Under the (neighbor)Hood: Understanding Interactions Among Zoning Regulations

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Motivation

Housing is becoming unaffordable in many cities around the world

- Greater Boston [2018]: At least 97% census tracts rent or owner costs to income ratio $>$ 30%
- New units built 2000-19 (11,308; 4.3 million) $\simeq$ 1950-69 (11,908; 3.1 million)
- Little vacant space: 1.9% of lots undeveloped

Local governments adopted **many types of land-use regulations** over 20th century

- At least 54 municipal, state, & national govts relaxed 1 or more regulations recently worldwide

Unclear how effective these reforms will be as literature has studied regulations:

- By themselves [Ahlfeldt et al., 2017; Brueckner & Singh, 2020; Kulka, 2020; Anagol et al., 2021]
- Indices or wedges [Turner et al., 2014; Herkenhoff et al., 2018; Cheshire & and Hilber, 2008]

This Paper: Study Interactions Under the (neighbor)Hood

1. Study *interactions* among zoning regulations
    - 3 most common regulations worldwide: density, height, allowing multifamily housing
2. Develop empirical framework to use regression discontinuity (RD) across regulation boundaries:
    - Historically studied at administrative (municipal) boundaries–many amenities discontinuous
    - With parcel-level data, exploit cross-sectional variation in regulations within neighborhoods
    - RD at regulation boundaries within towns, elementary school attendance areas
3. Theoretical framework:
    - Supply effects on single-family (SF) & multifamily (MF) units
    - Highlight price effects from *composition effect*, in addition to option value & supply effect
4. Policy effects from MA 40 A law amendment (not today)
    - Supply and price effects of zoning reform around transit stops (localized reform)

Preview of Findings

1. Which regulation(s) affect supply of housing?
    - Combinations of regulations involving density have largest effect
        - 9-109% jump in number of units at boundaries; multifamily units
    - Allowing multifamily housing or relaxing height → little effect on supply
        - These regulations are not binding in Greater Boston
2. Price effects on housing costs:
    - Monthly multifamily rents ↓ 4.2-6.9% at boundary where density is relaxed
    - SF sale prices ↓ 2.2-4.4% at boundary with density, density + multifamily is relaxed
    - Total jump in housing costs (not quality-adjusted housing)
    - Differences are likely driven by the composition effect
    - Zoning regulations affect per-housing-unit price (entry cost into neighborhood)
3. Chapter 40A Policy Effects
    - 23% increase in units per parcel, specifically close to central Boston
    - Relaxing regulations has biggest impacts on prices in suburbs close to CBD
    - ↓ 6% median monthly rent
    - ↓ 11% median sale price in suburbs, option value dominates in central Boston

Outline

Regulatory Environment for Housing and Data

Theoretical Framework

Empirical Strategy & Testing RD Assumptions

Results

- Supply & Characteristics Effects
- Price Effects

Conclusion

Types of Zoning Regulations

Study the 3 most common residential zoning regulations in the US

1. Multifamily (MF) zoning
2. Maximum height restrictions
3. Density restrictions: dwelling units per acre (DUPAC) (minimum lot size, FAR, lot frontage, ...)

Municipalities may use multiple zoning regulations

- In Greater Boston, broad use-type zoning and height restrictions adopted after 1917
- After WWII, municipalities found regulations "*did not sufficiently limit the housing potential of a given parcel, and recommended changes to the zoning to cap the total amount of habitable floor area in a structure relative to the area of the parcel on which it sat*" [MacArthur, 2019]

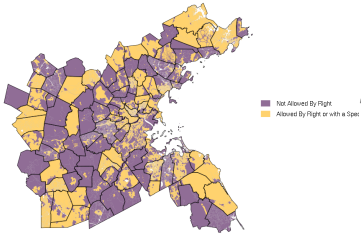
Interactions can be complex → Bindingness matters:

- Municipality allows 5 DUPAC, height $\leq$ 20 ft, no MF–build → at most 5 SF homes, 2 floors tall
- Only allowing MF in this community won't help because the binding constraint is DUPAC

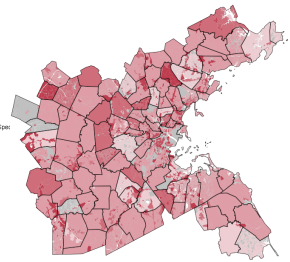
Data Sources

1. Sample: 86 towns in the Greater Boston Area Sample Map
2. Land-use regulations:
    - Metropolitan Area Planning Council (MAPC) [parcel level]: 2020 Zoning Atlas
    - Maximum density, building heights, multifamily allowed
3. Warren Group: Universe of buildings [2010-2018] ACS validation
    - Unit characteristics, sales prices, assessed values
4. CoStar: historic rent and building characteristics for 5+ unit buildings [n=18,536]
    - Impute rent for 2-4 unit buildings: 6.29% (BLS, 2017) of building assessed value Validation
    - Overestimating buildings in $500-1400 range; underestimating in $1500-3300 range

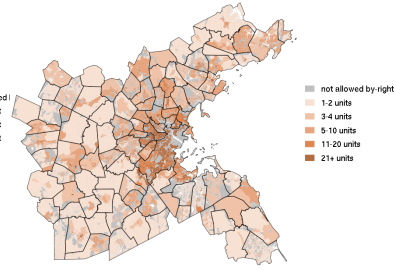
Multifamily Zoning



Height Restrictions



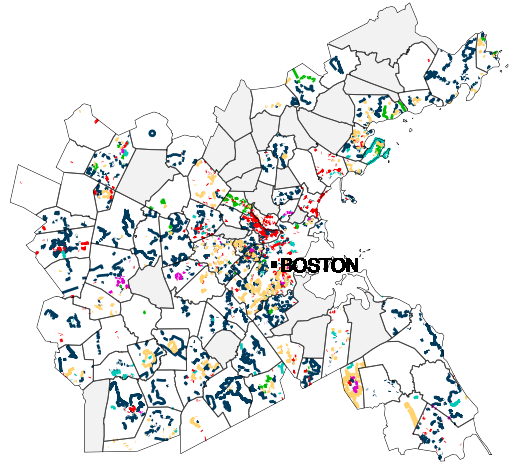
Dwelling Units Per Acre



WRLURI

Regulatory Scenarios (Sc.)	Sc. 1	Sc. 2	Sc. 3	Sc. 4	Sc. 5	Sc. 6
Multifamily Changes	X			X	X	
Height Changes		X		X		X
DUPAC Changes			X		X	X
Mean DUPAC	9.34	7.92	13.87	11.89	11.20	38.58
Mean Height (10 feet)	3.51	4.13	3.39	3.50	3.45	4.33
Mean Multifamily	0.50	0.50	0.63	0.51	0.51	0.82
No. of Boundaries	161	124	1557	61	775	426

Cross-Sectional Variation across Space



Outline

Regulation and Supply Effects

- We want to understand the impact of (combinations of) regulations on housing supply and prices
- Do all regulations limit supply to same extent?
- Testable prediction:

	Single Δ Reg.			Multiple Δ Reg.		
	Mult. Fam (MF)	Height (H)	Density (D)	MF+D	MF+H	D+H
No. of Units	?	–	↑	↑	–	↑

- CA, OR, MSP: changing multifamily zoning
  - Lack of understanding? First-step? Virtue signalling?

