A Test for Pricing Power in Urban Housing Markets

+

a little bit from

Is the Rent Too High? Land Ownership & Market Power

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Lincoln Institute of Land Policy Urban
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Do Urban Landlords Have Pricing Power?

- Housing is an essential economic choice
- A lot of effort to understand and measure (and maybe improve) this market
- An untested assumption is that housing supply is competitively: $P = MC$
- If that were not true... Smith (1776); Ricardo (1817); Chamberlin (1933)
  1. Pricing power would be a supply constraint
  2. Zoning's costs must be revisited: currently measured as the wedge between P and MC Glaeser Gyourko (2002)
  3. Housing supply and production function estimates are mis-estimated Combes, Duranton, Gobillon (2021), Baum-Snow and Han (2023)
  4. Counterfactuals in models with housing are biased Ahlfeldt, Redding, Sturm, & Wolf (2015); Severen (2021); Brinkman and Lin (2020)

RQ 1: Is pricing power an empirically relevant force in housing?
RQ 2: If present, does this affect how we should think about urban policies?

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Our empirical approach: pass-through test

- We focus on a difference between competitive and noncompetitive markets: pass-through. (Duso and Szücs, 2017; Fabra and Reguant, 2014; Pless and van Benthem, 2019; Loy, Weiss, and Glauben, 2016; Brissimis and Kosma, 2007; Garin and Silvério, 2023)
  - In competitive markets, individual supplier's cost shocks do not affect price
  - Using NYC data, we isolate exogenous variation in costs (taxes) to individual buildings and ask whether cost shocks are passed through to price
- We use two complementary approaches:
  1. DID using a sudden tax procedure change
  2. Synthetic tax IV using annual changes to assessment formulas
- We find evidence that idiosyncratic cost shocks are passed through to rent, **inconsistent with perfectly competitive markets**
- Discuss three possible causes of pricing power: (1) differentiation (2) concentration (3) capacity constraints

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Data Sources

- We collect public data on all NYC buildings from 2007-2019 (PLUTO, FAR, MDRC)
  - Observe: location, ownership, zoning, number of units, lot, renovation year, rent regulations, assessments, age, structure type, avg. unit size
- Scrape NYC DOF for rent and expense data from communication letters ('NOPV') sent to all landlords – IV analysis
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Idiosyncratic Cost Shocks: Perfect Competition case

We can decompose a marginal cost shock into a common component mc_t and a building idiosyncratic component ε_{jmt}

$$\mathrm{d}\ln\left[\mathrm{mc_{jmt}}\right] = \underbrace{\Delta_{mt}}_{\text{Common}} + \underbrace{\varepsilon_{jmt}}_{\text{Idiosyncratic}}$$

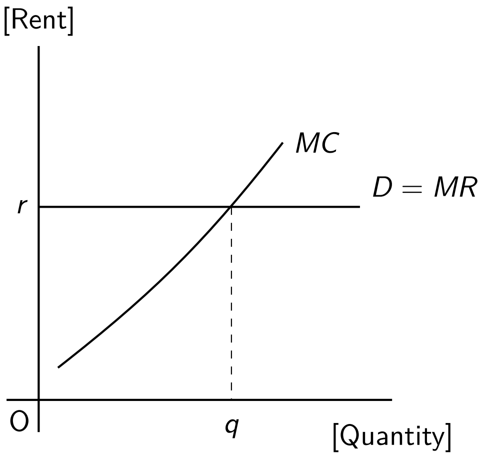

Figure: Pass-through with Perfectly Elastic Demand

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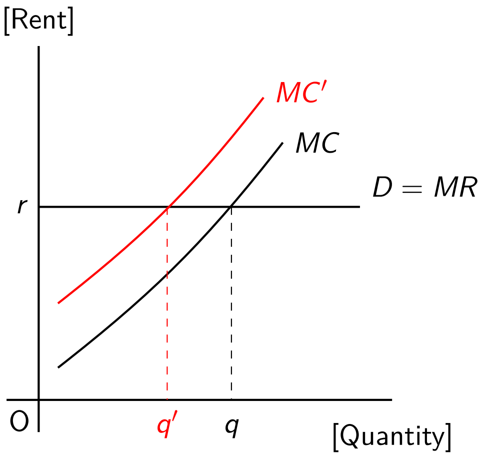
Under perfect competition, the common component of a shock changes the marginal cost for all buildings. This results in a change in quantity at all buildings



