The Price of Inclusion: Evidence from Housing Developer Behavior

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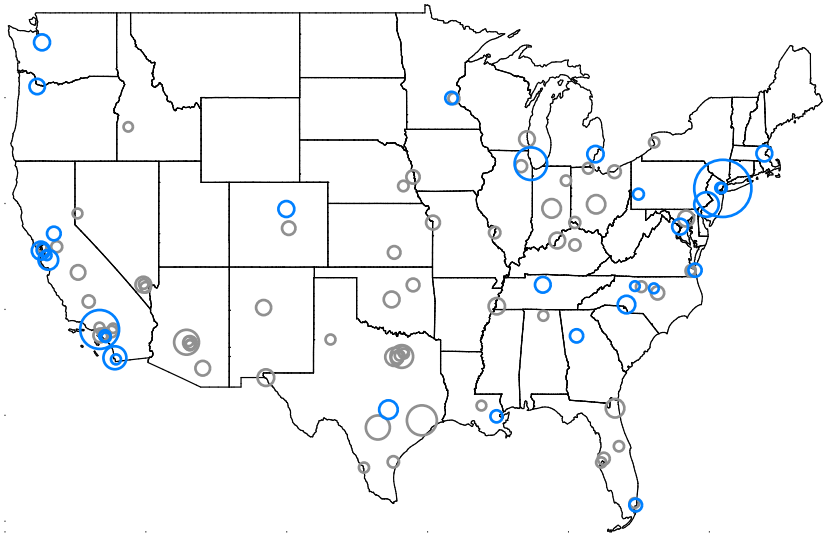
July 2022

Inclusionary Housing 101

- Mandate or incentive (subsidy, zoning rights, etc.) for mixed-income housing
- Developers reserve *share* of units for low-income HHs at below-market rent
  - E.g.: 20% of units for 25-year exemption of building from property taxation
- Policy motive: social integration
  - Typical IH unit is in a higher-income neighborhood vs. other housing programs

- **Core economic issue of voluntary IH:** developer participation constraint
  - Developers only participate if profitable
  - But government wants most/best units at minimum fiscal cost

IH in the 100 Most Populous U.S. Municipalities in 2020



IH in 2000

This Paper

How cost-effective is voluntary inclusionary housing (421-a) in New York City?

3 contributions:

1. Develop and estimate microeconometric model of housing developer behavior
2. Use estimates to analyze the supply and marginal fiscal cost of inclusionary units
3. Explain cost differences versus LIHTC and Section 8, and estimate MVPF of 421-a

Summary of Results

1. **421-a is very costly on the margin**
   - Citywide average marginal fiscal cost per inclusionary unit: **$1.6 million**
   - Average fiscal cost is **3x** more than LIHTC & Section 8 units in NYC

2. **High costs reflect fundamental policy trade-off between cost and quality**
   - 421-a's cost premium versus LIHTC & Section 8 **mostly explained by neighborhood**
   - High developer breakevens, not high incidence on developer profit

3. **421-a is an "opportunity bargain" in some areas but is not cost-effective in others**
   - Neighborhood-specific MVPFs of 421-a range from **zero to infinity**
   - Variation in **costs and benefits both important** to MVPF variation

Prior Literature

- Housing supply responses to tax subsidies, especially LIHTC

  Susin (2002), Sinai & Waldfogel (2005), Gibbons & Manning (2006), Baum-Snow & Marion (2009), Eriksen & Rosenthal (2010)

- Existing policy evaluation literature of IZ: city-level diff-in-diffs

  Powell & Stringham (2004), Bento et al. (2009), Mukhija et al. (2010), Schuetz et al. (2011), Hamilton (2019)

- Much recent work in housing policies aimed at inclusion and desegregation

  Chyn (2016), Collinson & Ganong (2018), Bergman et al. (2019), Diamond & McQuade (2019), Diamond et al. (2019), Favilukis et al. (2019), van Dijk (2019)

- Estimating regulatory compliance costs via revealed preference

  Pitt & Slemrod (1989), Anderson & Sallee (2011), Kisin & Manela (2016), Cullen & Mansur (2017), Benzarti (forthcoming), Einav et al. (2020)

Overview

1. Policy Background
2. Model
3. Data and Estimation
4. Results
5. Cost-Effectiveness Evaluation

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Policy Mechanics of 421-a

Property tax exemption primarily for buildings with onsite inclusionary units

- $1.6B in tax expenditure in FY 2019 (15% of relevant tax base)
- 4.6 percent of all eligible new residential units are income-restricted due to 421-a

A developer plans to build an apartment building. Do they participate in 421-a?

- *If accept*: Must reserve 20% of units, but get tax exemption
  - Below-market rent set by government
  - Regulated tenant selection: income-restricted, sometimes other conditions
  - Tenants in *unreserved* units: Business as usual
- *If decline*: Business as usual — free to choose rents and tenants for all units

Completions | $ Tax Expenditure | % Tax Expenditure | Schematic Diagrams

Housing Supply At Center of IH Policy Debate

421-a forfeits billions of dollars in public money for minimal public benefit in return …a windfall for real estate developers, with little return for communities.

– Association for Neighborhood and Housing Development

Ultimately, however, MIH reflects a fundamental failure to recognize that inclusionary housing is always voluntary. No development occurs without the expectation of a threshold rate of return on investment.

– Eric Kober (former senior official, NYC Department of City Planning)

Measurement of 421-a Tax Incentive

421-a incentive is the present discounted value of tax savings as a share of building value:

$$\Delta\tau_i = \frac{\text{PDV}_{i,0}}{V_{i,0}} = \mathrm{E}_0\left[\sum_{s=0}^{\infty} \frac{\tau_{i,s}^0 - \tau_{i,s}^1}{(1+\rho)^s}\right]$$

$\tau_{i,s}^1$ and $\tau_{i,s}^0$ = building i's tax rate in year s if it respectively accepts or rejects 421-a.

$\rightarrow$ Obtain from newly-built microsimulation model of NYC property tax code

Ideal measure of incentive: Δ profits between accepting and next best alternative

1. Restrict developers' price expectations
2. Restrict their choice set: Only accept or reject 421-a, no other margins

$\rightarrow$ Will later try to convince you that #2 is not an egregious oversimplification

Sources of Variation in 421-a Tax Incentive

Policy reforms:

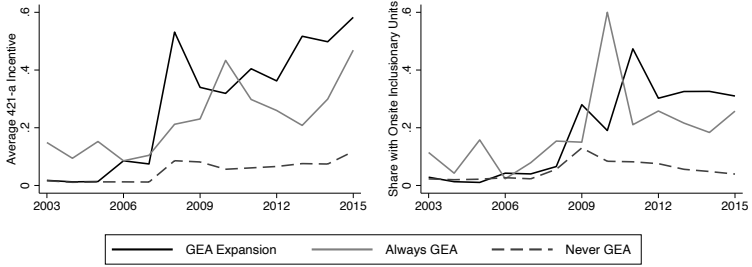
- **GEA Expansion**: Region of NYC ("GEA") w/ different tax regime expands in 2007
- **"As-Of-Right" Curtailment**: In "NPP" regions of NYC until 2008, buildings 421-a eligible even w/o inclusionary units $\rightarrow$ tax subsidy eliminated or capped

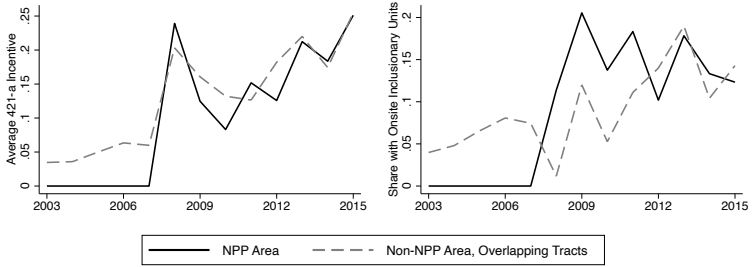
Idiosyncratic variation in assessment:

- **Assessment Growth Caps**: assessed-value growth cannot exceed caps, which vary by building type, binding for some buildings but not others
- **Condo Underassessment**: DOF uses biased estimates of condo market values, as required under law to benchmark condos against rentals