Regulation and Price Effects–Mechanisms

Price effect is equilibrium object

Regulation → 3 mechanisms at the boundary

A **Option value** (single-family sale price only)

- Increased options induce positive price differences [Turner et al, 2014]

B **Composition effect**: regulations induce differences in house characteristics/quality

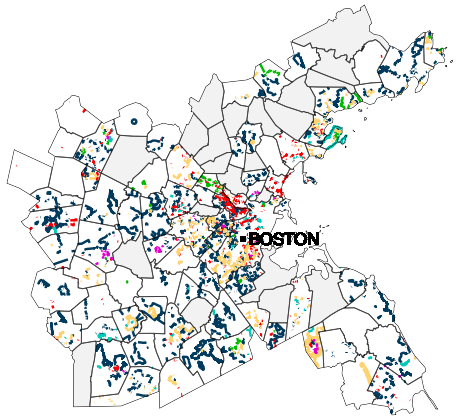
- Negative price difference in smallest unit available
- Similar to housing as two-part tariff [Banzhaf & Mangum, 2019]

C **Sorting mechanism**

- Heterogeneous preferences for observed and unobserved house characteristics

Outline

Empirical Strategy: Spatial RD



Employ a spatial RD around zoning regulation boundaries (not admin boundaries) to study effects on:

- Supply of different housing types
- Multifamily rents and single-family sale prices

Identifying Assumptions:

1. On both sides of boundary, type of housing & density changes due to the regulation
2. Close to boundary, observed unobserved land quality is continuous

Regulation assignment

Empirical Specification

RD estimates of effects of regulation on prices, supply:

- Non-parametric model: Total effect

$$Y_{xt} = \sum_{x=\underline{x}}^{\bar{x}} \mathbb{1}\delta_x^{dist} + \lambda_x^{seg} + \phi_t + \epsilon_{xt}$$

- Y_{xt}: number of of units or linear probability model (2-3 or 4+ units against SF)
- Y_{xt}: Log sale price (SF) or monthly rent (MF)
- $\mathbb{1}\delta_x^{dist}$: Distance bin dummy
- ϕ_t: sale year or rent year fixed effect
- λ_x^{seg}: Boundary fixed effect
- No housing unit characteristic controls (endogenous)

Selecting Zoning Boundaries

Delineation of the regulation boundaries [1918-1956] was likely not random

- Likely discrete jump in underlying quality at boundaries

1. Overlap with roads, municipal and school boundaries, and natural features

   → Remove boundaries with overlaps

   → Split boundaries with intersections: compare buildings within the same municipality, school attendance area, broad-use zoning district (residential or mixed-use)

2. Delineated to avoid/encompass socio-politically motivated buildings and areas creating curves

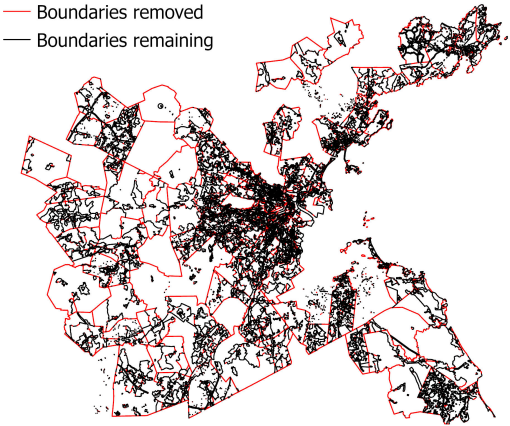
   - Curves likely overlap with unobserved quality differences that have persisted to date

   → Straight line boundaries

   - For each property perpendicular closest distance to boundary
   - Draw orthogonal line 50m both sides; keep if endpoints in 15m buffer of boundary

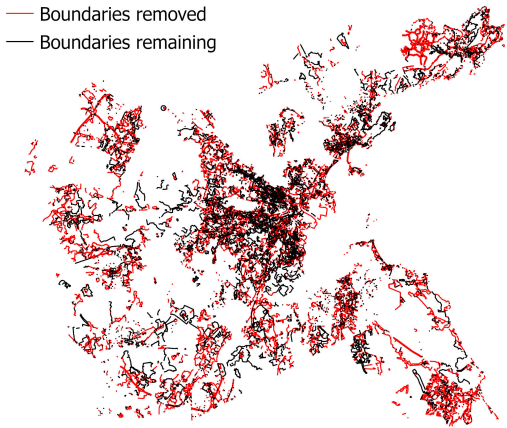
Removing city boundaries and natural features

Boundaries removed
Boundaries remaining



Removing school boundaries and broad zoning use boundaries

Boundaries removed
Boundaries remaining



Step-by-step boundary removal

Testing Spatial RD Continuity Assumption

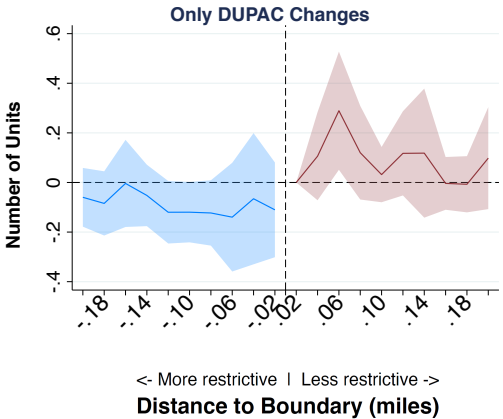
Test if location quality is continuous at boundary

1. Continuity of amenities like distance to schools, water bodies, parks, highways, and municipality center Results
2. Continuity of location and land quality Results
    - Predict house sales prices and multifamily rents from observed location amenities
    - Test if there are discrete jumps in unobserved location quality