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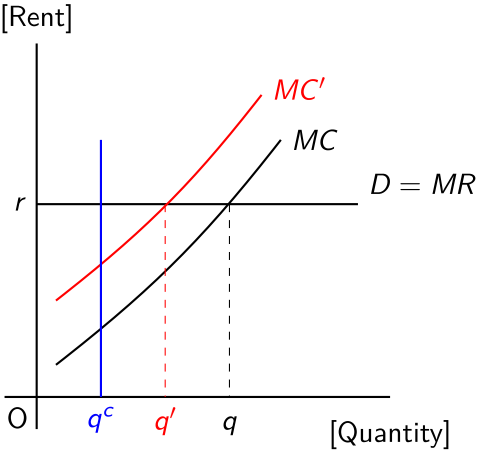

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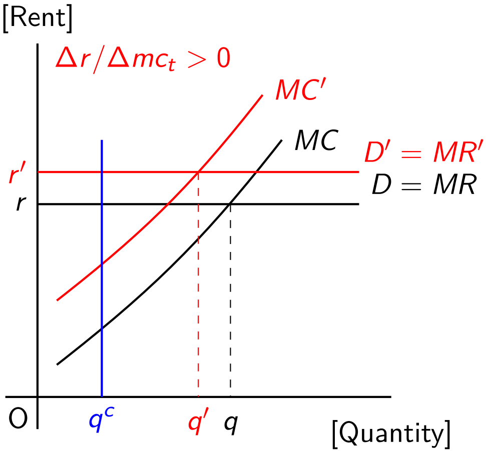
Quantity responses in the same direction aggregate, raising prices through a shift in residual demand.



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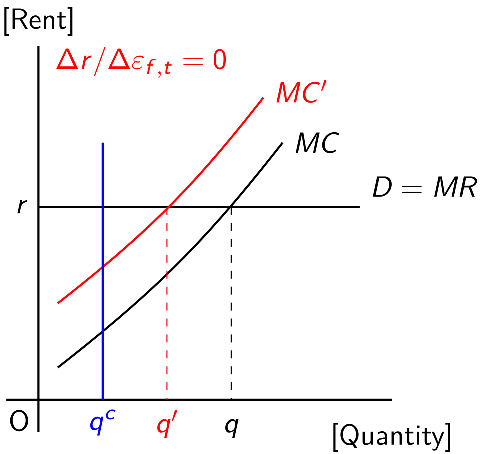
The idiosyncratic component does not aggregate **by construction**, resulting in no price shift.

$$\Delta r/\Delta\varepsilon_{jmt} = 0 \tag{1}$$



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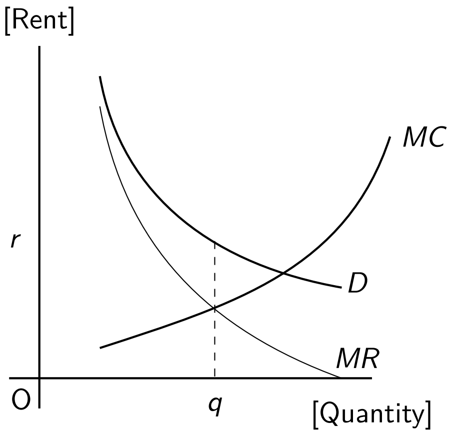

Figure: Pass-through with Downward Sloping Demand

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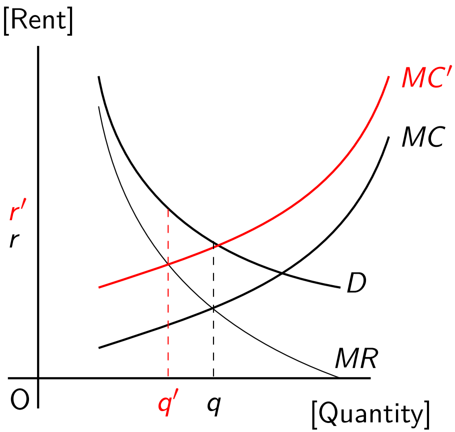
When demand is finite-elastic, the common component operates similarly by eliciting quantity (and price) responses