Calculation | Further Details | Duration of 421-a Incentive

Supply Responses to Two Changes in 421-a Incentives





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Model Preliminaries

- The developer of a building *i* maximizes profit π_i. Two considerations:
  - PDV of tax savings
  - PDV of foregone rental income
- Sole decision is over 421-a participation: No intensive margin or rent-setting power
  - Binding zoning rules mean construction is essentially predetermined
  - In appendix: Model w/ monopolistic competition & intensive margin

Developer's Problem

Developer *i* takes up 421-a if it is profitable to do so:

$$D_i = 1[\Delta\pi_i \geq 0]$$

Take-up condition: Value of tax savings must exceed foregone rental income

$$\Delta\tau_i \geq \lambda\mu_i + (1 - \lambda)\delta_i$$

- $\Delta\tau_i$: 421-a tax incentive, expressed in p.p. of building's market value
- $\lambda \in [0, 1]$: Inclusionary share of units
- μ_i: Log diff in rent, market-rate units versus inclusionary units
- δ_i: Log diff in rent on market-rate units, due to presence of inclusionary units

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Data

Observe all 421-a eligible multifamily residential construction, 2003–2015, in NYC:

- **Property Tax Assessments** (DOF)
  - Scraped and digitized raw PDF tax assessments of all new construction
    $\rightarrow$ administrative codes that record inclusionary housing provision
- **Land-Use Records** (DCP)
  - Detailed information on zoning, lot characteristics, land value
- **Building Permits** (DOB)
  - Key filing date for 421-a eligibility as well as identity of developer
- **Neighborhood Characteristics** (2010 Census / 2013–2017 ACS)
  - Census block & block-group data on poverty rate, HH income, composition by race/ethnicity/education/age, commuting mode shares, vacancy rate, etc.

ASSESSMENT ROLL 2016-2017
City of New York

Taxable Status Date: January 5, 2016

Parcel Information

Owner Name
110 CORONA LLC

Property Address and Zip Code
11017 CORONA AVENUE 11368

Real Estate Billing Name and Address
110 CORONA LLC
110-17 COR ONA AVENUE
FLUSHING NY 11368

Borough: Queens
Block: 2011
Lot: 36

Tax Class: 2
Building Class: D1

Land Information

Lot Size	Irregular	Corner
72.37 FT x 112.44 FT	IRREG	

Building Information

Number of Buildings	Building Size	Extension	Stories
1	44.00 FT x 50.00 FT		5.00

Assessment Information

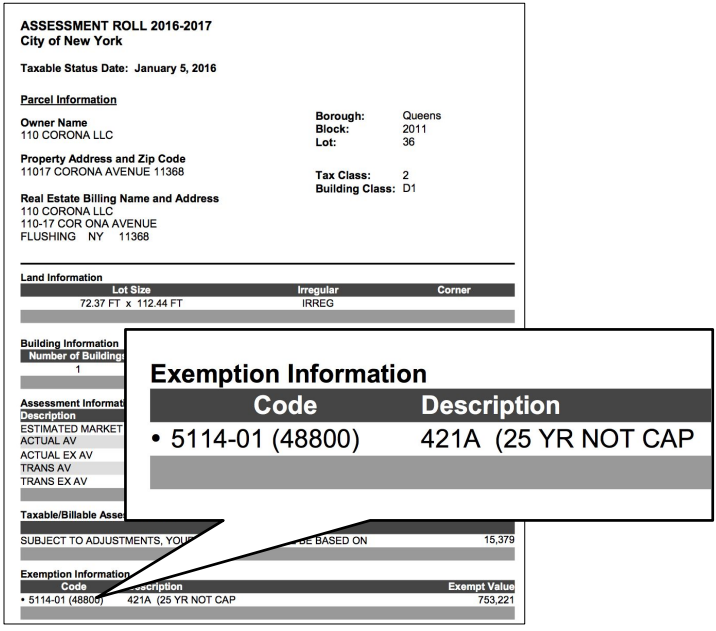
Description	Land	Total
ESTIMATED MARKET VALUE		1,708,000
ACTUAL AV	224,550	768,600
ACTUAL EX AV	209,171	753,221
TRANS AV	224,550	580,050
TRANS EX AV	209,171	564,671

Taxable/Billable Assessed Value

SUBJECT TO ADJUSTMENTS, YOUR 2016/17 TAXES WILL BE BASED ON	15,379

Exemption Information

Code	Description	Exempt Value
• 5114-01 (48800)	421A (25 YR NOT CAP	753,221



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	421-a	LIHTC	Tenant-Based Section 8	Project-Based Section 8	Public Housing	All Rental Units
Panel A: Building-Level Characteristics						
% Social Units in Building	19.3	89.3	n.a.	94.0	100.0	n.a.
Panel B: Block-Level Characteristics						
Med. HH. Income	$100,043	$42,223	$41,187	$36,899	$23,420	$63,093
Med. Monthly Rent	$2,163	$1,128	$1,189	$964	$553	$1,452
% Poor	17.0	31.4	26.4	33.0	43.7	21.2
% Less than HS	10.8	25.7	26.3	27.6	34.2	19.8
% HS Graduate	13.8	24.9	27.3	25.1	30.9	23.0
% Some College	14.4	23.0	22.2	20.4	22.0	19.5
% College Graduate	33.5	16.7	15.3	17.3	9.4	22.1
% More than College	27.6	9.7	8.9	9.7	3.4	15.7
% Non-Hispanic White	44.8	13.0	19.4	17.7	4.9	32.9
% Non-Hispanic Black	16.9	40.5	30.9	32.0	42.8	23.0
% Hispanic	37.6	40.9	41.6	43.8	47.7	30.6
% Asian	14.6	5.1	5.8	5.9	4.4	11.6
Median Age	33.9	33.0	32.8	39.0	33.8	35.8
% Renters	83.8	90.8	83.3	91.1	97.7	78.6

	Does the Building Provide Onsite Inclusionary Housing?			
	Yes		No	
	Mean	Std. Dev.	Mean	Std. Dev.
Estimated Market Value ($ Millions)				
Total	84.12	274.80	16.48	117.41
Land	9.82	39.41	2.05	20.05
Building	74.30	241.91	14.43	101.28
Total Per Unit	0.536	1.524	0.557	1.498
Tax Rate (p.p.)				
Level	0.31	0.32	0.47	0.81
Size of 421-a Incentive	32.95	28.23	4.74	13.07
Present Value of Tax Savings ($)				
Total	16,107,285	40,975,046	1,238,956	8,486,184
Per Inclusionary Unit	443,782	549,262	126,610	523,299
Number of Units				
Total	105.89	178.21	19.95	85.74
Residential	102.23	175.66	17.48	69.45
Number of Buildings	581		11,565	
Number of Units	59,393		202,179	

Estimation

Difference in profits between providing on-site inclusionary units and not:

$$\Delta \log \pi_i = \Delta\tau_i + x_i\beta + \Delta e_i$$

- $\Delta\tau_i$: Building-specific estimate of 421-a tax incentive
- $x_i\beta$: Lot/neighborhood observables to explain variation in rent foregone
- Δe_i: Unobservable shocks to rent foregone / 421-a participation costs

Assume e_i is distributed Type I Extreme Value with dispersion parameter σ:

$$\Pr(D_i = 1|x_i) = \frac{\exp[(\Delta\tau_i + x_i\beta)/\sigma]}{1 + \exp[(\Delta\tau_i + x_i\beta)/\sigma]}$$

Next: Define and estimate objects of interest from $\widehat{\sigma}$ and $\widehat{\beta}$