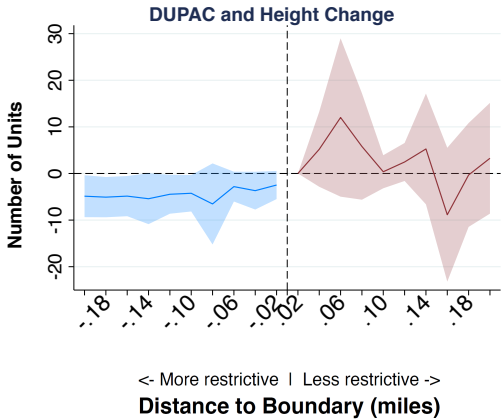
Outline

Outline

Relaxing density alone, along with height increases number of units

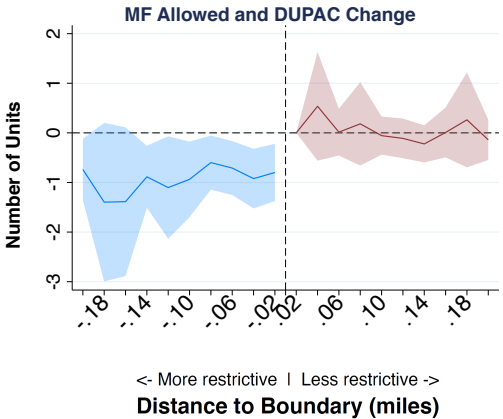


8.7% jump (mean 1.3 units)

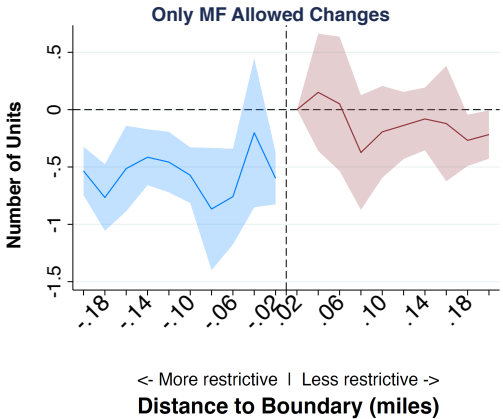


109% jump (mean 2.6 units)

Allowing multi-family homes increases the supply of units

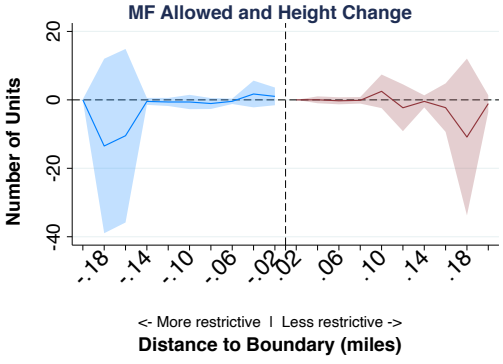


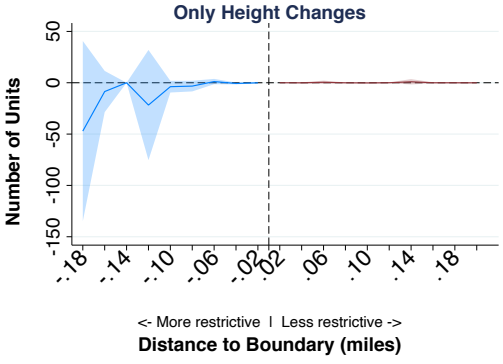
53.7% jump (mean 1.6 units)



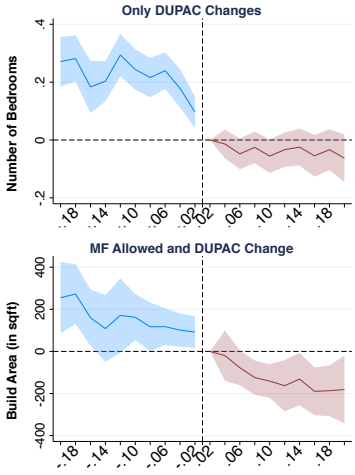
51.2% jump (mean 1.9 units)

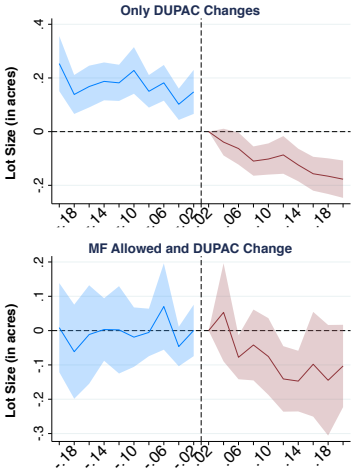
Little effect of height and multifamily on supply of units



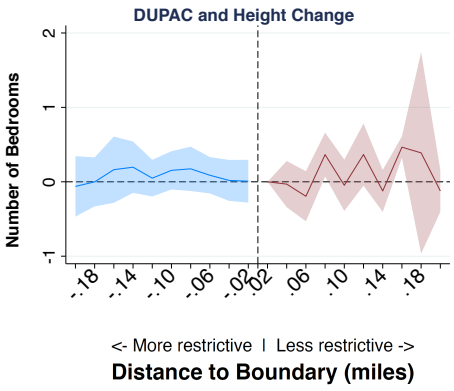


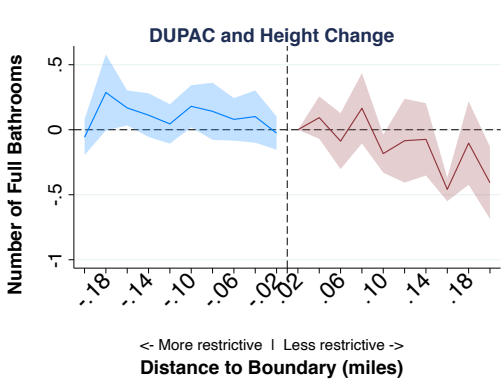
Relaxing density & allowing multi-family homes changes house characteristics





Boundaries with height & density changes together, house characteristics remain similar





Taking Stock of Supply and Characteristics Effects

Relaxing density alone or with other regulations ↑ number of units by 9-109%

- No effects on supply of units from height regulation
- Density appears to be a binding regulation in Greater Boston, maximum height is not

Allowing MF housing impacts type of housing built, particularly supply of 2-3 unit buildings Types

Regulations also change the supply of property characteristics

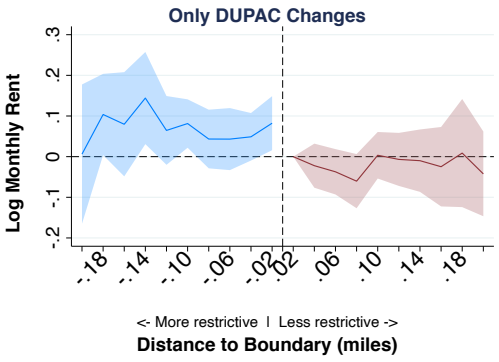
- Relaxing density and allowing multi-family homes leads to smaller properties
- Relaxing density and height does not affect property characteristics much

→ Focus on price and rent differences at boundaries where density regulations or its combinations change; only multifamily changes