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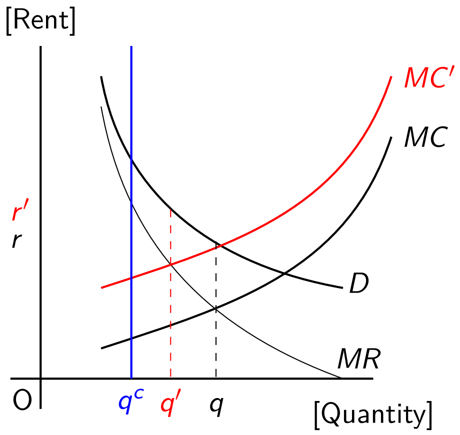
When demand is finite-elastic, the common component operates similarly by eliciting quantity (and price) responses unless constraints bind.



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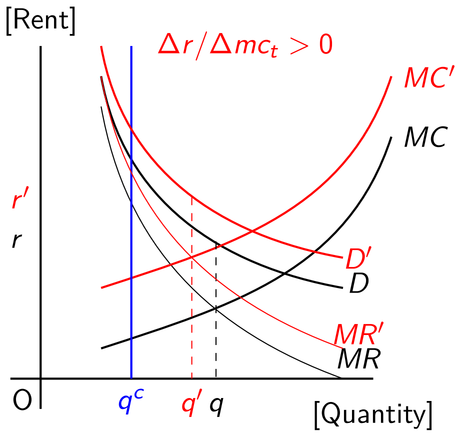
Again, individual responses aggregate and affect residual demand as well.



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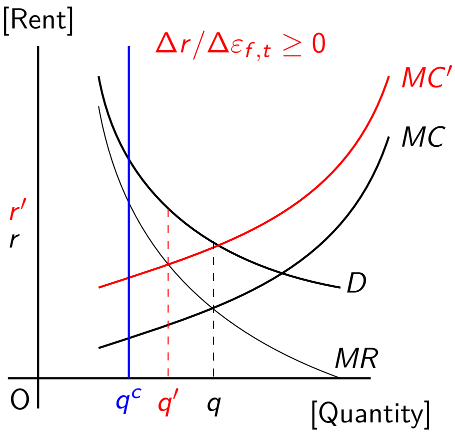
However, unlike before, the idiosyncratic component **does** generate an price response for the given building

$$\Delta r / \Delta \varepsilon_{jmt} \geq 0 \quad (2)$$



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Specifications

Start with hypothetical regression of rent on costs with fixed effects:

$$\ln(r_{jmt}) = \beta \cdot \ln(mc_{jmt}) + \Lambda_j + \Lambda_{mt} + U_{jmt} \tag{3}$$

$$\rightarrow \mathrm{d}\ln(r_{jmt}) = \beta \cdot \mathrm{d}\ln(mc_{jmt}) + \lambda_{mt} + u_{jmt} \tag{4}$$

$$= \beta \cdot [\Delta_{mt} + \varepsilon_{jmt}] + \lambda_{mt} + u_{jmt} \tag{5}$$

$$= \beta \cdot \varepsilon_{jmt} + \tilde{\lambda}_{mt} + u_{jmt} \tag{6}$$

$\tilde{\lambda}_{mt}$: market-time FE absorbs common shock

... however, cannot be sure $\mathrm{Cov}(u, \varepsilon) = 0$

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Approach 1: Small Building Reform

We use an unannounced 2011 change in the tax calculation for 4-5 unit buildings relative to 6-9 unit buildings, both Tax Class 2

- Prior to 2011:
  - 4-5 market value from comparable sales
  - 6-10 market from from 'income capitalization' GIM method
- In 2011, "on the advice of counsel," NYC harmonized method to use GIM for all
- NYC Auditor found reform did not provide a way for owners to anticipate the change, and reported a 47% drop in per unit tax liability

We compare change in rents of (4-5) to (6-9) unit buildings

Key assumption: [weak] common market-level fluctuations (including overall impact of policy); [strong] 4-9 unit buildings in 'same market'

