Do New Housing Units in Your Backyard Raise Your Rents? *

Xiaodi Li†

October 31, 2019

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 decreasing their rents. Others contend that new development will attract high-income households and new amenities, generating an amenity effect and driving up rents. In this paper, 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 for every 10% increase in the housing stock, rents decrease 1% and sales prices also decrease within 500 feet. 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 is larger, causing net reductions in the rents and sales prices of nearby residential properties.

Keywords: housing supply, housing affordability, spillover effect

JEL Codes: R10, R31, R58

*I am grateful to Ingrid Gould Ellen, Sewin Chan, and Johannes Stroebel for their advice and guidance. I also thank Maxwell Austensen, Vicki Been, Jaclene Begley, Itzhak Ben-David, Devin Michelle Bunten, Eric Chiang, Alex Xi He, Tatiana Homonoff, Sung Kwan Lee, Hsi-ling Liao, Steve Mello, Rachel Meltzer, Katherine O′Regan, Paola Sapienza, David Schleicher, Jenny Schuetz, Daniel Waldinger, Andrew Wang, Mark Willis, and Wei You for their feedback and help. I thankfully acknowledge the generous research grant from Fannie Mae.

†NYU Wagner and NYU Furman Center

1 Introduction

As cities across the U.S. 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 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 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, Malpezzi, and Mayo, 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 near new high-rises with approved construction 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.

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 paper introduces a longitudinal

[1] Recently, the argument whether increasing market-rate housing supply results in lower housing prices has been the most controversial among the urbanist community (Gray, 2019; Florida, 2019). Mainstream urban economists have argued that construction of taller and denser residential buildings can relieve the housing affordability crisis. However, 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.

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.

I find that for every 10% increase in the housing stock within a 500-foot buffer, residential rents decrease by 1%. The rent reduction is caused by the completion of new high-rises rather than their approval. Across neighborhoods, the impact is smaller in more central areas, presumably due to more elastic demand. Within neighborhoods, the impact is smaller for lower-rent buildings. Finally, the negative impact appears to be driven by supply effects rather than dis-amenity effects, like changes in neighborhood physical features, blocked views, or shadows. New housing units alleviate the growing demand for existing housing units and moderate the rapid growth of residential rents.

Residential property sales prices also decrease when new high-rises within 500 feet are completed. I find little evidence of anticipatory reductions in sales prices, presumably because of limited information and the difficulty in predicting the completion timing of new high-rises. The negative impact is concentrated among condos, which is consistent with a housing market segmented by property type (Tu, 1997; Hartley, 2014). There are four types of residential properties in NYC - rental buildings, condos, co-ops, and 1-5 family houses.[2] Because 99% of new high-rises are condos and rental buildings, they do not significantly affect sales prices of co-ops and 1-5 family homes.

To address the hypothesis about amenity effects, I find new high-rises and their high-income tenants 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

[2]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.

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 (2018) estimate the rent elasticity with respect to new supply by PUMA between 0 and -0.1 in large metropolitan areas in the US.[3] Gyourko and Molloy (2015) conclude from their literature review that restricting housing supply raises housing prices on broader housing markets (Glaeser, Gyourko, and Saks, 2005a; Gyourko and Saiz, 2006).[4]

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 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.[5]

As noted, many renters fear that new market-rate housing units and their high-income tenants lead to higher rents, gentrification, and displacement in local neighborhoods (Monkkonen, 2016; Been, Ellen, and O′Regan, 2018). 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. 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

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

[4] In terms of welfare, researchers show that restricting housing supply has a serious adverse effect on US GDP and welfare (Turner, Haughwout, and van der Klaauw, 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).

[5] One closely related paper is Asquith, Mast, and Reed (2019), finding new luxury buildings in low-income census tracts decrease monthly rents by about 171 dollars within 250 meters (inner circle), compared to rents 250-600 meters away (outer ring). To address the endogeneity that rents in the inner circle are trending upwards than rents in the outer ring, they add in $InnerCircle * Year$ dummies.

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 paper shows that new high-rises lower rents not only for nearby high-end rental buildings, but for mid-range rental buildings as well.

This paper is related to a literature examining the negative impact of foreclosures on immediately surrounding housing prices (Schuetz, Been and Ellen, 2008; Campbell, Giglio, Pathak, 2011; Hartley, 2014; Anenberg and Kung, 2014; Gerardi et al, 2015). There are two mechanisms to explain this negative impact: (1) Foreclosures increase local housing supply when they are listed (supply effect); and (2) foreclosed properties are poorly maintained, which generates negative externalities (dis-amenity 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.[6] 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 paper also relates to literature estimating the spillover effect of new affordable housing. For example, the Low Income Housing Tax Credit (LIHTC)[7] 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 paper is structured as follows: Section 2 describes the data sources. Section 3

[6]Two other papers suggest the negative effect of foreclosure is mainly caused by the supply effect. Hartley (2010) finds foreclosures of multifamily properties do not affect nearby single-family properties because they are not substitutes. Mian, Sufi, and Trebbi (2015) document that foreclosures cause local housing supply to increase.

[7]"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

discusses the research design. Section 4 shows descriptive statistics. In Section 5, I present the estimated impact of new high-rises on residential rents, heterogeneity analysis, and robustness checks. Sections 6 and 7 discuss the impact on sales prices and restaurant openings respectively. Section 8 considers policy implications.

2 Data Sources

2.1 New High-rises

In this paper, I focus on the impact of new high-rises, because they offer many new market-rate housing units within a small area. New high-rises are defined as newly built, market-rate residential properties with seven or more floors (Hall Jr, 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.).[8] 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 development.[9] 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-ries.

Since this paper 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.[10] The SHD dataset covers borough-block-lot, subsidy program, and other

[8]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

[9]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

[10]The dataset can be downloaded here: http://coredata.nyc/

characteristics for subsidized housing in New York City. I merge the SHD and Certificate of Occupancy data using borough-block-lot. In this paper, 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. 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). I show that the 421-a Tax Incentive and Inclusionary Housing subsidies do not affect the impact of new high-rises in the heterogeneity analysis section.

In addition, I use the 2015 Map Primary Land Use Tax Lot Output (MapPLUTO) shapefile from the Department of City Planning (DCP) to draw buffers around new high-rises using ArcGIS.[11]

2.2 Residential Rents

This paper introduces a panel dataset covering 2003-2013 annual rents for NYC rental buildings by property. The dataset also includes property locations and characteristics. This information is extracted from the 2005-2015 Notice of Property Value (NOPV).[12] See Appendix A.1 for an NOPV statement. The NOPV reports estimated gross rental income with a two-year lag (e.g., the NOPV from 2005 reports rent information from 2003). The

[11] 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

[12] NOPV website: https://nycprop.nyc.gov/nycproperty/nynav/jsp/selectbbl.jsp

DOF issues the NOPV annually to inform homeowners of 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 1) an actual assessed value of $40,000 or less, 2) ten or fewer dwelling units, 3) six or fewer dwelling units and no more than one commercial unit, or 4) a special franchise.[13] 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, youngerand 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 prices.[14] 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 seven 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

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

[14] 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.

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.2 for details. Second, this dataset incorporates the change in concessions and vacancy rates. This paper does not distinguish between the impact of new high-rises on gross rents and vacancy rates.

2.3 Sales Prices

I use 2003-2013 New York City sales transactions information for residential properties from the NYC DOF and Automated City Register Information System (ACRIS). 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: 1) those with prices per unit that are outliers; 2) those that are not arms-length;[15] 3) 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.[16] Infogroup gathers location-related establishment information from 6,000 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

[15] 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 arms-length.

[16] The dataset can be downloaded through Wharton Research Data Services.

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.