Outline

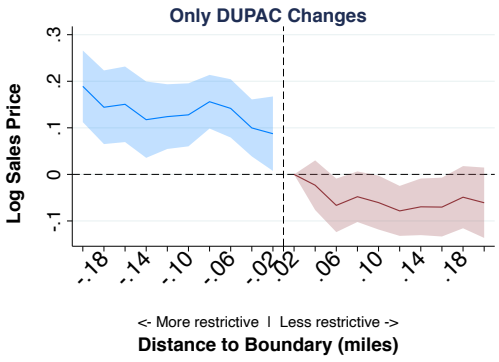
Allowing more density lowers house prices and rents

Monthly multifamily rents



RD estimate = 0.069 (0.03)

Single-family sale price

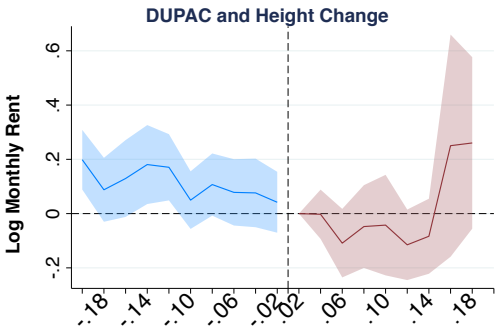


RD estimate = 0.044 (0.02)

Only MF | Only Height

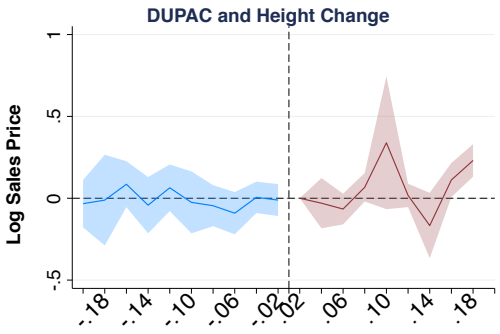
Relaxing height and density lowers rents

Monthly multifamily rents



RD estimate= 0.042 (0.057)

Single-family sale price

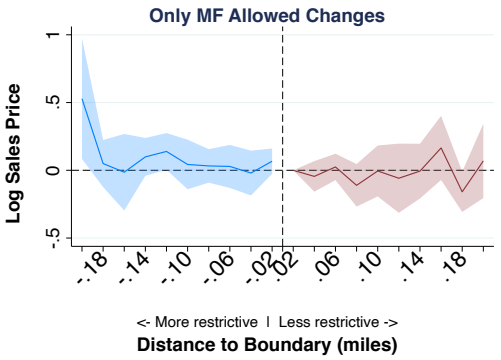


RD estimate = -0.011 (0.049)

Sales Prices and CoStar Rents | Regressions

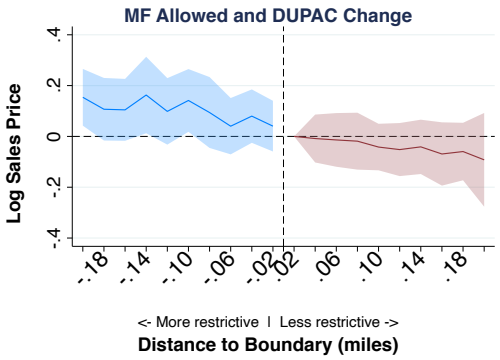
Allowing multifamily with relaxing density lowers house prices

Single-family sale price



RD estimate= 0.067 (0.047)

Single-family sale price



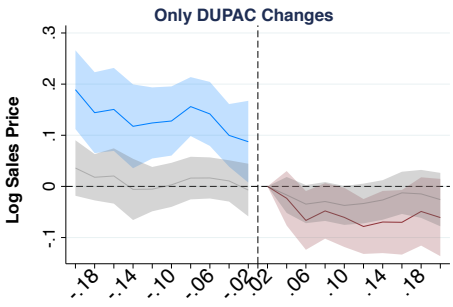
RD estimate = 0.022, (0.029)

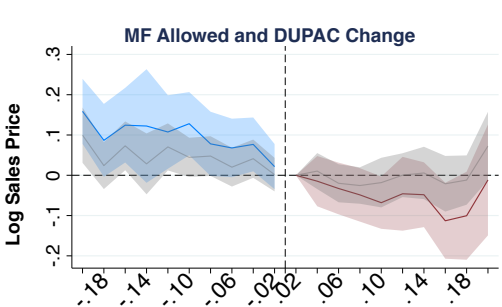
Price Differences and Mechanisms

Single-family sale prices:

- Composition effect driving price differences
- No price difference in quality-adjusted housing
- Effects from sorting mechanism and option value small or equal and opposite

House Sale Prices and Composition Effect





Price Differences and Mechanisms

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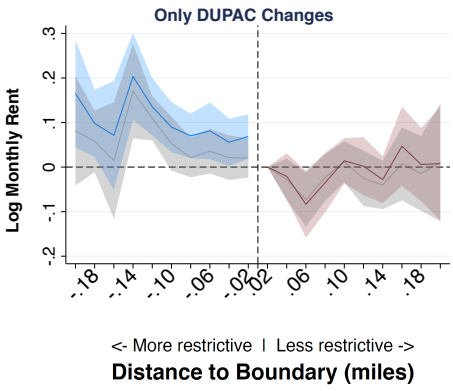
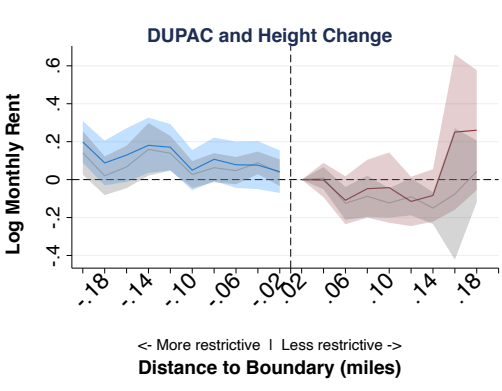
Multifamily rents:

- Price differences from unobserved characteristics (observe fewer characteristics) or sorting mechanism

Multifamily Rents and Composition Effect





Price Differences and Mechanisms

Single-family sale prices:

- Composition effect driving price differences
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- Effects from sorting mechanism and option value small or equal and opposite

Multifamily rents:

- Price differences from unobserved characteristics (observe fewer characteristics) or sorting mechanism

Affordability:

- Regulations affect characteristics and quality of housing → increase price per unit for smallest unit on restricted side
- Regulations increase prices for consumers with low WTP for high quality
- If goal is affordability, focus on *total* rent and price differences

Outline

Conclusion

- Which regulations are relaxed matters!
  - Density + other regulations have largest effect ↑ multifamily supply
  - Allowing multifamily only (MSP, CA, OR) and relaxing height → less effect on supply of units
- Combinations of Density & other regulations are most effective ↓ MF rents
  - Relaxing density and height lowers rents
  - Relaxing density and allowing multifamily homes lowers house prices
- House price differences due to regulation induced quality differences (composition effect)
  - Local lens allows us to study this composition effect in detail
- Effects from 40A Amendment (not today)
  - Supply effects more prominent close to CBD
  - Affordability effects more prominent in suburbs than inner cities
  - Help first-time home buyers, renters

Thanks!