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For two sets of buildings, $\{T = (4-5), C = (6-9)\}$ in m, where only one is shocked: $\varepsilon^T < 0$ and $\varepsilon^C = 0$

$$
\begin{aligned}
&\mathrm{d}\ln(r^T_{jmt}) - \mathrm{d}\ln(r^C_{jmt}) && (7)\\
&= \left(\beta \cdot \mathrm{d}\ln(mc^T_{jmt}) + \mathrm{d}\lambda_{mt} + u^T_{jmt}\right) - \left(\beta \cdot \mathrm{d}\ln(mc^C_{jmt}) + \mathrm{d}\lambda_{mt} + u^C_{jmt}\right) && (8)\\
&= \left(\beta \cdot \left[\Delta_{mt} + \epsilon^T_{jmt}\right] + \mathrm{d}\lambda_{mt} + u^T_{jmt}\right) - \left(\beta \cdot \left[\Delta_{mt} + \epsilon^C_{jmt}\right] + \mathrm{d}\lambda_{mt} + u^C_{jmt}\right) && (9)\\
&= \beta \cdot \epsilon^T_{jmt} && (10)
\end{aligned}
$$

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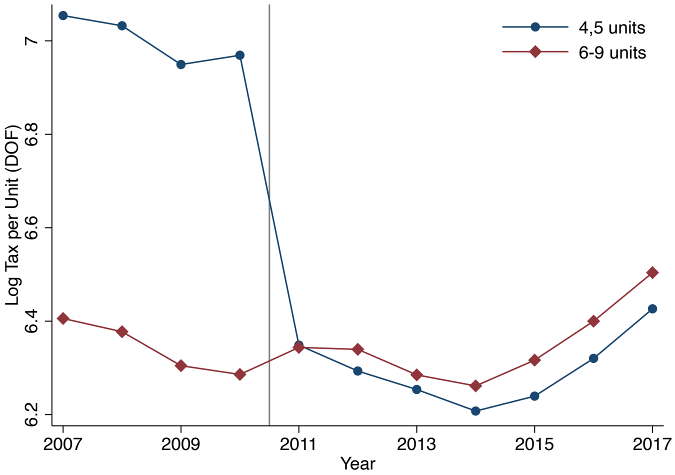

Figure: Change in Property Taxes (NYC NOPV)

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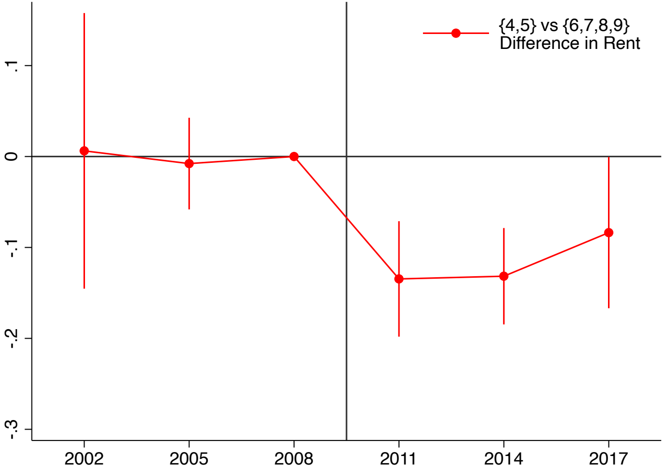

Figure: Change in (log) Unit Rents (NYCHVS)

Approach 1: Small Building Reform

Panel A: Log Assessed Property Tax per Unit			
	(1)	(2)	(3)
$1[t > 2010] \cdot 1[\{4, 5\}]$	-0.66	-0.60	-0.60
	(0.01)	(0.01)	(0.01)
Building Controls	N	N	Y
Tract-year FEs	N	Y	Y
Unique Buildings	54,569	54,445	53,462
Observations	655,853	654,143	653,159

Panel B: Log Unit Rent			
	(4)	(5)	(6)
$1[t > 2010] \cdot 1[\{4, 5\}]$	-0.05	-0.12	-0.12
	(0.04)	(0.03)	(0.02)
Building Controls	N	N	Y
SBA-year FEs	N	Y	Y
Observations	8,259	8,259	8,259