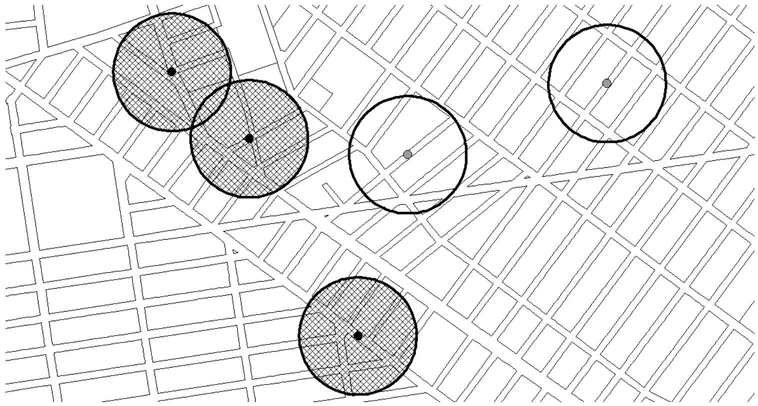
3 Research Design

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. 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.[17] 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 1, I restrict the sample to rental buildings within 500 feet of new high-rises that received approved Building Permits between 2000 and 2010, and examine the rent changes for rental buildings within 500 feet 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 feet because the average distance between two adjacent Manhattan avenues is 750 feet and between two adjacent Manhattan streets is 270 feet (Pollak, 2006). I document that new high-rises do not significantly affect rental buildings that are 500-1000 feet away in the outer ring 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 (the completion year minus the approval year) is 3-year. Then, I remove rental buildings completed after 2002 to focus on the impact of new high-rises on existing rental buildings.

[17] See "Permit Process" for details: https://www1.nyc.gov/site/buildings/business/building-permits.page

Figure 1: 500-feet buffers



Note: Black dots are completed new high-rises, and grey dots are approved new high-rises which have not yet been completed. The event study sample includes rental buildings within shadowed and hollow circles.

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

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

$ln(Rent_{it})$ is the natural logarithm of annual rent per unit for property i and year t. $YearSinceCompletion(\tau)$ 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+}.[18] $YearSinceCompletion(\tau)$ 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+}.[19] *Borough*Year* dummies control for housing market trends.[20] 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, $YearSinceApproval(\kappa)$ dum-

[18]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.

[19]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.

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

mies 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.

Because the identification strategy exploits the plausibly exogenous timing of completion, 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: 1) infighting between partners; 2) labor, construction equipment, or materials shortages; 3) unexpected site conditions or building violations; 4) 2008 financial crisis;[21] 5) financing problems unrelated to the local housing market; or 6) weakening of the local housing market (Hughes, 2016; Solomont and Bockmann, 2017; Been, E-mail interview, October 31, 2018). 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 paper 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 feet of new high-rises completed by the end of 2013.[22] 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.[23] This leaves me with 578 census tracts. According to the classification from Furman Center (2016b), 57.31%

[21] On average, new high-rises approved between 2000 and 2007 took 2 years to complete, and those approved between 2008 and 2010 took 3.45 years. Much fewer new high-rises received approved Building Permit after 2008, as shown in Appendix C.1. However, the impact of new high-rises on rental buildings before and after 2008 is not significantly different.

[22] Census tracts generally encompass a population between 1,200 and 8,000, and their boundaries mostly follow visible and identifiable features. There are 2,168 census tracts in NYC.

[23] This procedure removes 5,658 observations from the residential rents dataset and 2,388 observations from the sales prices dataset.

of those census tracts are high-income, 36.14% are gentrifying, and 6.54% are non-gentrifying.

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. On the contrary, Appendix B.2 shows the estimated rent changes for rental buildings within 500 feet of completed new high-rises when I compare those rental buildings to the rest of NYC. The result confirms 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 feet of new high-rises, which is a significant one percentage point higher than the rest of NYC from 2003 to 2013.

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 B.3. This evidence confirms that developers choose specific locations with the fastest-growing rents to build new high-rises. Therefore, restricting the sample to rental buildings within 500 feet of new high-rises is needed to address the endogeneity issue.

4 Descriptive Statistics

From 2000 to 2010, 1141 new high-rises received approved Building Permits.[24] Figure 2 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.[25] Appendix C.1 shows these percentages by approval years. As for the construction length, the range is

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

[25] 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.

Figure 2: Approved new high-rises in New York City

Note: 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.

between 0 and 15 years; see Appendix C.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. Those new high-rises provided 59,148 units, accounting for around 80% of new market-rate housing units completed between 2003 and 2013 within their 500-foot buffers.[26]

To draw a more comprehensive picture, I analyze the impact of new high-rises on residential property sales prices and restaurant openings in addition to residential rents. As for analysis of new restaurant establishments, the sample includes properties completed after 2002, regardless whether they are commercial or residential. Table 1 shows summary statistics for these three variables.

Table 1: Summary statistics for dependent variables

Variable	# of observations	Mean	Std. Dev.	P10	P50	P90
annual rents per unit in NYC	127,680	16735	11988	7600	13700	28990
annual rents per unit in Manhattan	83,511	19474	13512	8227	16700	32920
annual rents per unit in other boroughs	44,169	11556	5409	7070	10566	16629
sales prices per unit in NYC	66,022	954130	1097592	212500	640479	1985500
sales prices per unit in Manhattan	48,837	1134389	1207576	296698	780000	2300000
sales prices per unit in other boroughs	17,185	441865	359835	125000	355000	845147
# of food service openings per property in NYC	69,938	0.19	0.53	0.00	0.00	1.00
# of food service openings per property in Manhattan	51,062	0.20	0.56	0.00	0.00	1.00
# of food service openings per property in other boroughs	18,876	0.15	0.41	0.00	0.00	1.00

[26] From 2003 to 2013, around 210,000 new housing units were added to NYC, 21% of them belonging to affordable housing projects.

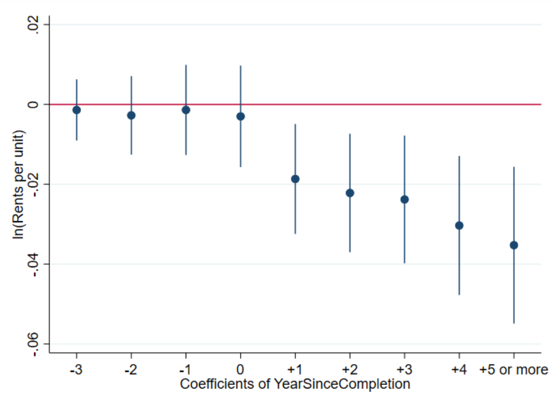
5 The Impact on Residential Rents

5.1 Main Finding

5.1.1 Rents Before and After Completions

Following the research design, Figure 3 and Column (1) of Table 2 show the regression results for equation (1). Rents for rental buildings within 500 feet of completed new high-rises decrease by 1.6% one year after the completion significantly and persistently.[27] 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 one year, as rents cannot change immediately due to leases.[28]

Figure 3: Rents before and after the completion year



Note: 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 property.

In Column (2) of Table 2, I control for $SubBorough * Year$ dummies rather than $Borough * Year$ dummies, and the results are consistent with those in Column (1).[29] In

[27]Standard errors are clustered by property. When standard errors are clustered by new high-rise or census tract, the magnitude of standard errors become bigger, but the rent reduction is still significant.

[28]In following years, rents experience a gradual decline, presumably because residential rents are sticky (Gallin and Verbrugge, 2019).

[29]The United States Census Bureau divides New York City into 55 sub-borough areas.

Table 2: Rents before and after the completion year

ln(Rents)	(1)	(2)		(3)	(4)	(5)
3 years before the completion year	-0.00139	-0.000528	*3 years before the completion year*	-0.0228		
	(0.00391)	(0.00395)	**PercentageChange*	(0.0329)		
2 years before the completion year	-0.00274	0.000104	*2 years before the completion year*	-0.00594		
	(0.00502)	(0.00503)	**PercentageChange*	(0.0213)		
1 year before the completion year	-0.00138	-5.31e-05	*1 year before the completion year*	-0.000167		
	(0.00576)	(0.00575)	**PercentageChange*	(0.0186)		
0 year after the completion year	-0.00300	-0.00209	*0 year after the completion year*	0.0244		
	(0.00649)	(0.00642)	**PercentageChange*	(0.0255)		
1 year after the completion year	-0.0187***	-0.00728	*1 year after the completion year*	-0.0541*		
	(0.00702)	(0.00697)	**PercentageChange*	(0.0301)		
2 years after the completion year	-0.0222***	-0.0109	*2 years after the completion year*	-0.0492		
	(0.00757)	(0.00752)	**PercentageChange*	(0.0340)		
3 years after the completion year	-0.0238***	-0.0177**	*3 years after the completion year*	-0.0744**		
	(0.00816)	(0.00808)	**PercentageChange*	(0.0376)		
4 years after the completion year	-0.0303***	-0.0181**	*4 years after the completion year*	-0.163***		
	(0.00888)	(0.00884)	**PercentageChange*	(0.0439)		
5+ years after the completion year	-0.0353***	-0.0182*	*5+ years after the completion year*	-0.221***		
	(0.0100)	(0.00996)	**PercentageChange*	(0.0485)		
			Post		-0.0991***	-0.127***
			**PercentageChange*		(0.0210)	(0.0419)
			Post			0.0574
			**PercentageChange*^{2}			(0.0660)
Constant	-2.253	-1.079	Constant	-1.952	-2.229	-2.225
	(13.52)	(13.18)		(13.58)	(13.57)	(13.57)
Trend Control	Borough*Year	SBA*Year		Borough*Year	Borough*Year	Borough*Year
Observations	127,680	127,680		126,113	126,113	126,113
R-squared	0.280	0.327		0.280	0.279	0.279
Number of properties	13,711	13,711		13,512	13,512	13,512