Please send comments or questions to:

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Appendix

Towns Included in Analysis

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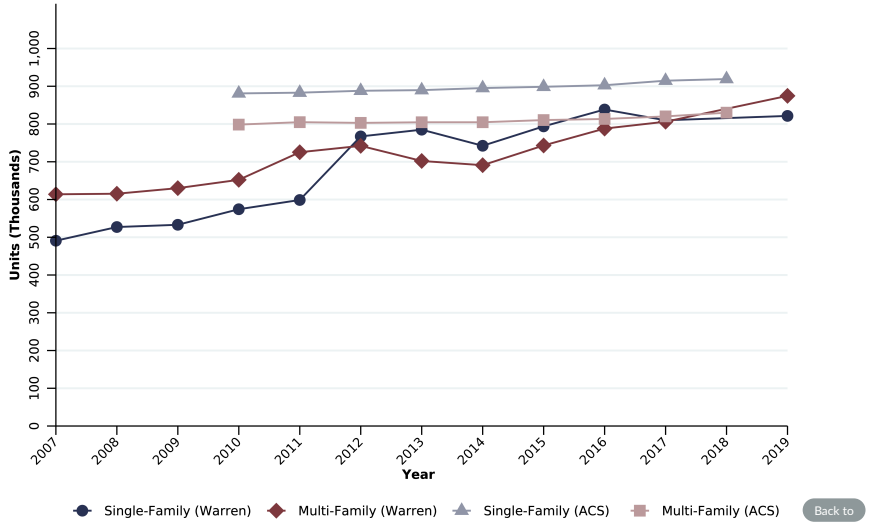
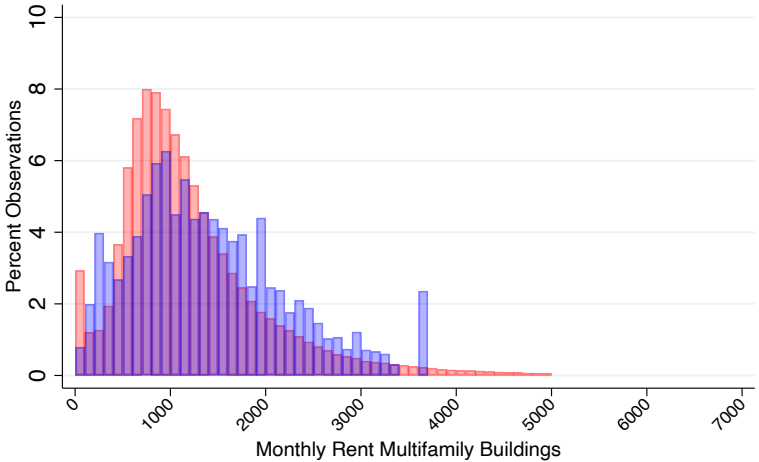
Municipality Included Municipality Not Included

Validation of Warren Group Data



Rent Imputation



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Boundary Selection

Removal step	Remaining boundaries
Baseline	26,306 (100%)
Removing municipal boundaries	24,475 (93.0%)
Removing water bodies	24,300 (92.4%)
Removing major roads	21,328 (81.1%)
Removing elem. school attendance areas	20,922 (79.5%)
Removing school district boundaries	20,863 (79.3%)
Removing broad-use zoning boundaries	9,674 (36.8%)
Keeping boundaries with straight-line segments	8,756 (33.3%)

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Assignment of Regulation Scenarios to Boundaries

Back

	(1)	(2)	(3)	(4)	(5)	(6)
Regulatory Scenarios (Sc.)	Sc. 1	Sc. 2	Sc. 3	Sc. 4	Sc. 5	Sc. 6
Multifamily Changes	X			X	X	
Height Changes		X		X		X
DUPAC Changes			X		X	X
T-test mean difference from regulatory scenario 3						
Dist. to Municipality Center (miles) (Difference) [t-stat]	1.401 (-0.242) [-2.056]	1.495 (-0.149) [-1.202]	1.643 - -	1.374 (-0.269) [-1.527]	1.949 (0.305) [4.431]	1.289 (-0.354) [-5.116]
Mean Share ≤ 18 (Difference) [t-stat]	0.210 (-0.119) [-1.196]	0.205 (-0.015) [-1.524]	0.220 - -	0.235 (0.015) [1.056]	0.223 (0.003) [0.574]	0.185 (-0.036) [-6.011]
Mean Share ≥ 65 (Difference) [t-stat]	0.142 (0.003) [0.389]	0.132 (-0.007) [-0.755]	0.139 - -	0.140 (0.001) [0.087]	0.144 (0.005) [0.574]	0.115 (-0.024) [-4.440]
Mean Share Black (Difference) [t-stat]	0.060 (0.11) [0.784]	0.063 (0.014) [0.995]	0.049 - -	0.088 (0.039) [1.920]	0.124 (0.075) [7.747]	0.089 (0.040) [4.564]
No. of Boundaries	91	77	906	37	445	277

Theoretical Framework

Zoning areas $k = L, R$ on either side of boundary at location $x = 0$ between $-\bar{x}$ and $\bar{x}$

Lot x either single family or multifamily based on zoning vector at x: $z^k \in \{z^L, z^R\}$; L is more regulated than R, i.e. $z^L \leq z^R$

Bundle of housing characteristics $h(z^k)$

Consumers are heterogeneous in their preferences (γ^τ) and outside options

- In outside option (ν^τ) → Downward sloping demand (unlike Black (1999))
- In preferences for house characteristics → Sorting, different elasticity of demand

Consumers earn wage w, choose location x, derive location utility $V(x, h(z^k), z^k, \gamma^\tau)$, pay $p(x, h(z^k), z^k)$ sale prices or monthly rents

Housing utility $V(.)$ is divided into direct housing utility $V^{direct}(x, h(z^k), z^k, \gamma^\tau)$, and zoning area housing utility $V^{neighbor}(z^k)$