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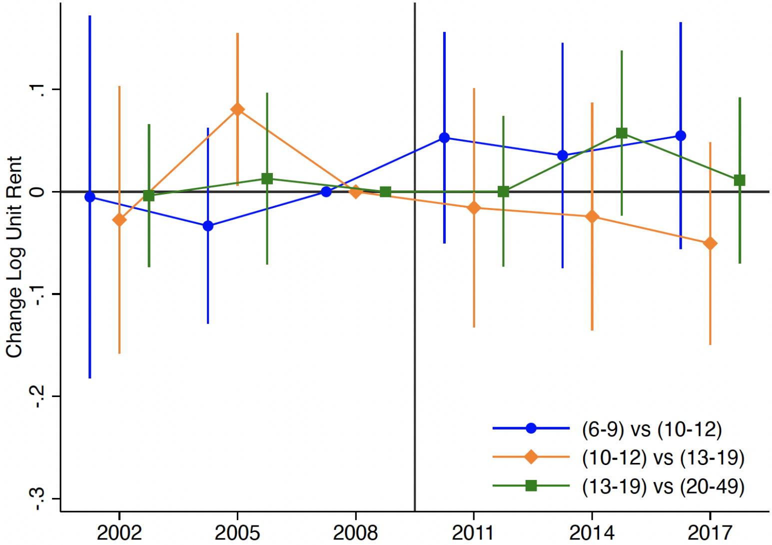

Approach 2: Synthetic Tax IV

We isolate building-level idiosyncratic cost shocks using annual changes in tax formulas for large buildings.

- Post-2010, 11+ unit taxes assessed using building-specific "capitalization rates"
- Building rent information plugged into nonlinear formula:

$$\text{CAP}_{jt} = \alpha_t^0 + \text{GIPSF}_{jt}^{\alpha_t^1} + \alpha_t^2 \cdot \ln[\text{GIPSF}_{jt}], \quad \text{GIPSF}_{jt} = (\text{GI}_{jt}/\text{Sqft}_{jt}) \tag{11}$$

- $\{\alpha\}$ from annual quantile reg. of city-level repeat sales by DOF (eq 11 is not reg)

IV: Synthetic tax IV = annual formula changes + initial (2007) income values:

$$Z_{jt} = \ln\left[(\text{NI}_{j,2007}/(\widehat{\text{CAP}}_{j,2007,t} + \text{ETR}_t)) \cdot \text{ETR}_t)\right] \tag{12}$$

Key assumption: Building and tract-year FEs purge market variation

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We isolate building-level idiosyncratic cost shocks using annual changes in tax formulas for large buildings.

- Post-2010, 11+ unit taxes assessed using building-specific "capitalization rates"
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$$\mathsf{CAP}_{jt} = \alpha_t^0 + \mathsf{GIPSF}_{jt}^{\alpha_t^1} + \alpha_t^2 \cdot \ln[\mathsf{GIPSF}_{jt}], \quad \mathsf{GIPSF}_{jt} = (\mathsf{GI}_{jt}/\mathsf{Sqft}_{jt}) \tag{11}$$

- $\{\alpha\}$ from annual quantile reg. of city-level repeat sales by DOF (eq 11 is not reg)

IV: Synthetic tax IV = annual formula changes + initial (2007) income values:

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Approach 2: Synthetic Tax IV

Panel A: Main Specifications				
	Reduced Form	Reduced Form	2SLS	2SLS
	(1)	(2)	(3)	(4)
Log Cf Tax	0.036	0.028		
	(0.003)	(0.003)		
Log Total Cost			1.196	1.282
			(0.075)	(0.112)
Robust F Stat			69.93	44.23
Robust AR Stat			118.85	86.01
One-Side Test			0.005	0.006
Time-varying controls	N	Y	N	Y
Tract-year FEs	Y	Y	Y	Y
Building FEs	Y	Y	Y	Y
Observations	152,559	152,559	152,559	152,559