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Do Developers Respond to the 421-a Incentive?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fixed Effects:	None	Borough			Neighborhood Tabulation Area		
Controls:	None	None	Lot	Lot & Block	None	Lot	Lot & Block
421-a Incentive	4.92***	5.18***	5.58***	5.99***	5.20***	5.87***	6.02***
	(0.30)	(0.54)	(0.64)	(0.69)	(0.65)	(0.76)	(0.74)
N	11,669	11,669	11,647	11,640	7,465	7,450	7,445
Clusters	179	179	179	179	82	82	82
Marginal Effect	0.18***	0.18***	0.19***	0.19***	0.26***	0.26***	0.26***
	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Std. Dev. of Δe_i	0.368***	0.350***	0.325***	0.303***	0.349***	0.309***	0.301***
	(0.023)	(0.036)	(0.038)	(0.035)	(0.044)	(0.040)	(0.037)

$\rightarrow$ Not meaningful as elasticity. Instead, implies little unexplained dispersion in $\Delta \log \pi_i$

Endogenous Construction

Problem: Developers may respond to 421-a on margins beyond accept vs. reject

$\rightarrow$ Will tend to inflate $\Delta\tau_i$ among participants versus nonparticipants

Solution: Simulated instruments approach (Currie & Gruber 1996)

1. Identify similar lots to lot *i* on predetermined dimensions
2. On those lots, record buildings' characteristics and tax exemptions
3. Simulate tax consequences of each such building if it were instead on *i*'s lot
4. Take average of counterfactual buildings' 421-a savings

Computing and Using the Simulated Instrument

Simulated instrument:

$$\widetilde{\Delta\tau_i} = \frac{1}{|\mathcal{F}_i|} \sum_{j \in \mathcal{F}_i} \Delta\tau(b_j, x_i)$$

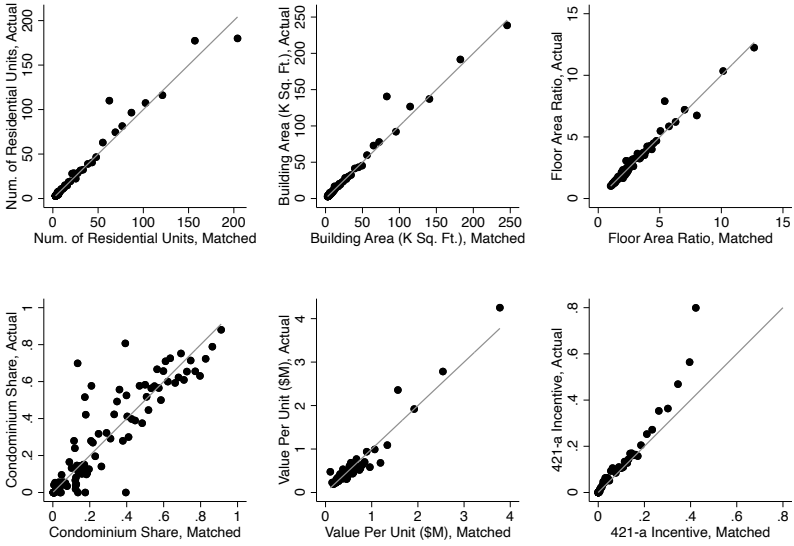
- $\mathcal{F}_i$: Set of similar lots to i (same borough, same zoning class, $\pm$ 20% of i's lot area)
- $\Delta\tau(b_j, x_i)$: 421-a savings if j's building were instead on lot i

Moment conditions:

$$E\left[\left\{D_i - \Lambda\left(\frac{\Delta\tau_i + x_i\beta}{\sigma}\right)\right\} z_i\right] = 0$$

- $z_i = (x_i, \widetilde{\Delta\tau_i})$: Treat all other lot/neighborhood characteristics as exogenous
- $\Lambda(\cdot)$: Logit function

‘Zeroth’ and First Stages of Simulated Instrument



Regressions

Estimating Developer Breakevens

What is the minimum amount a developer would accept for an inclusionary unit?

First, find the incentive $\Delta\tau_i^*(x_i)$ at which developer i is just indifferent in expectation:

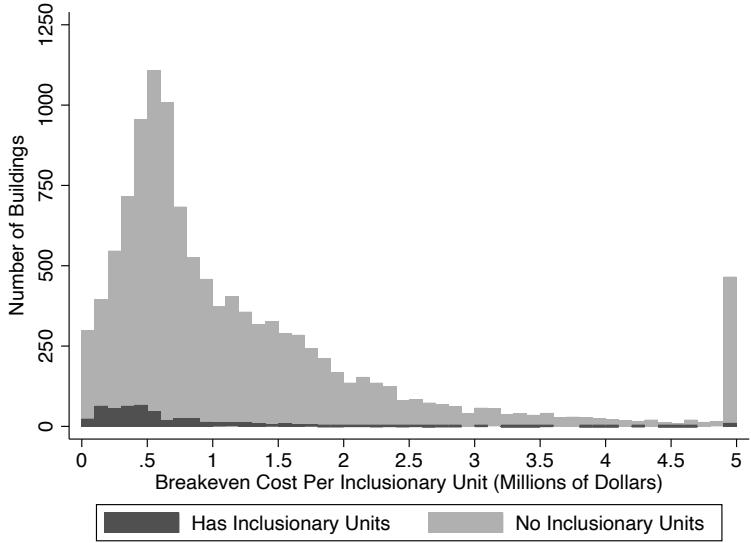
$$E[\Delta \log \pi_i | x_i] = \Delta\tau_i + x_i\widehat{\beta} = 0$$
$$\implies \Delta\tau_i^*(x_i) = -x_i\widehat{\beta}$$

Then, to obtain breakeven per inclusionary unit, rescale:

$$\text{FC}_i = -(v_i/\lambda) \cdot x_i\widehat{\beta}$$

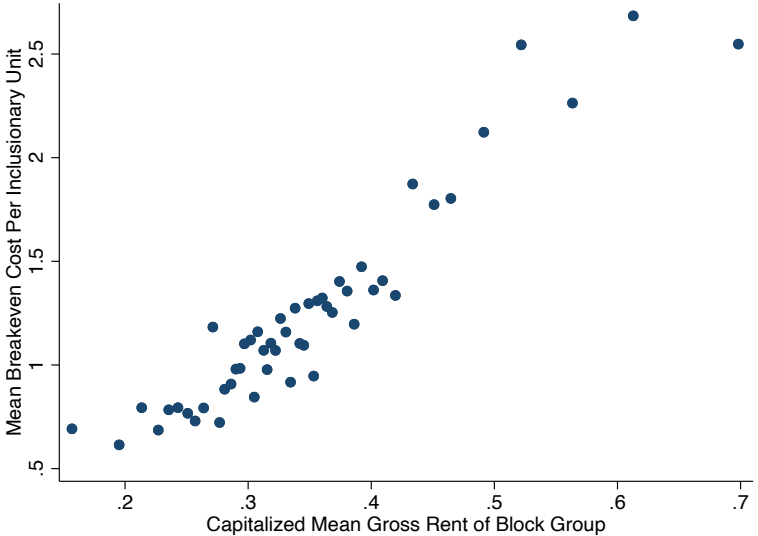
To government, FC_i is the minimum fiscal cost per unit in building i.

Histogram of Estimated Developer Breakevens, by Take-Up Decision



% of Building Value

Estimated Breakevens Are Strongly Related to Neighborhood Rents



Estimating Supply Responses

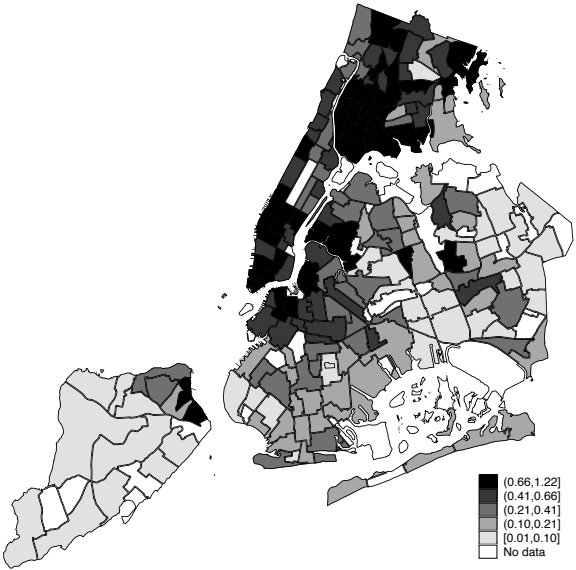
How many inclusionary units would be added if the 421-a incentive were increased?