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows regression results for equation (1), equation (2), and equation (3). $YearSinceApproval$ dummies are controlled in Column (1) and (2), $YearSinceApproval * ProposedPercentageChange$ is controlled in Column (3)-(5). Property fixed effects are included, and standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped in Column (3)-(5).

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

5.1.2 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 $YearSinceApproval(\kappa)$ 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 4, 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.[30] Following the regulation, construction does not generate negative spillover effects on neighboring rental buildings.

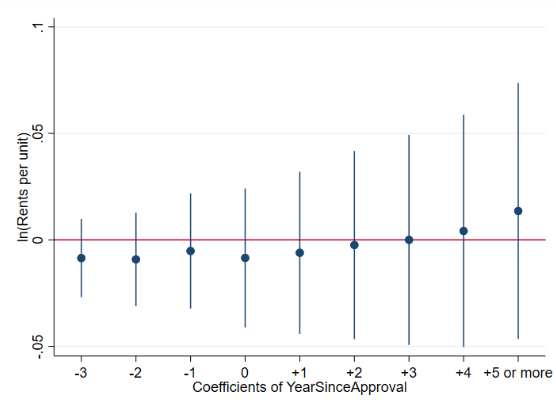
5.1.3 Outer Ring

To explore what happens to rental buildings slightly further away, I estimate equation (1) using rental buildings that are 500-1000 feet away from new high-rises that received approved Building Permits between 2000 and 2010, as illustrated in Figure 5. Following the 500-feet buffer analysis, I remove rental buildings completed after 2002, and rental buildings belonging to census tracts without any rental building within 500-1000 feet of the new high-rises completed by the end of 2013.

Figure 6 presents coefficients of $YearSinceCompletion$. For rental buildings that are 500-1000 feet away from new high-rises, their residential rents do decrease but not sig-

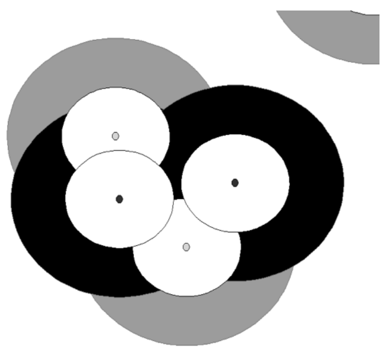
[30] See http://insidesquad.com/new-york-city-construction-hours-and-noise-code/ for details.

Figure 4: Rents before and after the approval year



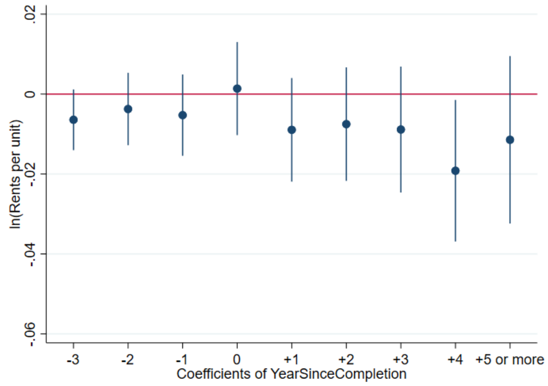
Note: This figure shows regression results for equation (1), indicating estimated rent changes before and after the approval year, controlling for the timing of completion. Property fixed effects and $Borough * Year$ dummies are controlled. Standard errors are clustered by property.

Figure 5: 500-1000 feet away



Note: Black dots are completed new high-rises, and grey dots are approved new high-rises which have not yet been completed. The outer ring sample includes rental buildings within black and grey areas.

Figure 6: Rents regression results for the outer ring



Note: This figure shows estimated rent changes before and after the completion year for rental buildings that are 500-1000 feet away from new high-rises. The number of observations is 106,634; the number of properties is 11,130; and the R-squared is 0.30. Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval$ dummies are controlled. Standard errors are clustered by property.

nificantly 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 feet of new high-rises, and so following analysis focuses on 500-feet buffers.

5.1.4 Elasticity Regarding New Housing Units

To better interpret the magnitude of new high-rise impacts within 500-foot buffers, I estimate the residential rent elasticity with respect to new housing units. I use $YearSinceCompletion_{it}(\tau) * PercentageChange_i$ 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 feet of property i by the number of existing residential units within 500 feet of property i.[31] I also use $YearSinceApproval_{it}\kappa * ProposedPercentageChange_i$ to control for residential rent changes related to the approval. $ProposedPercentageChange_i$ is

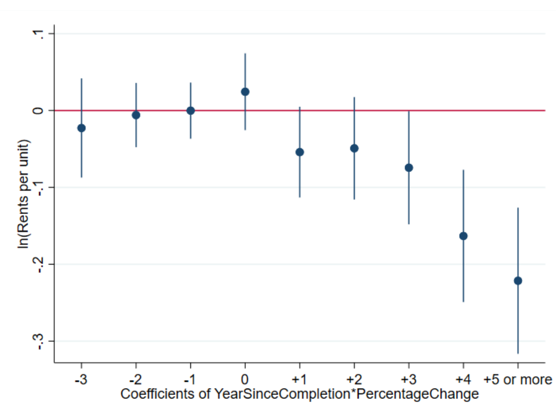
[31] I use 2002 MapPLUTO to measure the existing housing stock, and the average percentage change is 9.4%.

calculated by dividing the proposed number of residential units in approved new high-rises within 500 feet of property i by the number of existing residential units within 500 feet of property i. It is important to control for $YearSinceApproval * ProposedPercentagesChanges$, because developers propose to build more housing units (relative to existing housing stock) in areas with faster-growing rents, as shown in Appendix D.2.

$$\begin{aligned} ln(Rent_{it}) =& \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion_{it}(\tau) * PercentageChange_i \\ & + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) * ProposedPercentageChange_i \\ & + \delta Borough_i * Year_t + \mu_i + \varepsilon_{it} \end{aligned} \tag{2}$$

Column (3) of Table 2 and Figure 7 show regression results for equation (2). One year after the new high-rise completion, residential rents in the 500-foot buffer with more new housing units (relative to the existing housing stock) decrease by more. The negative impact experience gradual increase afterwards, presumably because rents are sticky.

Figure 7: Rents before and after the completion year in terms of $PercentageChange$



Note: 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 property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

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).

$$\begin{aligned} ln(Rent_{it}) =& \alpha + \beta Post_{it} * PercentageChange_i \\ &+ \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) * ProposedPercentageChange_i \\ &+ \delta Borough_i * Year_t + \mu_i + \varepsilon_{it} \end{aligned} \tag{3}$$

Column (4) of Table 2 shows regression results for equation (3).[32] For every 10% increase in the housing stock within a 500-foot buffer, residential rents decrease by 1%. 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 and show the regression result in Column (5). The coefficient of the squared term is not significant. Therefore, following heterogeneity analysis and robustness checks are based on equation (3).

5.2 Heterogeneity Analysis

5.2.1 by Centrality

I explore how the impact of new high-rises varies by the distance to the Empire State Building. The Empire State Building is often used as a proxy for centrality in NYC. Since 2000, city centers have experienced a striking rise in housing demand due to the convenience of access to work and consumption (Baum-Sanow and Hartley, 2016; Couture and Handbury, 2017). Therefore, more central areas have more potential buyers and renters and, in turn, more elastic demand and smaller responses to shocks (Piazzesi, Schneider, and Stroebel, 2019).