Assumptions and Price Differences at Boundary

A.1 Housing markets are perfectly competitive

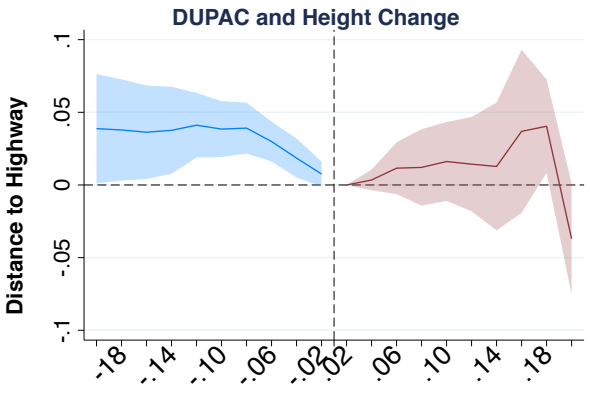
A.2 Housing markets are not locally segmented at the boundary

- Utility of consumer is $U(x, h(z^k), z^k, \gamma^\tau) = u(w - p(x, h(z^k), z^k))V(x, h(z^k), z^k, \gamma^\tau)$
- With utility $u(.) = \exp^{(w-p(x,h(z^k),z^k))}$, price per unit is given by:
  $p(x, h(z^k), z^k, \gamma^\tau) = w - \nu^\tau + \ln(V^{direct}(x, h(z^k), z^k, \gamma^\tau)) + \ln(V^{neighbor}(z^k))$
- Price differences at boundary:

$$p(x, h(z^L), z^L, \gamma^\tau) - p(x, h(z^R), z^R, \gamma^\tau) =$$
$$\ln(V^{direct}(x, h(z^L), z^L, \gamma^{\tau_L})) - \ln(V^{direct}(x, h(z^R), z^R, \gamma^{\tau_R}))$$
$$+ \ln(V^{neighbor}(z^L)) - \ln(V^{neighbor}(z^R)).$$

A.3 *As* $|x_L - x_R| \to \epsilon$ *for a small* ϵ, $\ln(V^{neighbor}(z^L)) - \ln(V^{neighbor}(z^R)) \to 0$.

Euclidean Distance to Highway



RD estimate = 0.005 (0.004)

Buildings on restrictive side measurably away from highways

For robustness, test if key supply and price results are driven by distance to highway by controlling for it Back

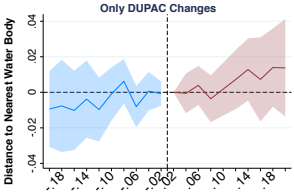
Linear Probability Model: Supply of Gentle and High Density Buildings

Back

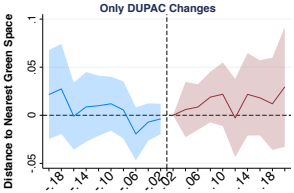
	2-3 units (Gentle-Density)				4+ units (High-Density)			
	Only MF	Only DU	MF & DU	H & DU	Only MF	Only DU	MF & DU	H & DU
MF allowed	0.469***		0.019		0.033		0.009	
	(0.101)		(0.024)		(0.011)		(0.014)	
Height (H)				-0.023				0.694
				(0.024)				(0.651)
DUPAC (DU)		0.001	-0.004	-0.010		0.001*	0.001	0.006
		(0.001)	(0.004)	(0.005)		(0.0005)	(0.001)	(0.006)
MFXDU			0.016***				0.002	
			(0.003)				(0.002)	
HXDU				0.001*				0.001**
				(0.0004)				(0.0003)
N	1,579	38,665	12,367	1,710	1,247	37,365	10,537	1,259
R^2	0.536	0.414	0.390	0.450	0.597	0.548	0.304	0.561
$\mathbb{E}(y)$	0.157	0.061	0.159	0.290	0.017	0.012	0.015	0.067

No supply effects from height, MF X height Density After 1956

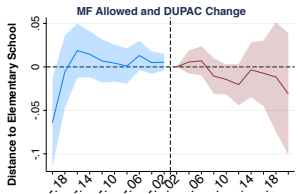
Euclidean Distance to Amenities



RD estimate = -0.001 (0.003)



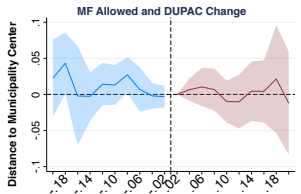
RD estimate = -0.004 (0.008)



<- More restrictive | Less restrictive ->

Distance to Boundary (miles)

RD estimate = 0.006 (0.005)



<- More restrictive | Less restrictive ->

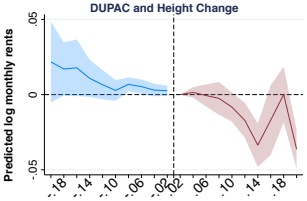
Distance to Boundary (miles)

RD estimate = -0.003 (0.008)

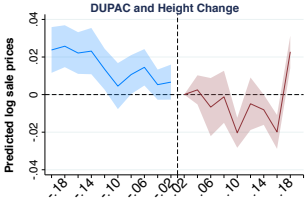
Highways Back

Predicted Prices and Density Boundaries

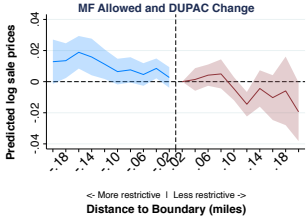
Back



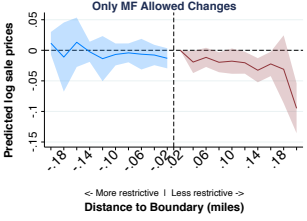
RD estimate = 0.007 (0.005)



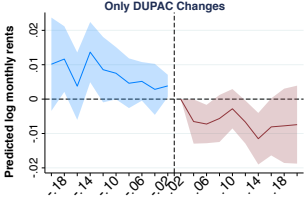
RD estimate = 0.003 (0.002)



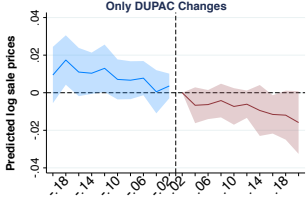
RD estimate = 0.001 (0.004)



RD estimate = -0.013 (0.008)



RD estimate = 0.004* (0.002)



RD estimate = 0.004 (0.003)

Linear Probability Model: Supply of Gentle and High Density Buildings (after 1956)

	2-3 units (Gentle Density)				4+ units (High Density)			
	Only MF	Only DU	MF & DU	H & DU	Only MF	Only DU	MF & DU	H & DU
MF	0.250		0.043		0.066		0.011	
	(0.066)		(0.019)		(0.035)		(0.014)	
H				-0.011				0.006
				(0.011)				(0.009)
DU		0.002	0.003	0.001		0.002	0.000	0.003
		(0.001)	(0.003)	(0.003)		(0.001)	(0.002)	(0.002)
MFXDU			0.004				0.003	
			(0.002)				(0.001)	
HXDU				0.000				-0.000
				(0.000)				(0.000)
N	2,108	54,007	14,803	4,562	1,996	53,096	14,042	4,105
$\mathbb{E}(y)$	0.278	0.128	0.238	0.376	0.028	0.019	0.020	0.067
R^2	0.383	0.276	0.315	0.511	0.574	0.509	0.410	0.653