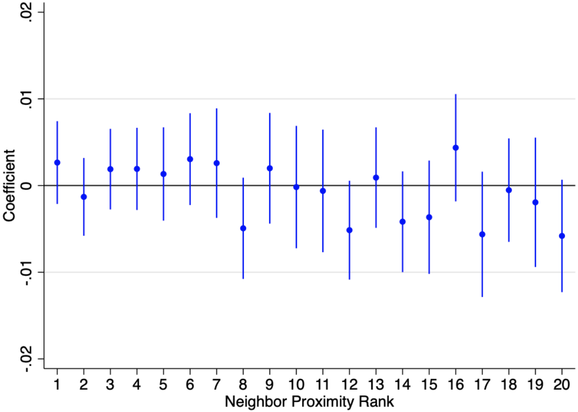
Approach 2: Synthetic Tax IV

Panel B: Alternative Market Specifications Reduced Form

	Subway Dist (1)	Building Age (2)	Yrs Since Renovation (3)	Avg Unit Size (4)
Log Cf Tax	0.027	0.024	0.027	0.025
	(0.003)	(0.003)	(0.003)	(0.003)
Time-varying controls	Y	Y	Y	Y
Building FEs	Y	Y	Y	Y
X-Group-year FEs	Y	Y	Y	Y
Observations	154,254	154,254	154,254	154,254

Approach 2: Synthetic Tax IV

Figure 2: Correlation Between Instrument and the n-th Nearest Neighbor's Rent

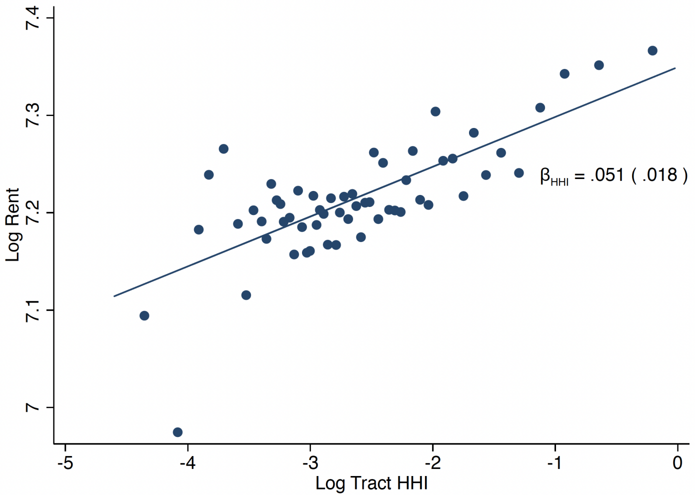


Why

A number of aspects of real estate markets can result in imperfect competition

1. **Differentiation:** Buildings and locations are not perfect substitutes (idiosyncratic commutes, taste for amenities) $\rightarrow$ variation in willingness to pay $\rightarrow$ downward sloping demand Watson & Ziv (2021)
2. **Concentration:** sub-markets may have few owners $\rightarrow$ recent real estate fin work explores this, but lacks formal theory Gurun, Wu, Xiao, & Xiao (2023); Austin (2023)
3. **Costly search and capacity constraints:** together these two realistic elements of housing markets can break Bertrand pricing. Intuition: capacity constraints make threats to capture the full market when competitors raise prices non-credible

Rent-HHI Correlations



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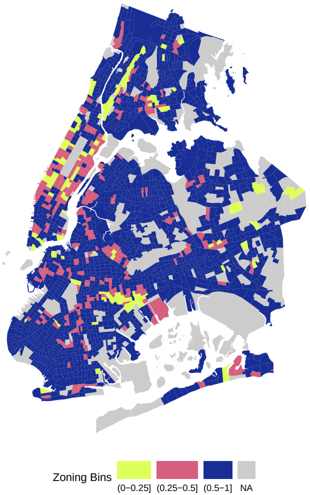
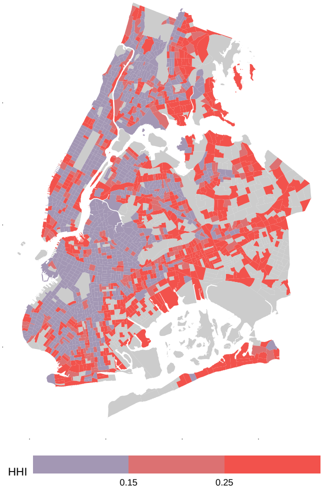
Constraints





Does any of this matter for policy?

Is the Rent Too High?