[32] When I restrict the sample to existing rental buildings within 500 feet of new high-rises completed before 2013, the treatment effect is -0.09 with the standard error as 0.02.

As shown in the left two columns of Table 3, new high-rises do not significantly affect nearby residential rents in very central areas. As for less central but still well connected areas, 10% increase in housing stock reduce rents by 2% within 500 feet.[33] Right two columns show residential rents in Manhattan, NYC's central borough, are not significantly negatively affected by new high-rises. In more central areas, new housing units attract more households from other neighborhoods. In the extreme case that the number of households from other neighborhoods offsets additional supply, the demand curve is perfectly elastic and new housing units do not affect local residential rents.[34]

Table 3: Heterogeneity analysis - by centrality

	Distance to Empire State Building		by boroughs	
	(1)	(2)	(3)	(4)
ln(Rents)	<3.14 miles	>=3.14 miles	Manhattan	Others
Post **PercentageChange*	0.0107	-0.201***	-0.0429	-0.139***
	(0.0234)	(0.0354)	(0.0330)	(0.0270)
Constant	20.55*	56.89**	28.88**	46.23
	(10.56)	(28.36)	(11.38)	(35.12)
Observations	62,573	63,540	82,923	43,190
R-squared	0.355	0.227	0.260	0.330
# of properties	6,545	6,967	8,651	4,861

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows the heterogeneity analysis for equation(3). The cutoff 3.14 miles is the median distance to the Empire State Building for the sample. Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval * ProposedPercentageChange$ are controlled. Standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

5.2.2 by High-end, Mid-range, and Low-end

New high-rises are mostly luxury buildings. Rents for new high-rises are 60% higher than the average rents in their census tracts, and 30% higher than the average of the upper

[33]Though those areas are not very central neighborhoods, they are still central relative to the New York metropolitan area.

[34]For the same reason, the negative impact of new high-rises is significantly bigger in gentrifying neighborhoods, compared to established high-income neighborhoods.

quartile in their census tracts; see Appendix D.3 for details. To test whether those luxury buildings can meaningfully decrease rents for low-end and mid-range rental buildings, I consider rental buildings' percentiles in their census tracts based on their 2013 annual rents per unit.[35] In this paper, a low-end rental building is categorized as a rental building with relatively low rents per unit in its census tract.

As shown in Table 4, within census tracts, new high-rises significantly decrease rents for mid-range rental buildings. It is presumably because of filtering that as high-income neighbors move into new high-rises, leaving behind older housing stock for middle-class households. Those older housing stock increase mid-range housing supply. However, the rent decrease for low-end rental buildings is not significant in the medium-term.[36]

Table 4: Heterogeneity analysis - by high-end, mid-range, and low-end

ln(Rents)	(1) <25%	(2) 25-50%	(3) 50-75%	(4) >=75%
Post	-0.0638	-0.106***	-0.118***	-0.0898**
**PercentageChange*	(0.0476)	(0.0364)	(0.0385)	(0.0438)
Constant	56.27*	30.09	-22.02	12.16
	(30.10)	(25.91)	(25.87)	(25.31)
Observations	28,309	31,256	32,296	34,252
R-squared	0.128	0.277	0.338	0.398
# of properties	2,948	3,225	3,355	3,984

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows the heterogeneity analysis for equation(3). The $Percentile$ is based on the property's 2013 rent per unit ranking in its census tract. Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval * ProposedPercentageChange$ are controlled. Standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

[35] Seventy-four percent of rental buildings underwent alteration from 2003 and 2013, and so their percentiles in 2003 are very different from those in 2013 (the correlation is 0.5). Some rental buildings with low percentiles in 2003 improved their property amenities and raised their rents, and appear in high percentiles in 2013.

[36] 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.

5.2.3 by New High-rise

In the sample, 8% of rental buildings have zero new high-rise completion nearby, 61% have a single completed new high-rise nearby, and 31% have multiple completed new high-rises nearby. As shown in Column (1) of Table 5, 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 heterogeneity by new high-rise type using rental buildings within 500 feet of a single approved new high-rise. As shown in Column (2) of Table 5, 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.[37] 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.

5.3 Robustness Checks

5.3.1 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).

First, to address the concern about 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 square feet (Forsyth, 2003).[38] Households in low-density neighbor-

[37] 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.

[38] I use 2002 MapPLUTO to calculate *Density*.

Table 5: Heterogeneity analysis - by new high-rise

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

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows the heterogeneity analysis for equation(3). $Multiple$ is 1 if the property i is within 500 feet of multiple new high-rise completions, and 0 otherwise. Columns (2) and (3) use rental buildings within 500 feet 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 $YearSinceApproval * ProposedPercentageChange$ are controlled. Standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

hoods 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 Table 6, 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.

Table 6: Robustness checks regarding negative spillover effects

	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 *PercentageChange*	-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 *PercentageChange*	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)
Observations	126,113	126,113	48,252	92,021	76,030	76,030
R-squared	0.279	0.279	0.267	0.259	0.285	0.285
# of properties	13,512	13,512	5,505	10,014	8,109	8,109

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows robustness checks 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 feet 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. Standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

Second, I address the concern that new high-rises decrease nearby residential rents because they eliminate views from existing apartments. New York City views are mostly associated with skylines, prominent buildings and bridges, parks, Hudson and East Rivers, etc. (Toy, 2007; Bonislawski, 2017). Mid-rise and low-rise 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 buildings. As shown in Column (3) and Column (4) of Table 6, 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.

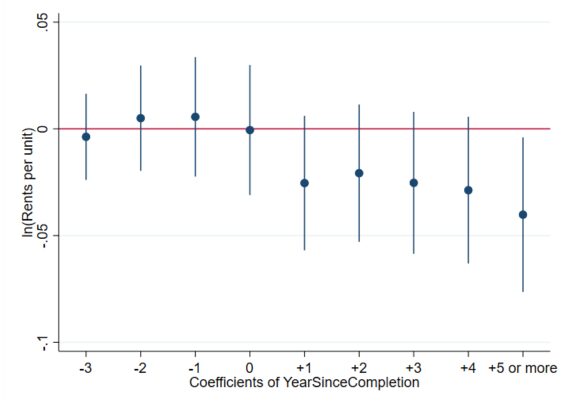
Third, I explore the heterogeneity by new high-rise heights, because taller new high-rises are more likely to cast shadows on existing rental buildings. Using rental buildings within 500 feet of a single approved new high-rise, I show that the negative impact of new high-rises does not depend on their heights, as shown in the right two columns of Table 6. Therefore, it is highly implausible that shadows explain the negative impact of new high-rises.

5.3.2 Unbalanced sample

When I estimate equation (1) and equation (2), the 2003-2013 residential rents dataset does not allow me to observe three years before the completion of new high-rises completed between 2003 and 2005. Similarly, the dataset does not allow me to observe four years after the completion of new high-rises completed between 2010 and 2013. Therefore, I further restrict the sample to rental buildings within 500 feet 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 feet 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 properties belonging to the restricted sample. Figure 8 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.

Figure 8: Robustness checks using the the balanced sample



Note: The figure shows estimated rent changes before and after the completion year for rental buildings within 500 feet 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-squared is 0.277. Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval$ dummies are controlled. Standard errors are clustered by property.

5.3.3 Vacancy Deregulation

Another possible explanation 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.[39] Therefore, owners of regulated housing units within 500 feet 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 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

[39] On June 14, 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, October 27, 2019)

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.

5.3.4 The residential rent dataset

As discussed in the data description section, the residential rent dataset has some caveats. In this section, I address three issues: 1) 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. 2) The estimated gross income for some rental buildings is missing from the NOPVs for various years due to format changes. And 3) the estimated gross income for rental buildings with commercial units includes commercial rents. As shown in Appendix D.4, none of those data caveats affects the finding that new high-rises decrease nearby residential rents.

6 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 feet 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 feet of a new high-rise completed by the end of 2013. I estimate equation (4):

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

$ln(Price_{it})$ 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 feet 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/unit i. Definitions of $YearSinceCompletion$, $YearSinceApproval$, and $Borough * Year$ are the same as their counterparts in rent estimates.