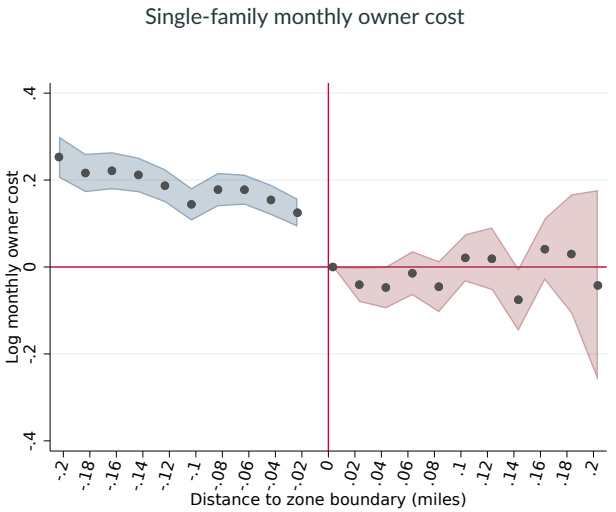
No supply effects from height, MF X height Back

Density across Boundaries

	Density Units				Density Area (sqft)			
	Only MF	Only DUPAC	MF & DUPAC	All	Only MF	Only DUPAC	MF & DUPAC	All
MF allowed	**0.251**		-0.351	-29.92	**0.179**		-0.136	8.329
	(0.079)		(2.044)	(32.09)	(0.042)		(0.187)	(6.373)
Height (H)				-0.540				0.094
				(1.801)				(0.142)
BR DUPAC		-1.294	-1.684			-0.327	**-0.394**	
		(0.771)	(1.361)			(0.287)	(0.166)	
DUPAC (DU)		**0.106**	0.303	-0.362		0.002	**0.020**	0.034
		(0.041)	(0.257)	(0.574)		(0.002)	(0.006)	(0.031)
MFXBR DU			-1.830				0.539	
			(5.285)				(0.351)	
MFXDU			0.402	1.395			-0.016	-0.201
			(0.405)	(1.111)			(0.010)	(0.158)
HXDU				0.098				0.001
				(0.113)				(0.005)
MFXHXDU				-0.518				0.047
				(0.471)				(0.039)
N	326	5274	1791	563	312	4775	1486	450
$\mathbb{E}(y)$								

Back to

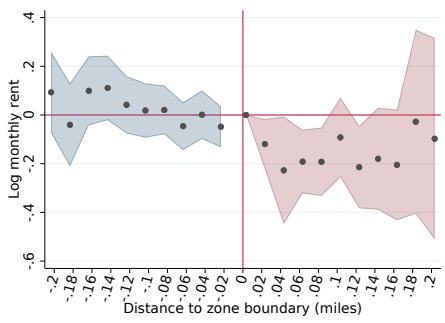
Price Effects: Only MF Allowed Changes



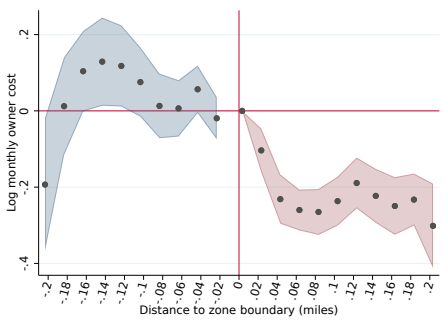
Back to

Price Effects: Only Height Changes

multifamily rents



Single-family monthly owner cost



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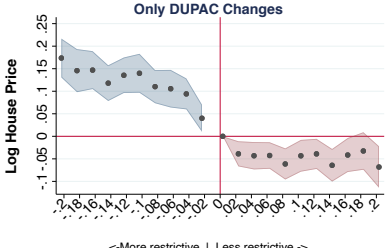
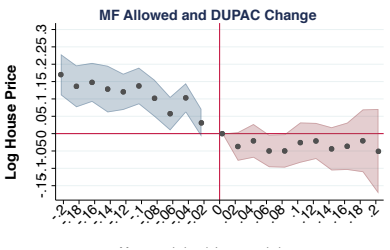
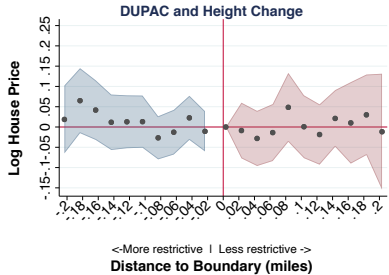
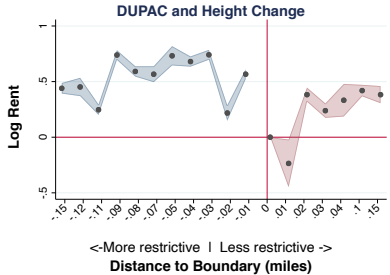
Sales Price and CoStar Rental Data Only









Direct effect on log rents and owner cost of housing

	Multifamily (rents)		Single-Family (housing costs)			
	Only DU	DU & H	Only MF	Only DU	MF & DU	DU & H
MF allowed			-0.040		-0.136***	
			(0.022)		(0.019)	
Height (H)		0.004				0.002
		(0.011)				(0.006)
DUPAC (DU)	-0.001*	-0.002**		-0.002*	-0.005***	-0.001
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
MFXDU					0.007***	
					(0.001)	
HXDU		0.000				0.000
		(0.000)				(0.000)
N	174,726	135,593	49,853	771,615	304,340	129,779
$\mathbb{E}(y)$	$1,142	$1,057	$2,446	$2,520	$2,228	$2,171
R^2	0.617	0.630	0.696	0.732	0.768	0.871

Back With year built f.e.

Direct effect on log rents and owner cost of housing (with year built f.e.)