$$\int \frac{\partial \Pr(D_i = 1|x_i)}{\partial(\Delta\tau_i)} dF_n(x_i) = \frac{1}{\sigma} \int \Pr(D_i = 1|x_i)\left[1 - \Pr(D_i = 1|x_i)\right] \, dF_n(x_i)$$

- σ: Dispersion of T1EV unobservable shocks
- $F_n(x_i)$: Distribution of unit characteristics x_i in neighborhood n
- $Pr(D_i = 1|x_i)$: Conditional probability of 421-a participation

$\rightarrow$ Supply response depends upon both observable and unobservable heterogeneity

Supply Response by Neighborhood Tabulation Area



Citywide Estimates

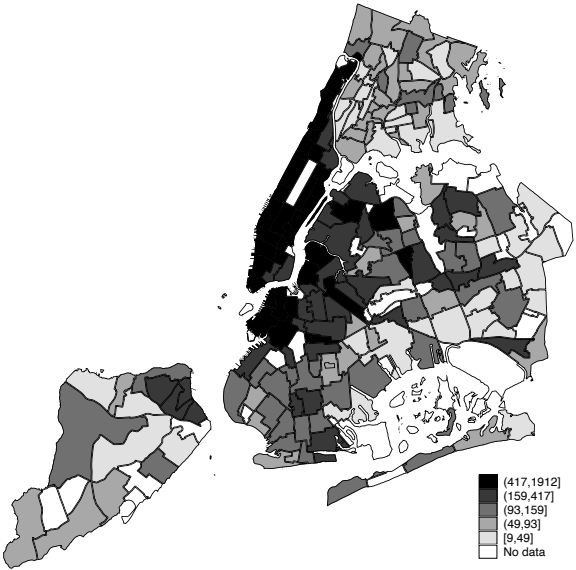
Estimating Average Marginal Fiscal Costs

How much does it cost NYC to get another inclusionary unit in neighborhood n?

$$\text{MFC}_n = \frac{1}{\lambda} \int \frac{\partial[v_i \Delta\tau_i \Pr(D_i = 1|x_i)]}{\partial(\Delta\tau_i)} \, dF_n(x_i) \Big/ \int \frac{\partial \Pr(D_i = 1|x_i)}{\partial(\Delta\tau_i)} \, dF_n(x_i)$$

- $v_i \Delta\tau_i \Pr(D_i = 1|x_i)$: Expected 421-a tax expenditure on building i

Marginal Fiscal Cost by Neighborhood Tabulation Area



Citywide Estimates

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Evaluating the Comparative Cost-Effectiveness of 421-a

Average fiscal cost per unit of 421-a, versus Section 8 and LIHTC:

- 421-a: $652K (std. err. $76K)
- Section 8: $246K
- LIHTC: $220K

Why is 421-a so costly? Decomposing into "between" and "within" factors:

- **Between**: 421-a units are in costlier neighborhoods → higher developer breakevens
- **Within**: Differences in admin cost, building amenities, developer incidence

→ Implement decomposition following DiNardo Fortin Lemieux (1996)

Do Differences in Neighborhoods Explain 421-a's Cost Premium?

- y_i: Neighborhood characteristic of unit i (e.g., % college grad, med. HH income)
- $f(y), g(y)$: densities of 421-a and (pooled) Section 8 & LIHTC units

Estimate densities using adaptive kernel, then compute ratio of densities:

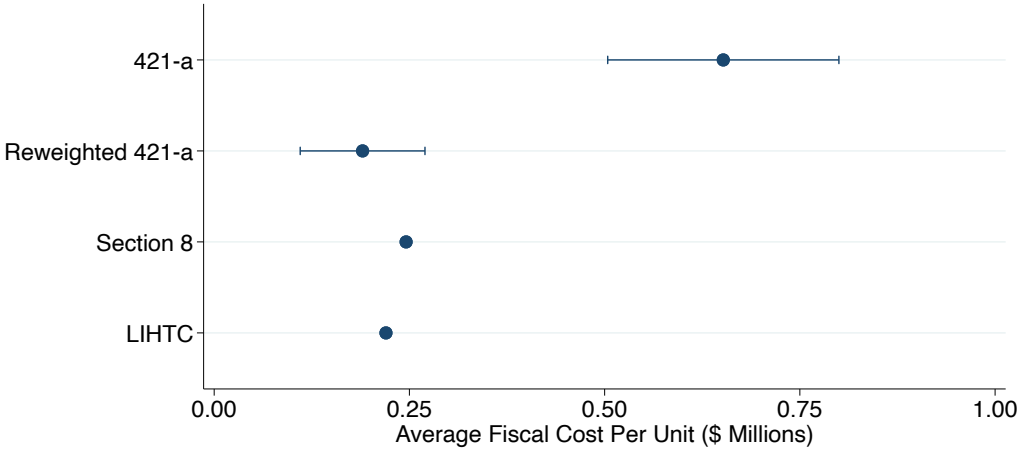
$$\psi(y) = \widehat{f}(y) \,/\, \widehat{g}(y).$$

Use DFL factor $\psi(y)$ to reweight average fiscal cost:

$$\widetilde{\text{AFC}} = \frac{1}{\lambda} \int \frac{\psi(y_i) v_i \Delta\tau_i \Pr(D_i = 1|x_i)}{\partial(\Delta\tau_i)} \, dF(x_i) \Big/ \int \frac{\psi(y_i) \Pr(D_i = 1|x_i)}{\partial(\Delta\tau_i)} \, dF(x_i)$$

$\rightarrow$ Cost of 421-a in counterfactual w/ neighborhood allocation of Section 8 & LIHTC

Neighborhoods Explain Most of 421-a Cost Premium



Incidence on Developers

What share of the fiscal cost of 421-a ends up as developer profits?

Use the Small and Rosen (1981) log-sum-exp formula for consumer surplus:

$$\frac{E[\Delta \log \pi_i \mid D_i = 1]}{E[\Delta \tau_i \mid D_i = 1]} = \frac{\sigma \int \log\left[1 + \exp\left(\frac{\Delta \tau_i + x_i \beta}{\sigma}\right)\right] \, dF_n(x_i \mid D_i = 1)}{\int \Delta \tau_i \, dF_n(x_i \mid D_i = 1)}$$

Result: Developers capture 46% of 421-a exemption

- Similar to incidence of Section 8 (Collinson and Ganong 2018)
- Compare to incidence-minimizing policy with same participation: 36% to developers

Incidence by NTA

Is the “Price of Inclusion” Worth Paying?

Weigh costs of 421-a against benefits: external estimates of neighborhood effects

$$\text{MVPF}_n = \frac{\text{PDV}(\text{Breakeven}_n) + \text{PDV}(\text{After-Tax Income}_n)}{\text{PDV}(\text{Marginal Fiscal Cost}_n) - \text{PDV}(\text{Fiscal Externality}_n)}$$

- WTP and program cost: Estimated breakevens and marginal fiscal costs
- Extrapolate impacts of 421-a from Opportunity Atlas, as in Bergman et al. (2020)
- Build MVPF calculator of 421-a from Hendren & Sprung-Keyser (2020) code base
- Predict “sender” NTAs by distance and pop. of renter HHs earning $30K–$60K

MVPF Calculation Details

Is the "Price of Inclusion" Worth Paying?

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MVPF Calculation Details

Is the "Price of Inclusion" Worth Paying?