Column (1) of Table 7 and Figure 9 present the sales prices before and after completions. The sales prices gradually decline right after nearby new high-rises complete.[40] Two years after the completion, the negative impact becomes significant, and persists at this lower level in the following years. Figure 10 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 diffifulty 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. [41]

[40] 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, Dastrup, Ellen, 2016).

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

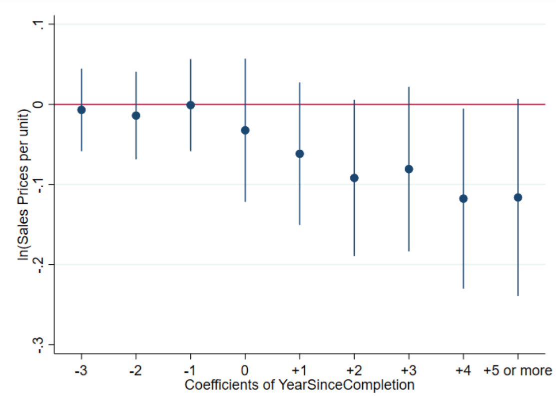
Table 7: Regression results for sales prices

ln(Sales Prices)	(1) Residential properties	(2) Residential properties	(3) 1-5 families	(4) Rental buildings	(5) Co-ops	(6) Condos
3 years before the completion year	-0.00686					
	(0.0271)					
2 years before the completion year	-0.0186					
	(0.0278)					
1 year before the completion year	-0.00556					
	(0.0291)					
0 year after the completion year	-0.0380					
	(0.0463)					
1 year after the completion year	-0.0591					
	(0.0478)					
2 years after the completion year	-0.0943*					
	(0.0510)					
3 years after the completion year	-0.0815					
	(0.0543)					
4 years after the completion year	-0.116*					
	(0.0593)					
5+ years after the completion year	-0.113*					
	(0.0655)					
After		-0.0568***	-0.00674	0.0380	-0.00733	-0.0559*
		(0.0208)	(0.0225)	(0.0544)	(0.0174)	(0.0306)
Constant	13.60***	13.62***	11.02***	7.025*	15.46***	13.24***
	(0.294)	(0.297)	(2.638)	(3.739)	(1.169)	(0.261)
Observations	65,380	65,380	9,347	4,023	12,920	39,090
R-squared	0.322	0.321	0.416	0.193	0.328	0.167
Number of census tracts	575	575	475	447	216	283

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

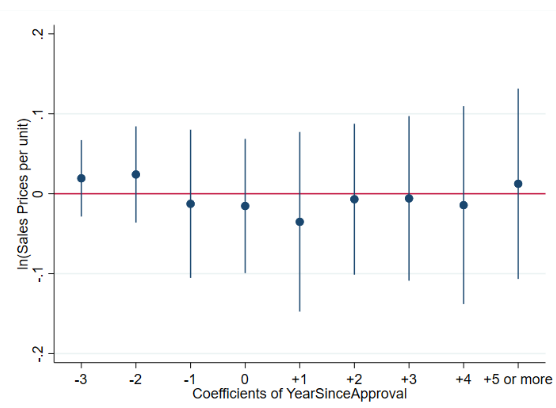
Note: This table shows regression results for equation (4) and equation (5). Census tract dummies, building class dummies, building age, gross square feet, the number of floors , $Borough * Year$, $YearSinceAppoval$ dummies are controlled. Standard errors are clustered by census tract.

Figure 9: Sales prices before and after completions



Note: 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 $YearSinceApproval$ are controlled. Standard errors are clustered by census tract.

Figure 10: Sales prices before and after approvals



Note: 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 $YearSinceCompletion$ are controlled. Standard errors are clustered by census tract.

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:

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

Regression results for equation (5) are shown in Columns (2)-(6) of Table 7. Two years after completions, nearby residential property sales prices decrease by 5.7%, and price reductions concentrate on condos. 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.[42] As for rental buildings, the number of transactions (4,023) is too small to estimate the impact accurately, as there are 532 independent variables in the regression.

The 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.[43]

To better interpret the magnitude of new condo impacts within 500-foot buffers on condo sales prices. I estimate the condo sales price elasticity with respect to new condo units in appendix E.2. For every 10% increase in condo stocks, condo sales prices decrease by 0.9%, which is not significantly different from the estimated rent elasticity.

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

[43] 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 E.1, after I restrict the samples, the results are consistent with Table 7.

7 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 paper, 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 feet 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 feet 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 equation (6):

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

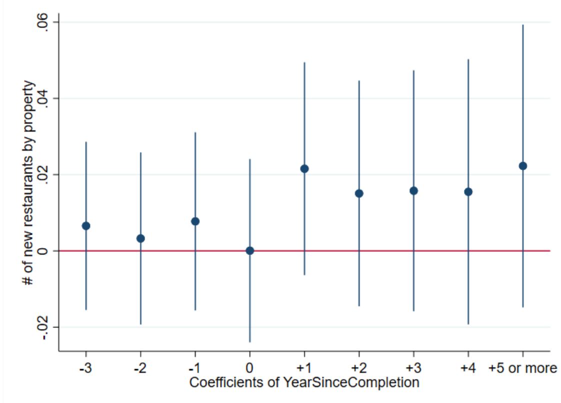
$Openings_{it}$ is the count of new restaurants in property i and year t. Definitions of $YearSinceCompletion$, $YearSinceApproval$, and $Borough * Year$ are the same as their counterparts in the previous analysis.

Figure 11 presents the regression results. 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 feet.[44]

I present that new high-rises do not affect the probability of closures for existing restaurants using a hazard model in Appendix F.1. Appendix F.2 shows that the completion

[44] 0.016 is the coefficient for $Post$ when I estimate $Openings_{it} = \alpha + \beta Post_{it} + \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) + \delta Borough_i * Year_t + \mu_i + \varepsilon_{it}$. 9% is the coefficient for $Post$ using the Poisson model. I calculate 0.11 as the treatment effect (0.016)*Number of properties (6358)/Number of completed new high-rises (916).

Figure 11: New restaurants regression results



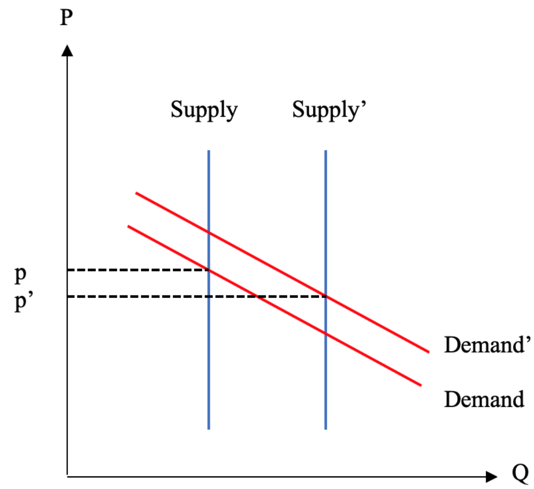
Note: This figure shows regression results for equation (6), indicating the estimated count of new restaurant before and after the completion year. The number of observations is 69,938, and the number of properties is 6,358. Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval$ are controlled.

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.

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 (Couture and Handbury, 2017; Glaeser, Kim, and Luca, 2018; Meltzer and Capperis, 2017).[45] However, residential rents and residential property sales prices still fall on net, presumably because the supply effect dominates the amenity effect as illustrated in Figure 12.

[45]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.

Figure 12: Supply and demand curves for the local housing market



Note: The completion of new high-rises increase local housing supply, shifting the supply curve to the right. At the same time, new high-rises bring in high-income households and new amenities, driving up the willingness to pay and shifting up the demand curve. Because the supply effect outweighs the amenity effect, the price decreases on the net.

8 Conclusion

In this paper, I restrict the sample to residential properties within 500 feet of approved new high-rises, and use an 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 and condo sales prices to decrease because new housing units alleviate demand pressure on existing housing units. 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.

This paper suggests 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.[46]

[46] This does not necessarily indicate market-rate development in itself will solve housing affordability crisis.