	Multifamily (rents)		Single-Family (housing costs)			
	Only DU	DU & H	Only MF	Only DU	MF & DU	DU & H
MF allowed			-0.018		-0.093***	
			(0.017)		(0.014)	
Height (H)		0.006				0.001
		(0.009)				(0.006)
DUPAC (DU)	-0.001	-0.002***		-0.003***	-0.003***	-0.002
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
MFXDU					0.004***	
					(0.001)	
HXDU		0.000				0.000
		(0.000)				(0.000)
N	171,945	133,766	49,701	769,028	303,811	129,547
$\mathbb{E}(y)$	$1,145	$1,062	$2444	$2,515	$2,227	$2,168
R^2	0.659	0.713	0.782	0.807	0.825	0.894

Back

Policy Experiment

- Vector of new regulation is $z_{40A}(x)$, old regulations $z_0(x)$
- θ_i: Average joint treatment effect of a one-unit change in regulations
- $p(x)$: Sales prices or rents
- Average change in housing costs near the transit stations:

$$\Delta p = \frac{1}{\overline{x} - \underline{x}} \int_{\underline{x}}^{\overline{x}} \Big(\max\{0, (z_{40A}(x) - z_0(x))\} \times \theta_i \times p(x) \Big) d(x) \tag{1}$$

$$\theta_i = \begin{cases} \hat{\rho}_1 & i = \text{regulatory scenario 1, 2, 3} \\ \hat{\rho}_1 + \hat{\rho}_3 \text{reg}_2 + \hat{\rho}_2 + \hat{\rho}_3 \text{reg}_1 & i = \text{regulatory scenario 4, 5, 6} \end{cases}$$

Policy Effects: Relaxing Regulations Near Transit Stops - Prices

Supply Back

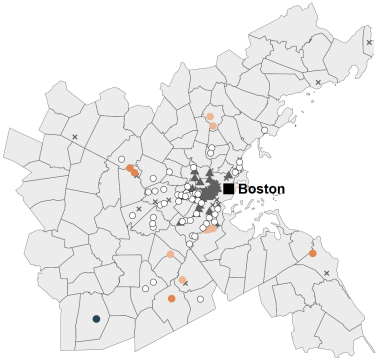


Figure 1: Change in monthly rents

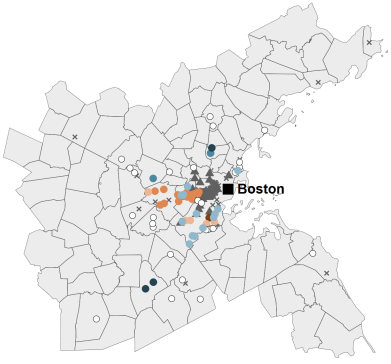


Figure 2: Change in single-family sales prices

% Change in Price/Rent

× No boundary near station	▲ Regulation already lower than Chapter 40A	○ 0% (null effect)
< 0% to -4.99%	-5% to -9.99%	</= -10%
> 0% to 4.99%	5% to 9.99%	>/= 10%

Policy Experiment: 2021 MA Chapter 40A Law Amendment (2021)

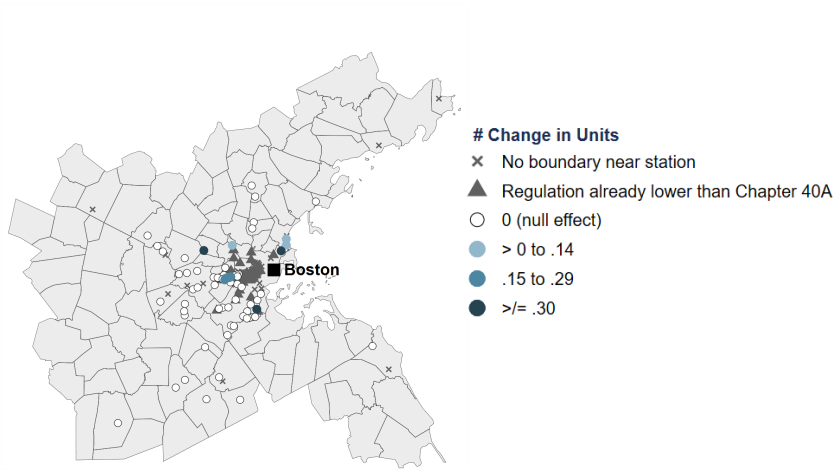
Towns should zone for multifamily development and allow density of at least 15 units per acre near metro transit stops

- Thought experiment: Small-scale relaxation of regulations within 0.2 mile around transit stop one at a time
- RD setup is well suited to study such small changes in limited area (not GE effects from large changes)

Details

Policy Effects: Relaxing Regulations Near Transit Stops - Supply

Back



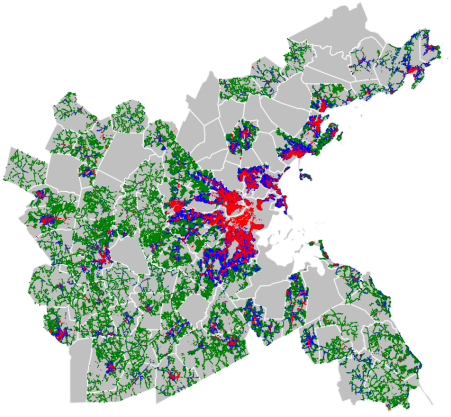
Renters: median Δ 23% increase in the number of units per lot

Main Land-Use Regulations for Residential Construction

- Dwelling units per acre (Dupac)
  - Will call this *Density* going forward
  - Maximum allowable units + minimum lot size
  - Changes the **density** of buildings
  - One standard deviation (SD) ↑ in average density ↓ 0.007 SD in WRLURI
- Height restrictions
  - Change the **size/built area** of building
  - One SD ↑ in average height ↓ 0.06 SD in WRLURI
- Multifamily allowed (MF)
  - Changes the **type** of building
    - Allowing multifamily by-right ↓ 0.07 SD in WRLURI

Back

Density across Space



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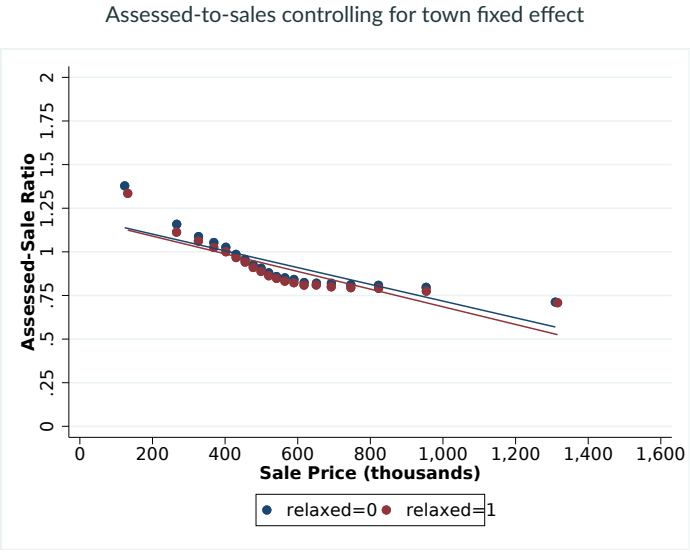
Assessed Values and Sales Prices



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Prices and Rents

1. Single-family prices:
    - Yearly tax assessor values
    - Sales prices
    - Owner cost of housing at 6.29% (BLS, 2017) for comparision with rents
2. Multifamily rents:
    - Owner cost of housing at 6.29% (BLS, 2017)
    - Co-star historic rent [n=18,536]
    - Imputed rent with ACS and detailed Co-star characteristics [n=112,992]

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