2000 and 2010. Restaurants belonging to a census tract without any restaurant within 500 ft of new high-rise completed by the end of 2013 are removed. As shown in the following figure, the completion of new high-rises does not affect the probability of closures for existing restaurant.

	(1)	(2)	(3)	(4)
ln(Rents)	<25 percentile	25–50 percentile	50–75 percentile	≥75 percentile
Post × *PercentageChange*	−0.00856	−0.0656*	−0.0752*	−0.116***
	(0.0397)	(0.0382)	(0.0432)	(0.0445)
Constant	72.55***	−0.264	21.76	−1.075
	(24.48)	(22.89)	(23.85)	(34.95)
# of observations	31,580	31,549	31,318	31,666
R^2	0.426	0.403	0.319	0.136
Number of properties	3242	3150	3130	3990

Notes: This table shows the heterogeneity analysis for Equation (3). The *Percentile* is based on the property's 2003 rent per unit ranking in its SubBorough. Property fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* × *ProposedPercentageChange* are controlled. *ProposedPercentageChange* outliers (the cutoff is 100%) are dropped.
Robust standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

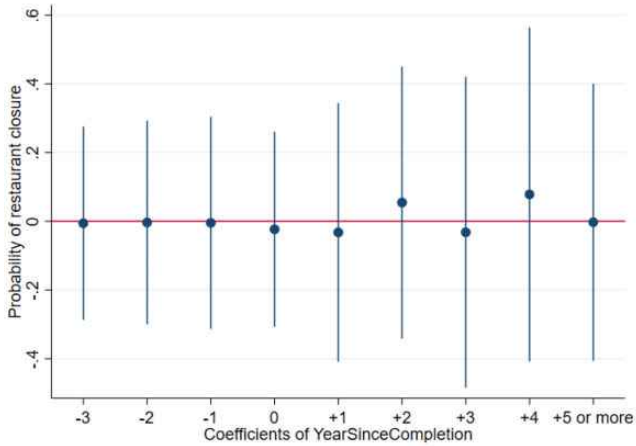
ln (Sales Prices)	(1) Residential properties	(2) 1–5 families	(3) Rental buildings	(4) Co-ops	(5) Condos
After	-0.0390^{***}	−0.146	-0.419^{**}	−0.00317	−0.125
	(0.0133)	(0.121)	(0.185)	(0.0131)	(0.0965)
Constant	21.04^{*}	163.4	−238.2	20.02^{*}	25.12
	(11.77)	(271.2)	(271.0)	(10.57)	(60.44)
Trend control	Borough × Year	Borough × Year	Borough × Year	Borough × Year	Borough × Year
# of observations	29,814	2,989	1,285	12,358	13,182
R^2	0.155	0.173	0.225	0.052	0.353
# of properties (condo/co-op units)	9185	1287	560	1286	6090

Notes: Properties (condo/co-op units) dummies, *Borough* × *Year* dummies and *YearSinceApproval* are controlled. Robust standard errors in parentheses.
***$p < 0.01$;**$p < 0.05$;*$p < 0.1$.

ln (Sales Prices)	(1) Residential properties	(2) 1–5 families	(3) Rental buildings	(4) Co-ops	(5) Condos
After	−0.0642***	−0.0160	0.0247	−0.00922	−0.0559*
	(0.0224)	(0.0319)	(0.0662)	(0.0193)	(0.0306)
Constant	12.42***	10.30***	2.550	15.35***	13.24***
	(0.292)	(3.221)	(4.100)	(1.136)	(0.261)
# of observations	58,177	4682	2818	11,587	39,090
R^2	0.308	0.430	0.194	0.330	0.167
# of census tracts	283	233	245	171	283

Notes: Census tract dummies, building class dummies, building age, gross square feet, number of floors, *Borough* × *Year* dummies and *YearSinceApproval* are controlled. Standard errors are clustered by census tract.
Clustered standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

$$h_i(t) = h_0(t)\exp(\alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion(\tau) I_i + \theta I_i + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) + \delta Chain_i + \gamma Employee_i) + \varepsilon_{it}$$

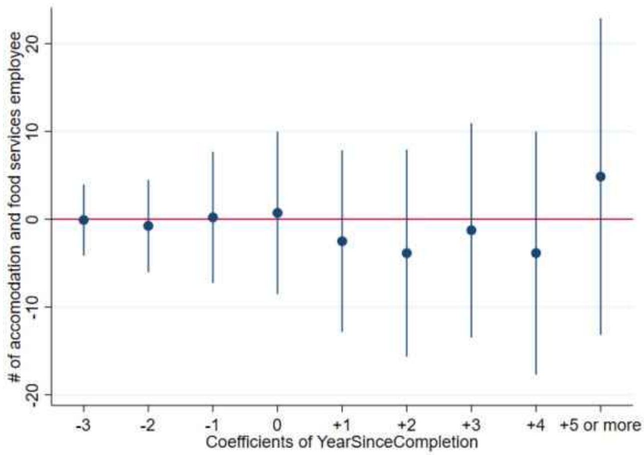


Notes: I is 1 if the approved new high-rise within 500 ft of restaurant *i* is completed by 2013. *Chain* is a dummy variable indicating whether the food service belongs to a chain. *Employee* measures the number of employees at the food service. *YearSinceApproval* dummies are controlled. The estimation is stratified by year and census tract.

E.2. The impact on number of jobs

I use LODES to measure the number of jobs in accommodations and food services. Since the dataset's geographic unit is census block rather than property, I restrict the sample to census blocks with new high-rises that received approved Building Permits between 2000 and 2010, and remove census blocks belonging to census tracts without any census block within 500 ft of new high-rise completed by the end of 2013. LODES reports the number of jobs by two-digit NAICS code, and so I can only analyze the impact of new high-rises on accommodations and food services. I estimate the following equation and present the result. New high-rises do not significantly affect the number of jobs in accommodations and food services.

$$Jobs_{it} = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion(\tau) + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) + \delta Borough_i \times Year_t + \mu_i + \varepsilon_{it}$$



Notes: Jobs$_{it}$ is the number of jobs in accommodations and food services in census block *i* and year *t*. The number of observations is 8137, and the number of census tracts is 780. Census blocks fixed effects, *Borough* × *Year* dummies and *YearSinceApproval* dummies are controlled. Standard errors are clustered by census block.