Evaluate 421-a by its marginal value of public funds (Hendren & Sprung-Keyser 2020):

$$\text{MVPF}_n = \frac{\text{PDV}(\text{Breakeven}_n) + \text{PDV}(\text{After-Tax Income}_n)}{\text{PDV}(\text{Marginal Fiscal Cost}_n) - \text{PDV}(\text{Fiscal Externality}_n)}$$

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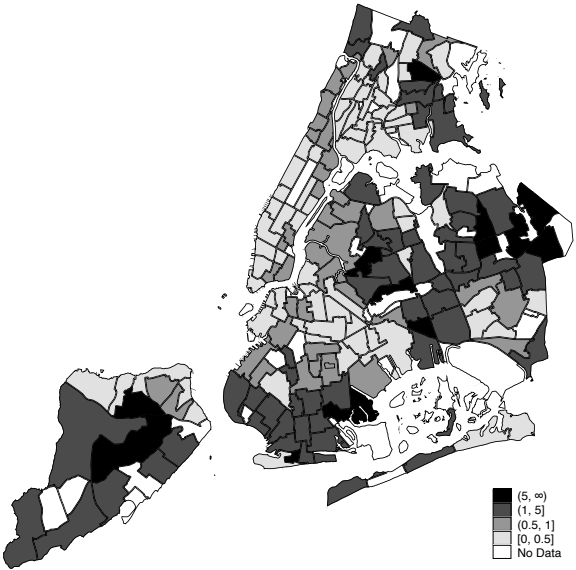
MVPF Calculation Details

MVPF of 421-a by Neighborhood Tabulation Area (Lower WTP)



Higher WTP

Conclusion

Hallmark of U.S. housing policy since 1970s: implementation via private sector

- Landlord acceptance of Section 8 vouchers, developer take-up of LIHTC, …
- First paper to study supply-side facing any housing policy using microdata

I apply my microeconometric framework to study NYC's 421-a program

- Inclusionary housing: urban policy of rising importance, yet almost no evidence
- Develop methods to estimate supply and marginal fiscal cost of inclusionary units
- Account for cost premium: DFL decomposition, incidence analysis, MVPF calculation

Thank you for attending!

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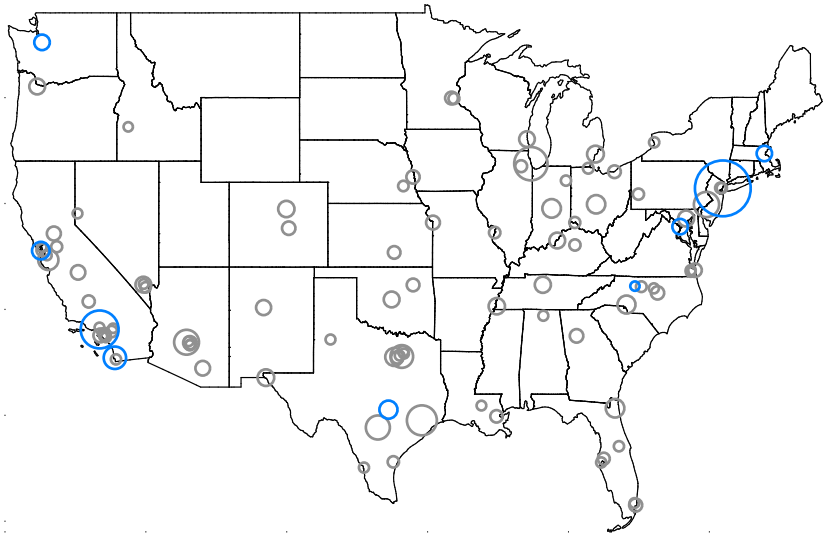
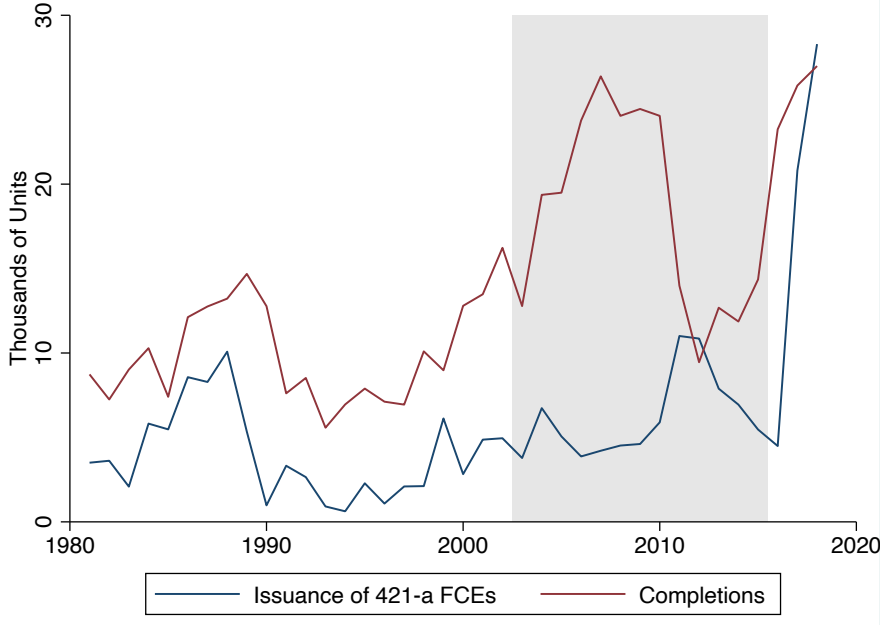
Additional Slides

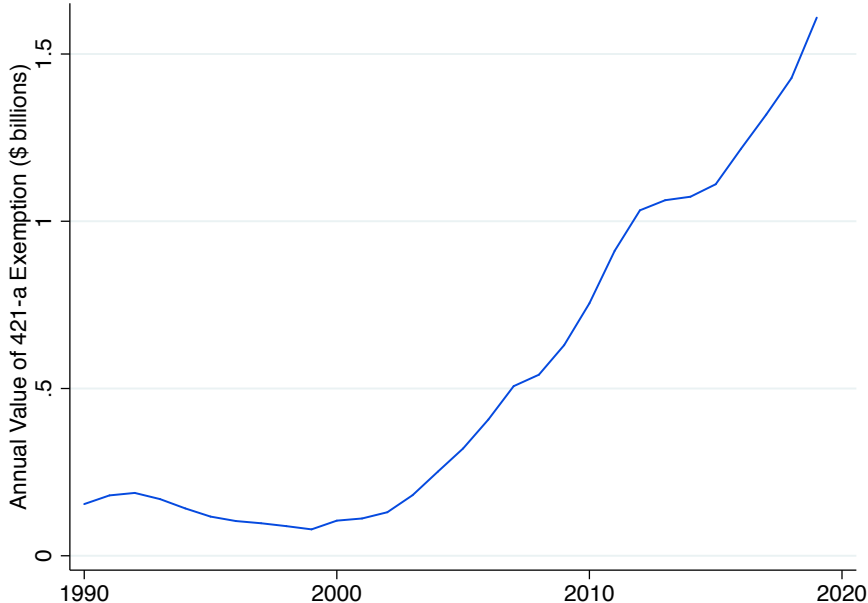
IH in the 100 Most Populous U.S. Municipalities in 2000



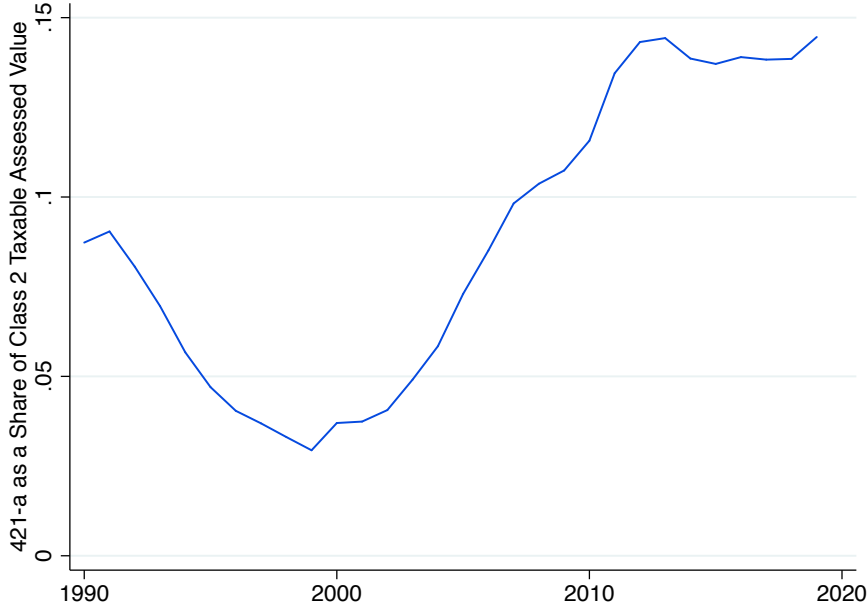
Back


Thousands of Units
0
10
20
30
1980
1990
2000
2010
2020
Issuance of 421-a FCEs
Completions