Unlike the above results, we explicitly model the source of pricing power from product differentiation

- We build a model of housing supply in the presence of pricing power, where
  - Pricing power coexists w/ inelastic short-run supply + policy restrictions
  - Endog. supply distortions: (1) Units are withheld, (2) Buildings are smaller (3) Redevelopments are less frequent
- Assess new policy implications
  1. Development incentives w/ rent commitments can broadly improve welfare
  2. Zoning restrictions increase pricing power *across* buildings
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Theory: Set Up

- **City**: $j \in \mathcal{A}$ discrete buildings with location amenities a_j
- Conceptualize pricing power in the presence of
  - *Short-run* supply constraints: housing is durable, rebuilding to fit demand is costly, landlords' supply may not fit demand
  - *Long-run* constraints: zoning restrictions may impede market clearing at optimal quantities as well
- Three agents:
  - ***Policy-constrained* Developers**: $d \in \mathrm{D}$ own parcels with buildings; can either redevelop (at a cost) or leave as-is and then sell to landlords
  - ***Supply-constrainted* Landlords**: $f \in \mathrm{F}$ bid to buy parcels and the right to lease space to renters
  - **Renters**: $i \in M$ mass of renters with utility defined over consumption and amenities $\rightarrow$ declining (residual) inverse demand for each parcel: $D_a(q_a)$

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Theory: Supply Side

Developer problem:

$$\pi_a^{\mathsf{d}} = \max_{\mathbb{1}_{redev}, q_{a,1}} \begin{cases} s_a(a, q_{a,0}) & \text{if } \mathbb{1}_{redev} = 0 \\ s_a(a, q_{a,1}) - C_a^{\mathsf{d}}(q_{a,1}) + \mathsf{S}_a & \text{if } \mathbb{1}_{redev} = 1 \end{cases}$$

$$\text{s.t. } q_{a,1} \le q_{a,z},$$

Landlord problem:

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Theory: Redevelopment

New monopoly margin of reduced quantity: redevelopment failure

- Redevelopment occurs only if :
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Policy: Redevelopment Subsidies

Prop.1 A subsidy equal to the reconstruction cost paired with an avg. rent ceiling equal to initial rent minus initial average cost is (i) implementable, (ii) reduces local redevelopment failure, and (iii) is locally social welfare improving.

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  - Paired with requirements for below-market rate housing
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Policy: Redevelopment Subsidies, Concentration, and Zoning

Prop.2 Greater zoning constraints on a given building increases monopoly markups at unzoned building

Prop.3 Greater ownership concentration of a given landlord increases monopoly markups of rival landlords

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Prop.3 Greater ownership concentration of a given landlord increases monopoly markups of rival landlords

Conclusion

- Perfect competition is a strongly-held but untested assumption in much of urban economics... conversely, an implicit assumption in recent empirical work on concentration
- We test the null hypothesis of perfect competition via pass-through of tax shocks
- Using two identification strategies, we show evidence of significant pass-through of idiosyncratic costs onto rents that is **inconsistent with perfect competition**
  - Results require isolating idiosyncratic variation, control for market-level fluctuations
  - Robustness: multiple identification strategies, placebo tests, alternative market definitions, different sets of controls and samples
- Consequences: pricing power is a supply constraint; estimates of zoning's effects/costs, housing supply curve estimates, housing production function estimates, and spatial counterfactuals all must be revisited.

Appendix

Other evidence for pricing power: HHI, Mark-Ups

2. Rent-HHI Correlations

Measures association between *rival* ownership concentration and own rents

- Prop.3 predicts that coefficient is positive
- Leave-Out HHI in Census tract ≈ concentration *around* building
- Compare 10-year change in concentration: 2009 vs 2019
- Controls: Tract / Building FEs, plus time-varying features

We find that a 10% increase in rival-HHI leads to 0.5% increase in Avg.Rent

▸ Table

3. Quantification Exercise: Demand Estimation

- Prior literature estimates housing demand elasticity
- Profit max implies building own-price elasticity key to price setting
- Markup set by Lerner / inverse elasticity rule:

$$\frac{r_j - c_j}{r_j} = \frac{-1}{\varepsilon_j} > 0 \tag{13}$$

- This is true only for redeveloped buildings not at a zoning constraint
- Use methods from discrete choice literature to estimate building level demand
  Berry (1994); BLP (1995); Bayer, Ferreira, & McMillan (2007); Ghandi & Houde (2018); Davis et al. (2021)
- Calculate OPEs for all buildings then use unconstrained, newly redeveloped sample to calculate markups