Reference

Asquith, Brian, Evan Mast, and Davin Reed. “Does Luxury Housing Construction Increase Nearby Rents?” (2019)

Aguirre, A., Benke, D., Neugebauer, M., and Santiago, R., “CityView: For East New Yorks Housing Crunch, Supply is not the Solution.” CityLimits (2016)

Anenberg, Elliot, and Edward Kung. “Can more housing supply solve the affordability crisis? Evidence from a neighborhood choice model.” Regional Science and Urban Economics (2018)

Anenberg, Elliot, and Edward Kung. “Estimates of the size and source of price declines due to nearby foreclosures.” American Economic Review 104.8 (2014): 2527-51.

Atta-Mensah, A. “CityViews: Major Community Group Rejects de Blasios East Harlem Rezoning.” CityLimits, (2017).

Baum-Snow, Nathaniel, and Justin Marion. “The effects of low income housing tax credit developments on neighborhoods.” Journal of Public Economics 93.5-6 (2009): 654-666.

Baum-Snow, Nathaniel, and Daniel A. Hartley. ”Accounting for central neighborhood change, 1980-2010.” (2016).

Been, Vicki, Ingrid Gould Ellen, and Katherine ORegan. “Supply Skepticism: Housing Supply and Affordability” Housing Policy Debate, 2019.

Bonislawski, Adam. “These homes have the best views in New York City” New York Post (2017)

Boustan, Leah Platt, Margo, Robert A., Miller, Matthew M., Reeves, James M., Steil, Justin P. “Does Condominium Development Lead to Gentrification?” NBER Working Papers No. 26170 (2019)

Bunten, Devin. “Is the Rent Too High? Aggregate Implications of Local Land-Use Regulation.” (2017).

Chan, Sewin, Samuel Dastrup, and Ingrid Gould Ellen. ”Do Homeowners Mark to Market? A Comparison of SelfReported and Estimated Market Home Values During the Housing

Boom and Bust." Real Estate Economics 44.3 (2016): 627-657.

Campbell, John Y., Stefano Giglio, and Parag Pathak. "Forced sales and house prices." American Economic Review 101.5 (2011): 2108-31.

Chew, Amee "Here is what we actually know about new development and displacement", Shelterforce, (2018)

Couture, Victor, and Jessie Handbury. "Urban revival in America, 2000 to 2010" No. w24084. National Bureau of Economic Research, 2017.

Diamond, Rebecca, and Timothy McQuade. "Who wants affordable housing in their backyard? An equilibrium analysis of low income property development". Journal of Political Economy, forthcoming

DiPasquale, Denise. "Why don't we know more about housing supply?" The Journal of Real Estate Finance and Economics18.1 (1999): 9-23.

Ellen, Ingrid Gould, et al."Does federally subsidized rental housing depress neighborhood property values?." The Journal of the Association for Public Policy Analysis and Management 26.2 (2007): 257-280.

Florida, Richard "How Housing Supply Became the Most Controversial Issue in Urbanism" Citylab (2019)

Furman Center. "New York City Multi-family Rental Housing and the Market Downturn" (2010)

Furman Center. "Mapping Affordable Housing Supported by the 421-a Tax Exemption Program" (2016a)

Furman Center. "Focus on Gentrification" (2016b)

Forsyth, Ann. "Measuring density: working definitions for residential density and building intensity." Design Brief 9.1 (2003): 2-8.

Gallin, Joshua, and Randal J. Verbrugge. "A Theory of Sticky Rents: Search and Bargaining with Incomplete Information." Journal of Economic Theory (2019).

Ganong, Peter, and Daniel Shoag. "Why has regional income convergence in the US declined?." Journal of Urban Economics 102 (2017): 76-90.

Genesove, David, and Christopher Mayer. "Loss aversion and seller behavior: Evidence from the housing market." The quarterly journal of economics 116.4 (2001): 1233-1260.

Gerardi, Kristopher, et al. "Foreclosure externalities: New evidence." Journal of Urban Economics 87 (2015): 42-56.

Glaeser, Edward L., Hyunjin Kim, and Michael Luca. "Nowcasting gentrification: using yelp data to quantify neighborhood change." AEA Papers and Proceedings. Vol. 108. 2018.

Glaeser, Edward L., Joseph Gyourko, and Raven E. Saks. "Why have housing prices gone up?." American Economic Review 95.2 (2005a): 329-333.

Glaeser, Edward L., Joseph Gyourko, and Raven Saks. "Why is Manhattan so expensive? Regulation and the rise in housing prices." The Journal of Law and Economics 48.2 (2005b): 331-369.

Glaeser, Edward, and Joseph Gyourko. "The economic implications of housing supply." Journal of Economic Perspectives 32.1 (2018): 3-30.

Glaeser, Edward L., and Bryce A. Ward. "The causes and consequences of land use regulation: Evidence from Greater Boston." Journal of Urban Economics 65.3 (2009): 265-278.

Goodman, J. David. "How Much Is a View Worth in Manhattan? Try 11 Million" The New York Times (2019)

Green, Richard K., Stephen Malpezzi, and Stephen K. Mayo. "Metropolitan-specific estimates of the price elasticity of supply of housing, and their sources." American Economic Review 95.2 (2005): 334-339.

Grey, Nolan. "How Luxury Units Turn Into Affordable Housing" Citylab, (2019)

Gyourko, Joseph, and Raven Molloy. "Regulation and housing supply." Handbook of regional and urban economics. Vol. 5. Elsevier, 2015. 1289-1337.

Gyourko, Joseph, and Albert Saiz. "Construction costs and the supply of housing structure." Journal of regional Science 46.4 (2006): 661-680.

Hall Jr, John R. "Manufactured home fires." Quincy, MA: National Fire Protection Association (2005).

Hankinson, Michael. "When Do Renters Behave Like Homeowners? High Rent, Price Anxiety, and NIMBYism." American Political Science Review (2018): 1-21.

Hartley, Daniel. "The effect of foreclosures on nearby housing prices: Supply or disamenity?." Regional Science and Urban Economics 49 (2014): 108-117.

Hsieh, Chang-Tai, and Enrico Moretti. "Housing constraints and spatial misallocation." American Economic Journal: Macroeconomics, forthcoming.

Hughes, C.J. "New Yorks Stalled Residential Construction" The New York Times, (2016)

Lee, Moon Wha. "Housing New York City 2011" (2013)

Lens, Michael C. and Paavo Monkkonen "Do Strict Land Use Regulations Make Metropolitan Areas More Segregated by Income?" Journal of the American Planning Association 82(1): 6-21. (2016)

Mast, Evan. "The Effect of New Luxury Housing on Regional Housing Affordability", Working paper, 2018

Mayer, Christopher J., and C. Tsuriel Somerville. "Residential construction: Using the urban growth model to estimate housing supply." Journal of urban economics 48.1 (2000): 85-109.

Meltzer, Rachel, and Sean Capperis. "Neighbourhood differences in retail turnover: Evidence from New York City." Urban Studies 54.13 (2017): 3022-3057.

Mian, Atif, Amir Sufi, and Francesco Trebbi. "Foreclosures, house prices, and the real economy." The Journal of Finance 70.6 (2015): 2587-2634.

Monkkonen, Paavo, and UC Center Sacramento. "Understanding and Challenging Opposition to Housing Construction in Californias Urban Areas." Housing, Land Use and Development Lectureship and White Paper (2016).

Oliva, Simeon. "The effects of waterfront development on housing prices: the case of

Eastern Baltimore" Diss. 2006.

Pearsall, Hamil. "From brown to green? Assessing social vulnerability to environmental gentrification in New York City."Environment and Planning C: Government and Policy 28.5 (2010): 872-886.

Pollak, Michael. "Knowing the distance." The New York Times, (2006)

Piazzesi, Monika, Martin Schneider, and Johannes Stroebel. "Segmented housing search". American Economic Review, 2019.

Rodríguez-Pose, Andrés, and Michael Storper. "Housing, urban growth and inequalities: the limits to deregulation and upzoning in reducing economic and spatial inequality." Urban Studies (2019)

Rosenthal, Stuart S. (2014) "Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a Repeat Income Model" American Economic Review 104(2): 687706.