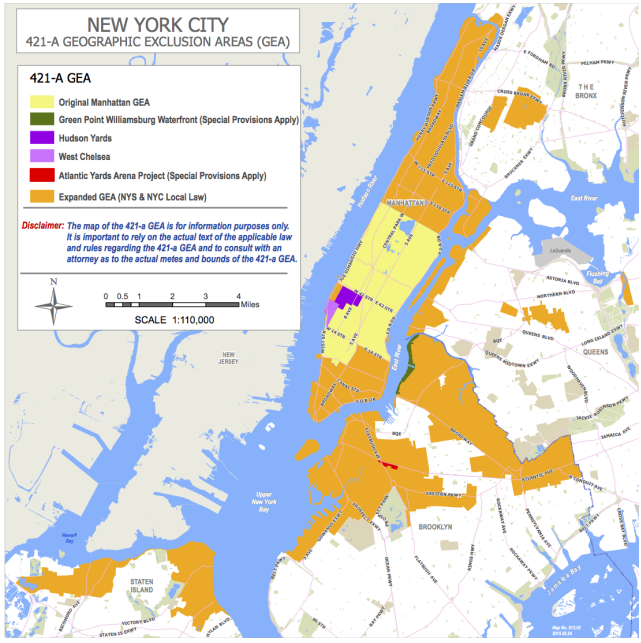
Back


Annual Value of 421-a Exemption ($ billions)
0
.5
1
1.5
1990
2000
2010
2020

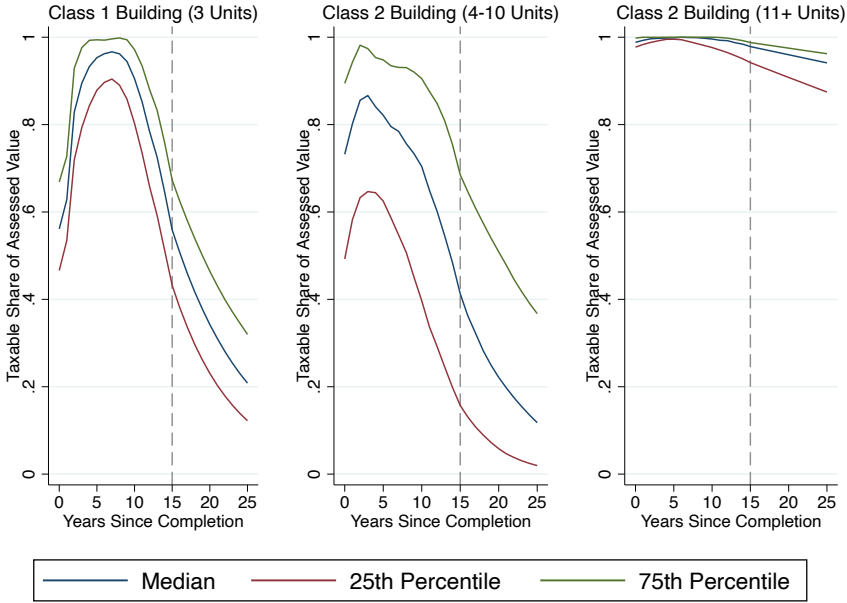
Back

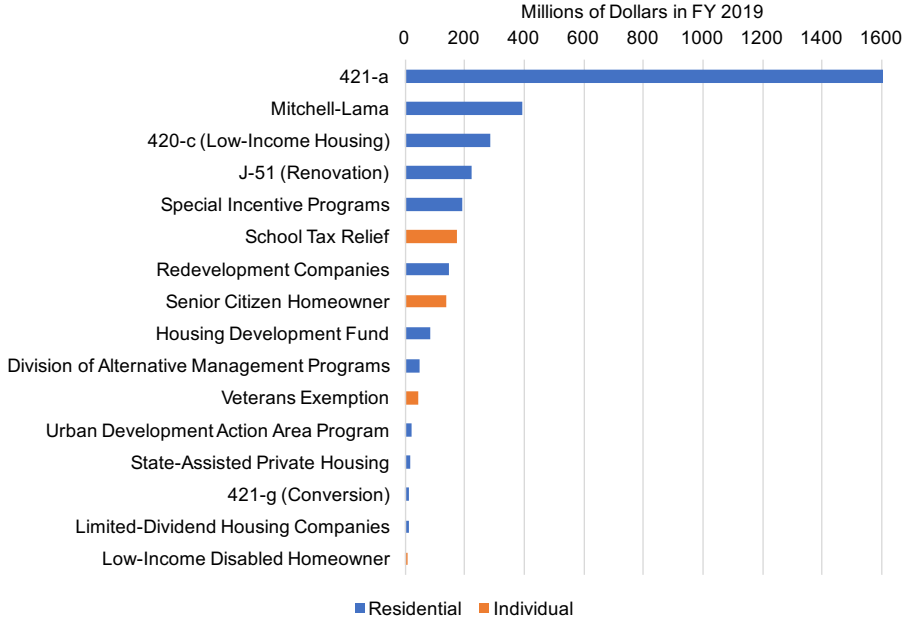

421-a as a Share of Class 2 Taxable Assessed Value
0
.05
.1
.15
1990
2000
2010
2020

Back


NEW YORK CITY
421-A GEOGRAPHIC EXCLUSION AREAS (GEA)
421-A GEA
Original Manhattan GEA
Green Point Williamsburg Waterfront (Special Provisions Apply)
Hudson Yards
West Chelsea
Atlantic Yards Arena Project (Special Provisions Apply)
Expanded GEA (NYS & NYC Local Law)
Disclaimer: The map of the 421-a GEA is for information purposes only. It is important to rely on the actual text of the applicable law and rules regarding the 421-a GEA and to consult with an attorney as to the actual metes and bounds of the 421-a GEA.
N
0 0.5 1 2 3 4 Miles
SCALE 1:110,000
THE BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NEW JERSEY
East River
Upper New York Bay
Hudson River
Newark Bay
Jamaica Bay

Back


Class 1 Building (3 Units)
Class 2 Building (4-10 Units)
Class 2 Building (11+ Units)
Taxable Share of Assessed Value
0
.2
.4
.6
.8
1
0
5
10
15
20
25
Years Since Completion
Median
25th Percentile
75th Percentile


Millions of Dollars in FY 2019
0
200
400
600
800
1000
1200
1400
1600
421-a
Mitchell-Lama
420-c (Low-Income Housing)
J-51 (Renovation)
Special Incentive Programs
School Tax Relief
Redevelopment Companies
Senior Citizen Homeowner
Housing Development Fund
Division of Alternative Management Programs
Veterans Exemption
Urban Development Action Area Program
State-Assisted Private Housing
421-g (Conversion)
Limited-Dividend Housing Companies
Low-Income Disabled Homeowner
Residential
Individual

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Smaller Policy Details For Which I Account

- **Mixed-Use Buildings**: Rescale τ_i by $\min\{1.12 - s_i, 1\}$ to account for penalty for use of 421-a to subsidize commercial development beyond threshold
- **Liberty Zone**: additional incentives for inclusionary development as part of 9/11 recovery package for downtown Manhattan, 2002–2007
- **Inclusionary Housing Program (R10 and Designated Areas)**: additional incentives for inclusionary development in R10 zoning districts and DAs, which are mostly up-zoned neighborhoods (applies only after rezoning)

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Lot Controls from Land-Use Data

- Assessed value of land
- Lot area, dimensions (frontage x depth), area, and type (e.g., corner lot)
- Zoning district (e.g., R8) and historic district indicator