3. Quantification Exercise: Demand Estimation

- Estimation equation from logit demand.

$$\ln[\mathbf{s}_{jbt}] - \ln[\mathbf{s}_{0bt}] = \beta_0 + \beta_1 \cdot X_{jbt} + \alpha_{bt} \cdot \mathbf{r}_{jbt} + \delta_{jbt},$$

  X_{jbt}: average square feet, building age, years since renovation, distance to subway, tract-year FEs, % rent stabilized

- Parameter of interest is α_{bt}: utility parameter on rent $\rightarrow$ OPE
  $\rightarrow$ (for a subset of buildings) Markup over $c_a^d + c_a^f$

- Standard issue is unobserved amenities: $\text{Cov}(r_{jbt}, \delta_{jbt}) \neq 0$

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3. Quantification Exercise: Demand Estimation

- IV: Two sources of rent variation: Rent $=$ Marginal Cost $+$ Markup

  1. Competition: 'BLP instruments' based on rival buildings ▸ Details
  2. Costs: Synthetic tax instrument using assessment procedure changes
  3. Costs: Historic building costs (Barr, 2016)) ▸ Details

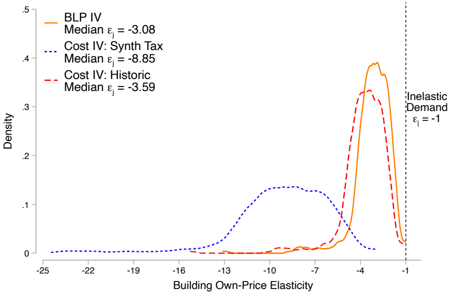
3. Quantification Exercise Results

	OLS (1)	BLP (2)	Tax (3)	Historic Costs (4)
α	1.01	-12.72	-36.61	-14.85
	(0.11)	(2.54)	(2.68)	(2.19)
Robust F Stat	-	57.54	233.15	33.50
Robust AR Stat for Rent	-	56.81	1468.04	101.59
Observations	354,435	354,435	183,210	336,139
Med(ε_{jbt})	0.18	-2.22	-6.40	-2.60
Med(ε_{jbt} | Unconst., New)	0.24	-3.08	-8.85	-3.59
Pct Elastic	0.00%	1.00%	1.00%	1.00%
Med(L_{jbt} | Unconst., New)	0.00	0.33	0.11	0.28
Avg(ε_{bt}^{Agg})	0.05	-0.59	-1.70	-0.69

3. Quantification Results: OPEs & Markups

Figure: Distribution of Results

(a) Own-Price Elasticity



(b) Markup as a Percent of Rent

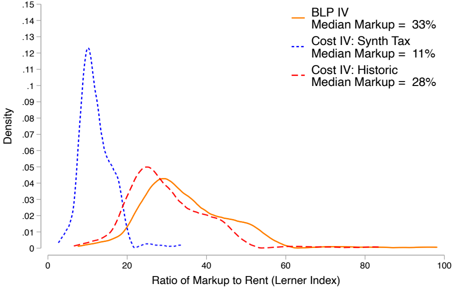


Table A5: Additional Demand Estimation Results

	OLS (1)	IV: BLP (2)	IV: TAX (3)	IV: Historic (4)
ε	0.33	-4.2	-9.6	-2.4
	(0.03)	(0.53)	(0.87)	(0.75)
Wald F Stat	–	15.0	149.0	15.9
AR Stat for Log Rent	–	22.0	1,654.7	130.1

Note: The table displays parameter estimates from log-log demand models. We estimate the (1) OLS regression and three 2SLS regressions using predicted expenses (2) BLP IVs, (3) the counterfactual tax IV, and (4) historic building costs. All models include Census tract-year fixed effects, along with controls for log distance to nearest subway station, log age, log years since renovation, log average unit square-feet, and an indicator for having an elevator. Standard errors are clustered by Census tract and the first stage F statistics and the Anderson-Rubin F statistic for the estimated coefficients are cluster robust as well.

◂ Back