Rosenthal, Linda. "Why We Must End Vacancy Decontrol to Save Rent-Regulated Housing" Citylimits.org (2015)

Satow, Julie. "Living in the Mix" The New York Times (2014)

Schuetz, Jenny, Vicki Been, and Ingrid Gould Ellen. "Neighborhood effects of concentrated mortgage foreclosures." Journal of Housing Economics 17.4 (2008): 306-319.

Solomont, E.B, and Bockmann, Rich. "The dirt gathers rust: All over NYC, projects are in limbo." The Real Deal (2017)

Toy, Vivian S. "Views You Wont Lose" The New York Times (2007)

Tu, Yong. "The local housing sub-market structure and its properties." Urban Studies 34.2 (1997): 337-353.

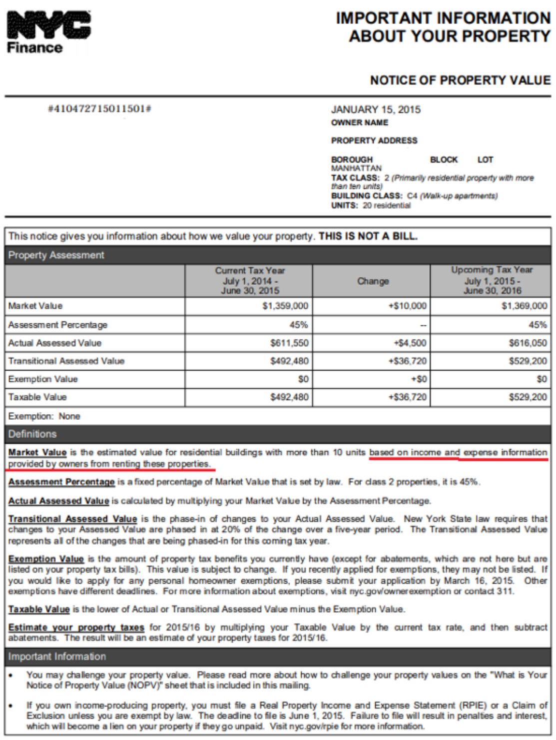
Turner, Matthew A, Andrew Haughwout, Wilbert van der Klaauw. 2014. "Land Use Regulation and Welfare." Econometrica 82(4): 13411403.

Zahirovich-Herbert, Velma, and Karen M. Gibler. "The effect of new residential construction on housing prices." Journal of Housing Economics 26 (2014): 1-18.

Appendix

A. Data Sources

A.1: Notice of Property Value



NYC Finance

IMPORTANT INFORMATION
ABOUT YOUR PROPERTY

NOTICE OF PROPERTY VALUE

#410472715011501#

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:

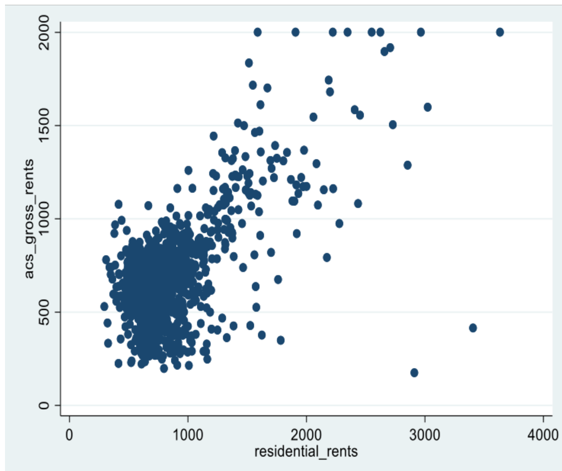
Number of Buildings:	1	Gross Square Footage:	9,750
Number of Stories:	5.00	Number of Residential Units:	20
Structure Type:	Walkup Apt	Gross Residential Sq. Footage:	9,750
Grade:	B Grade	Number of Commercial Units:	0
Construction Type:	Masonry	Gross Commercial Sq. Footage:	0
Year Built:	1925	Primary Zoning: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

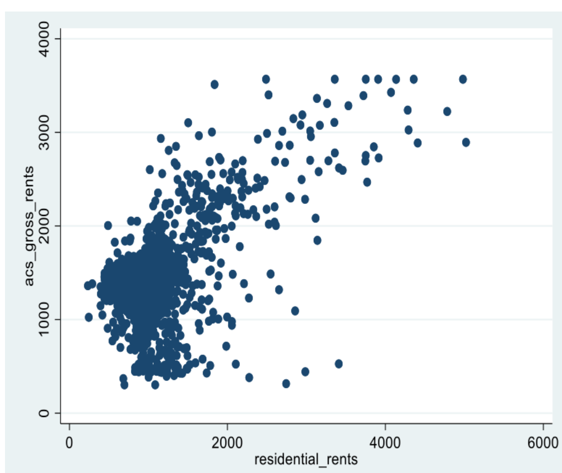
Note: Address and owner information is erased due to privacy reasons. The Notice of Property Value is mailed in January by the Department of Finance, informing the property owner of the property assessment for the coming tax year.

A.2: 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 five-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

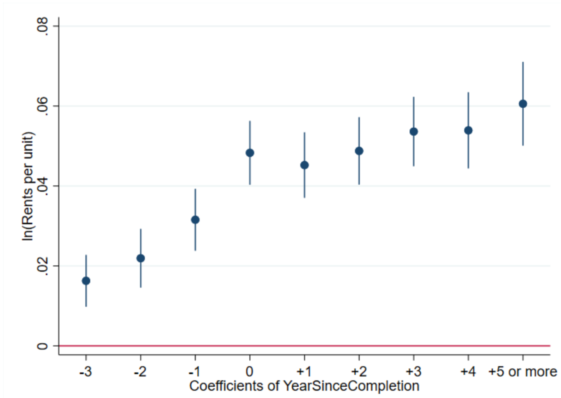
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: *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: Compare the 500-foot buffer to the rest of NYC

I estimate the following equation using the whole sample of NYC rental buildings with more than five units, except for rental buildings completed after 2002. The figure shows the regression result and confirms that new high-rises are built in areas with growing rents.

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

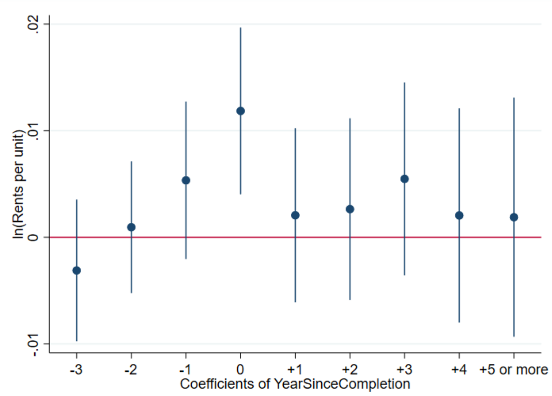


Note: The figure shows estimated rent changes before and after the completion year using the whole sample. The number of observations is 488,328; the number of properties is 53,273; and the R-squared is 0.242. Property fixed effects and $Borough * Year$ dummies are controlled. Standard errors are clustered by property.

B.3: Compare the inner circle to the outer ring

I estimate the following equation (the equation is as the same as Appendix B.2) using rental buildings within 1000 feet of completed new high-rises, except for rental buildings completed after 2002. The figure shows the regression result and confirms that residential rents in the inner circle (500 feet) grow faster than residential rents in the outer ring (500-1000 feet) before the completion of new high-rises.

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



Note: The figure shows estimated rent changes before and after the completion year using residential properties within 1000 feet of completed new high-rises. The number of observations is 218,121; the number of properties is 23,107; and the R-squared is 0.281. Property fixed effects and $Borough * Year$ dummies are controlled. Standard errors are clustered by property.