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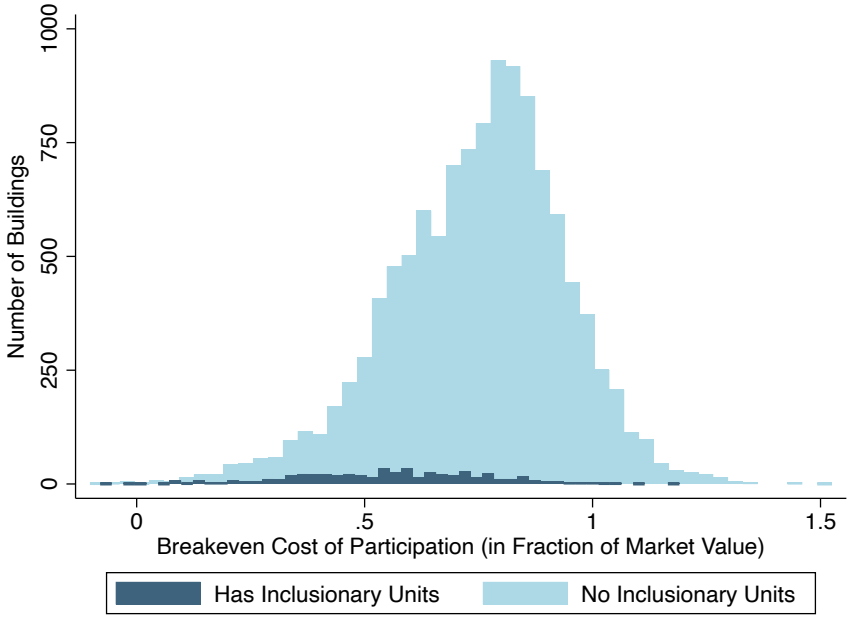
Number of Buildings
0
250
500
750
1000
0
.5
1
1.5
Breakeven Cost of Participation (in Fraction of Market Value)
Has Inclusionary Units
No Inclusionary Units

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Model Estimates from Simulated Instrument GMM Approach

	(1)	(2)	(3)	(4)
	None	Borough Fixed Effects		
	No Controls	No Controls	Lot Controls	Lot & Block Controls
421-a Incentive	5.419***	6.506***	5.525***	6.588***
	(0.384)	(0.986)	(1.009)	(1.060)
N	11,460	11,460	11,448	11,445
Clusters	178	178	178	178
Std. Dev. of e_i	0.335***	0.279***	0.328***	0.296***
	(0.024)	(0.042)	(0.060)	(0.053)

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	Exogenous Construction	Endogenous Construction
Supply Response	0.59***	0.60***
	(0.07)	(0.10)
Marginal Fiscal Cost	$1,593,037***	$1,568,194***
	(326,216)	(423,196)
Average Fiscal Cost	$651,974***	$650,714***
	(75,525)	(76,108)

Back: Supply Elasticities Back: MFCs

Data Sources by Housing Program

- **LIHTC**: National LIHTC Database, May 2019 release (HUD)
- **Tenant-Based Section 8**: Picture of Subsidized Households database (HUD)
- **Project-Based Section 8**: Database of active multifamily housing contracts as of March 2020 (Office of Multifamily Housing Programs, FHA, HUD)
- **Public Housing**: 2020 NYCHA Development Data Book

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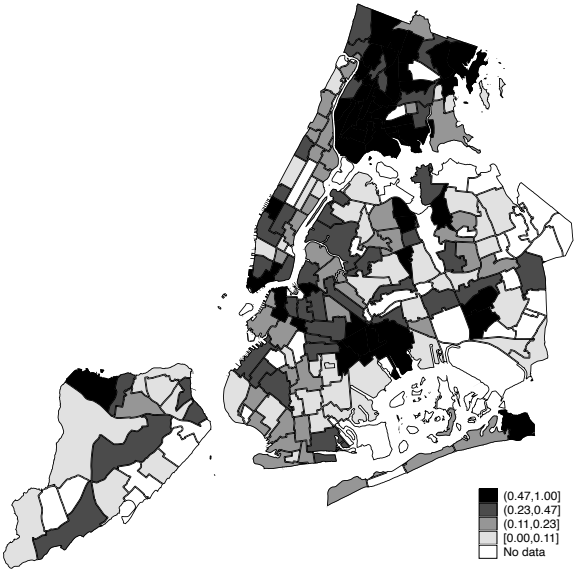
Developer Profit Share of Incidence



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MVPF Calculation Details

My MVPF code build directly upon the Hendren & Sprung-Keyser (2020) modules for:

- MTO: Chetty et al. (2016)
- Chicago housing vouchers: Jacob et al. (2015)

I adapt these modules in several ways to my context:

- Use NYC-specific intergen. income rank–rank function: Friedman et al. (2018)
- Use NYC-specific earnings lifecycle: 2015 ACS microdata
- Use NYC-specific MTR on labor income: NBER TAXSIM and NYC local PIT rate
- Match characteristics of 421-a or NYC Section 8 households
- Predict mobility effects using Opportunity Atlas (Bergman et al., 2020)

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MVPF Calculation Details

WTP for housing assumptions:

- High WTP: Value every $1 in breakeven as $1 transfer to household
- Low WTP: Value $1 in breakeven as $1 for inframarginal spending, $0 above counterfactual spending, using NYC housing expenditure distribution among HHs w/ incomes from $30K to $60K (2015 ACS)

Migration model:

- Restrict population to low-income renter households
- Calibrate move distance coefficient to match mean distance in Bergman et al. (2020)

Fiscal externalities:

- Effects on earnings / college subsidies (from Hendren & Spung-Keyser, 2020)
- Add NTA-specific displacement from Section 8 & LIHTC

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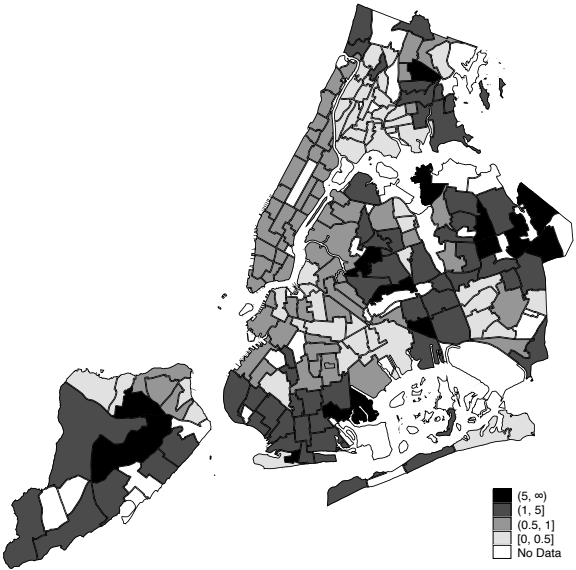
MVPF of 421-a by Neighborhood Tabulation Area (Higher WTP)



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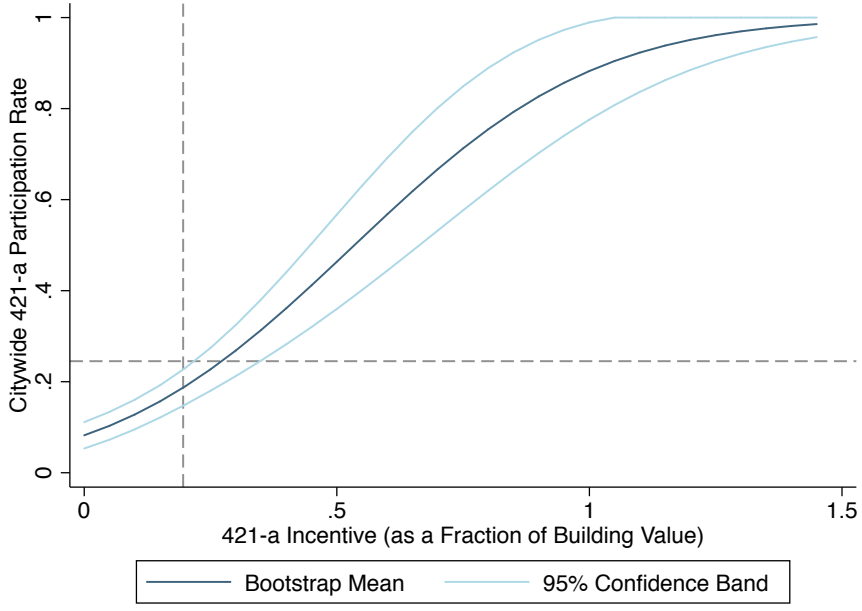
Tracing the Citywide Supply Curve

How would the 421-a take-up rate change under a nonmarginal change in incentives?

$$S(\Delta\tau) = \int \Pr(D_i = 1 \mid x_i, \Delta\tau)\, dF(x_i).$$

Implementation details:

- Make $\Delta\tau$ common across buildings, vary together
- Simultaneous (sup-t) bootstrap confidence bands as in Chernozhukov et al. (2013)


Citywide 421-a Participation Rate
0
.2
.4
.6
.8
1
0
.5
1
1.5
421-a Incentive (as a Fraction of Building Value)
Bootstrap Mean
95% Confidence Band

‘Laffer Curve’ for Inclusionary Units

How does the number of inclusionary units respond to a rise in the required share λ?

- Get more units from inframarginal buildings
- But buildings on the margin exit 421-a

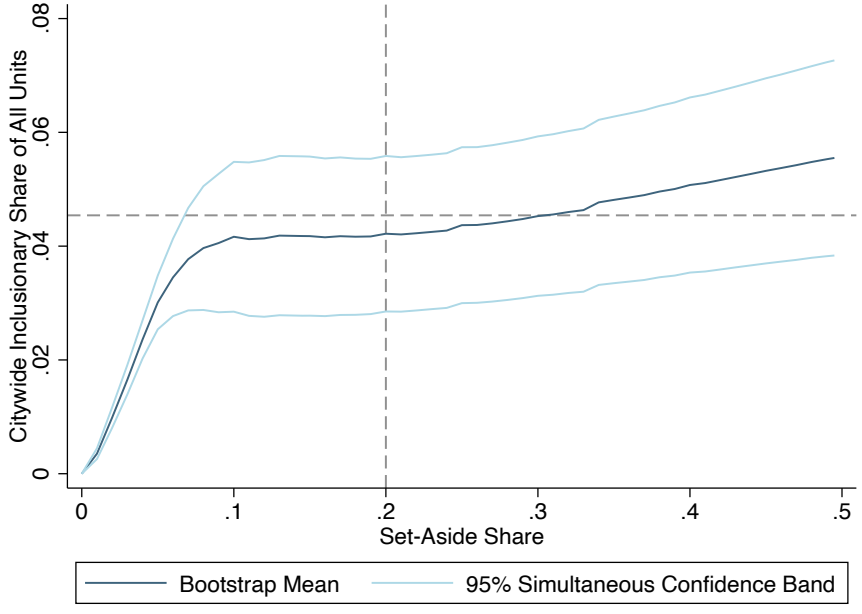
$\rightarrow$ Ambiguous b/c of opposite-signed mechanical and behavioral effects

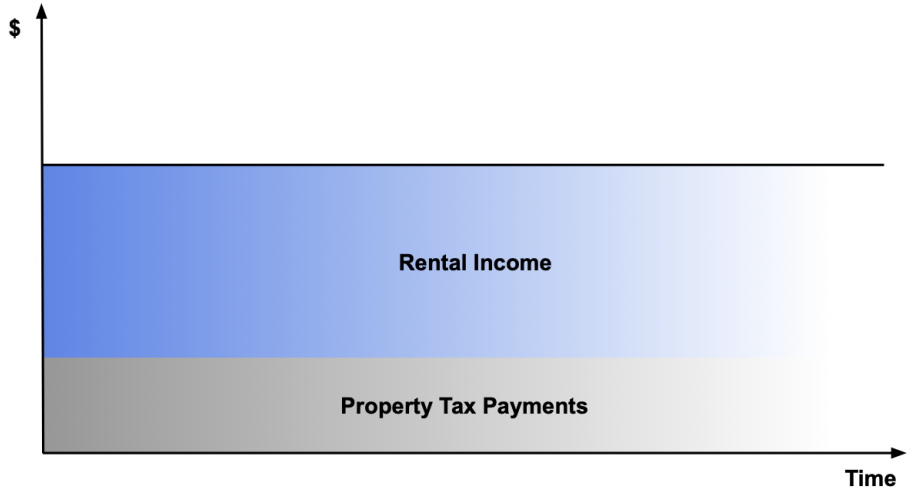
Number of inclusionary units:

$$I_n(\lambda;\, \{\Delta\tau_i\}) = \lambda \int \Pr(D_i = 1 \mid x_i, \lambda, \Delta\tau)\, dF_n(x_i).$$

Problem: No λ variation in data, need functional form assumption

$$\delta_i = \min\left\{ \frac{\lambda}{1-\lambda}\delta_0(x_i),\, \mu(x_i) \right\} \quad \Longrightarrow \quad \frac{\Delta\tau}{\lambda} \geq (\mu + \delta_0)(x_i)$$


Citywide Inclusionary Share of All Units
0
.02
.04
.06
.08
0
.1
.2
.3
.4
.5
Set-Aside Share
Bootstrap Mean
95% Simultaneous Confidence Band



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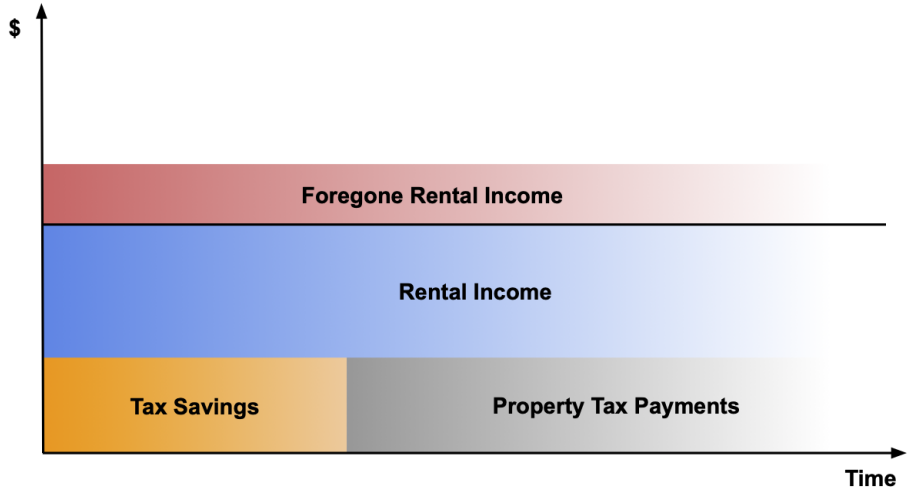
$
Foregone Rental Income
Rental Income
Tax Savings
Property Tax Payments
Time

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Duration of 421-a Tax Incentive, in Years

Years	Location	Inclusionary Housing		
		None	Off-Site	On-Site
1985–2006	Manhattan GEA	0	10	20
	Manhattan non-GEA, South of 110th Street	10	10	20
	Neighborhood Preservation Program Areas	20	20	20
	All Other Areas	15	15	25
2006–2008	Manhattan GEA	0	10	20
	Manhattan non-GEA, South of 110th Street	10	10	20
	Greenpoint–Williamsburg GEA	0	15	20
	Neighborhood Preservation Program Areas	20	20	20
	All Other Areas	15	15	25
2008–2016	Expanded GEA	0	0	25
	All Other Areas	15	15	25

Measurement of 421-a Tax Incentive

How NYC (and I) calculate a building's tax liability, in five easy steps:

Concept	Action
0. True Market Value	
1. Estimated Market Value	Estimate (0)
2. Actual Assessed Value	Apply assessment ratio to (1)
3. Transitional Assessed Value	Apply growth caps to (2)
4. Taxable Value	Apply tax exemptions to (3)
5. Tax Liability	Apply tax rate, then abatements, to (4)

$\rightarrow$ Convert liability sequences $\{\{T_{is}^0\}, \{T_{is}^1\}\}$ to rates $\{\{\tau_{is}^0\}, \{\tau_{is}^1\}\}$, compute diff in PDVs