C. Descriptive Statistics

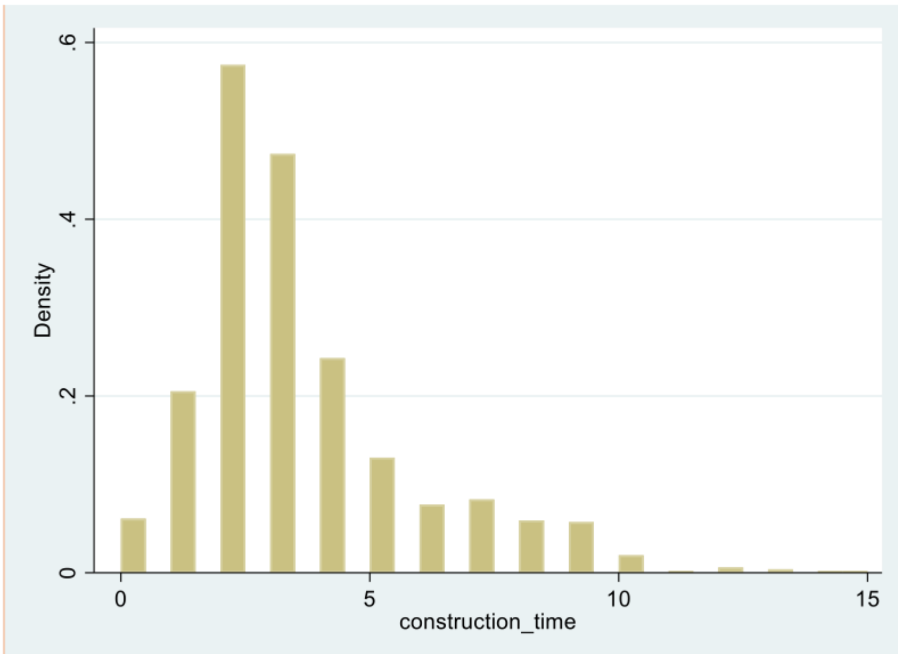
C.1: Completion Percentages by Year

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%

C.2: Distribution of Construction Times

Using the 2000-2010 NYC Building Permit dataset and 2000-2017 NYC Certificate of Occupancy dataset, this figure shows the distribution for the construction time (the completion year minus the approval year).

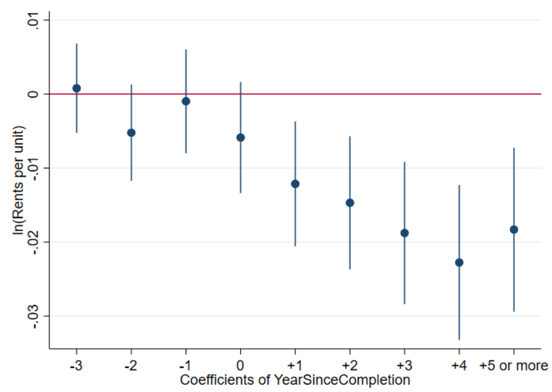


	Percentiles	Smallest		
1%	0	0		
5%	1	0		
10%	1	0	Obs	1,054
25%	2	0	Sum of Wgt.	1,054
50%	3		Mean	3.4416
		Largest	Std. Dev.	2.292254
75%	4	13		
90%	7	13	Variance	5.254428
95%	8	14	Skewness	1.377155
99%	10	15	Kurtosis	5.116062

D. The Impact on Residential Rents

D.1: Weighted least squares regression results

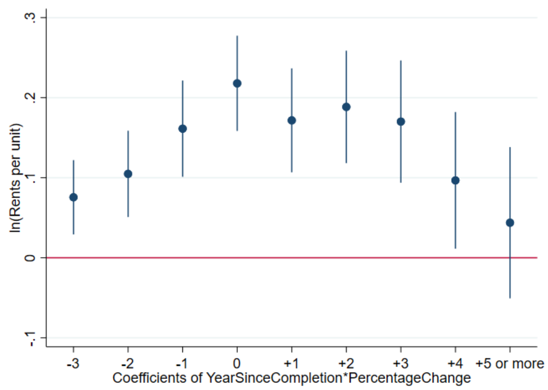
The following figure shows the coefficients for $YearSinceCompletion$ when I estimate equation (1) weighted by the number of units for rental buildings. The result is consistent with the ordinary least squares regression result.



Note: 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. Standard errors are clustered by property. The number-of-unit outliers (top 1.5%; the cutoff is 200) are dropped.

D.2: Not Controlling for $YearSinceApproval * ProposedPercenetageChange$

The following figure shows the coefficients of $YearSinceCompletion*PercenetageChange$ when I estimate equation (2) without controlling for $YearSinceApproval*ProposedPercentageChange$. 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 $YearSinceApproval * ProposedPercentageChange$ is important.



Note: The number of observation is 126,113; the number of properties is 13,512; and the R-square is 0.28. Property fixed effects and $Borough * Year$ dummies are controlled. Standard errors are clustered by property. $PercentageChange$ outliers (the cutoff is 100%) are dropped.

D.3: 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 2013 rent per unit in its census tract.

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

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

Note: $NewBuilding$ 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.

D.4: Robustness checks regarding data caveats

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

ln(Rents)	(1) RPIE required	(2) eight or more available years	(3) 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)
Observations	89,494	120,449	69,836
R-squared	0.298	0.288	0.274
Number of properties	9,336	12,011	7,691

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows robustness checks for equation(3). Property fixed effects, $Borough * Year$ dummies, and $YearSinceApproval * ProposedPercentageChange$ are controlled. Standard errors are clustered by property. $ProposedPercentageChange$ outliers (the cutoff is 100%) are dropped.

E. The Impact on Sales Prices

E.1: 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.

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)
Observations	58,177	4,682	2,818	11,587	39,090
R-squared	0.308	0.430	0.194	0.330	0.167
Number of census tracts	283	233	245	171	283

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: 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.

E.2: 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 feet of condo unit i by the number of existing condo units within 500 feet of condo unit i.[47]. $CondoProposedPercentageChange_i$ is calculated by dividing the proposed number of condo units within 500 feet of condo unit i by the number of existing condo units within 500 feet of condo unit i.

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

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

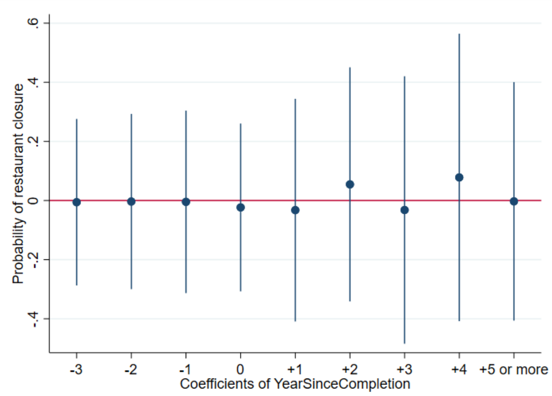
[47] I use 2002 PLUTO to measure the existing condo stock, and the average percentage increase is 20%.

F. The Impact on Restaurant Openings

F.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 5,245 restaurants operating in 2002 that are within 500 feet of new high-rises that received approved Building Permits between 2000 and 2010. Restaurants belonging to a census tract without any restaurant within 500 feet 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 probabilitty of closures for existing restaurant.

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



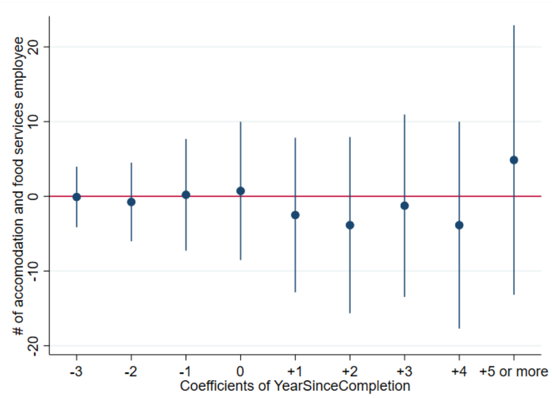
Note: I is 1 if the approved new high-rise within 500 feet of restaurant i is completed by 2013. $Chain$ is a dummy variable indicating whether the food service belongs to a chain. $Employee$ measures the number of employees at the food service. $YearSinceApproval$ dummies are controlled. The estimation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

F.2: The impact on number of jobs

I use LEHD Origin-Destination Employment Statistics (LODES) to measure the number of jobs in accomodations 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 feet 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.

$$Jobs_{it} = \alpha + \sum_{\tau \in T} \beta_\tau YearSinceCompletion(\tau)$$

$$+ \sum_{\kappa \in K} \gamma_\kappa YearSinceApproval_{it}(\kappa) + \delta Borough_i * Year_t + \mu_i + \varepsilon_{it}$$



Note: $Jobs_{it}$ is the number of jobs in accomodations and food services in census block i and year t. The number of observations is 8,137, 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.