

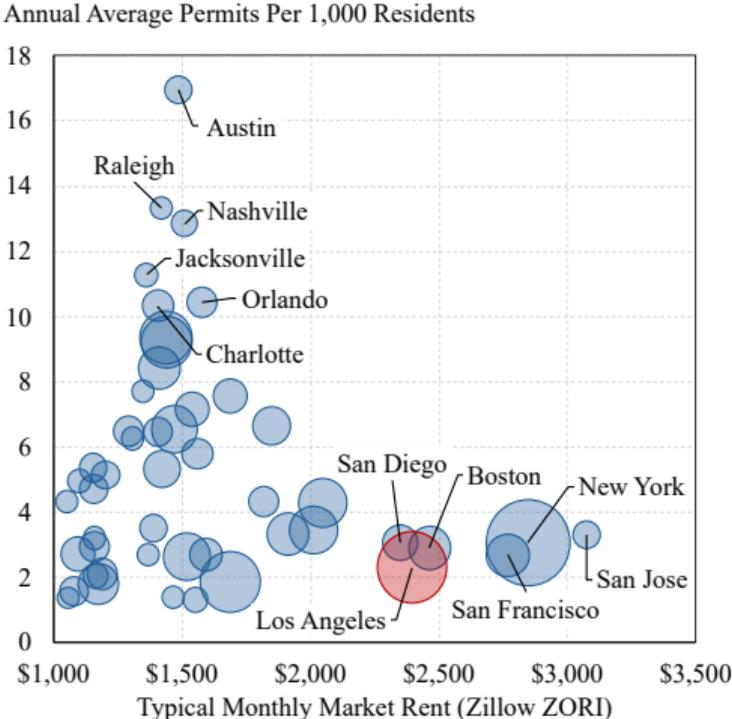
# How Costly Is Permitting in Housing Development?

Jonathan Gruber  
MIT & NBER

Evan Soltas  
Princeton & NBER

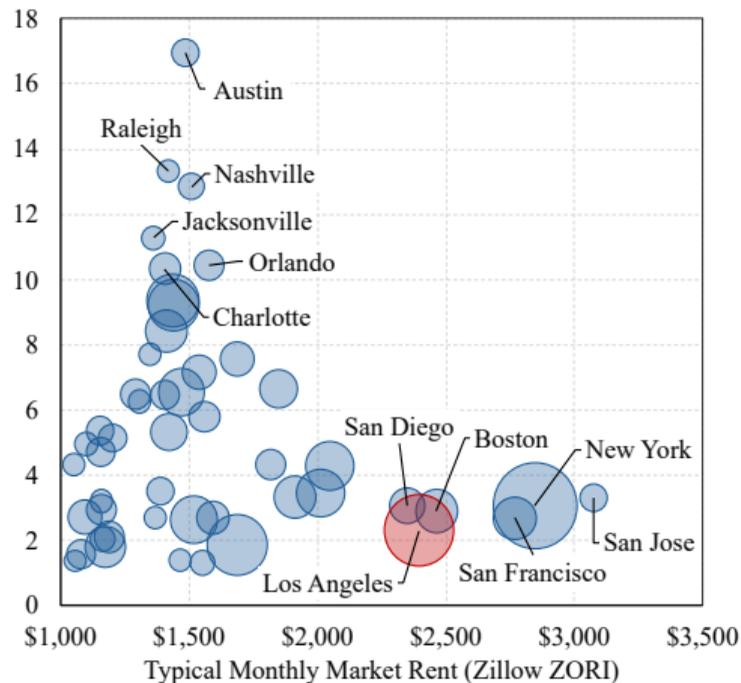
February 2026

# Housing Affordability in Leading U.S. Cities



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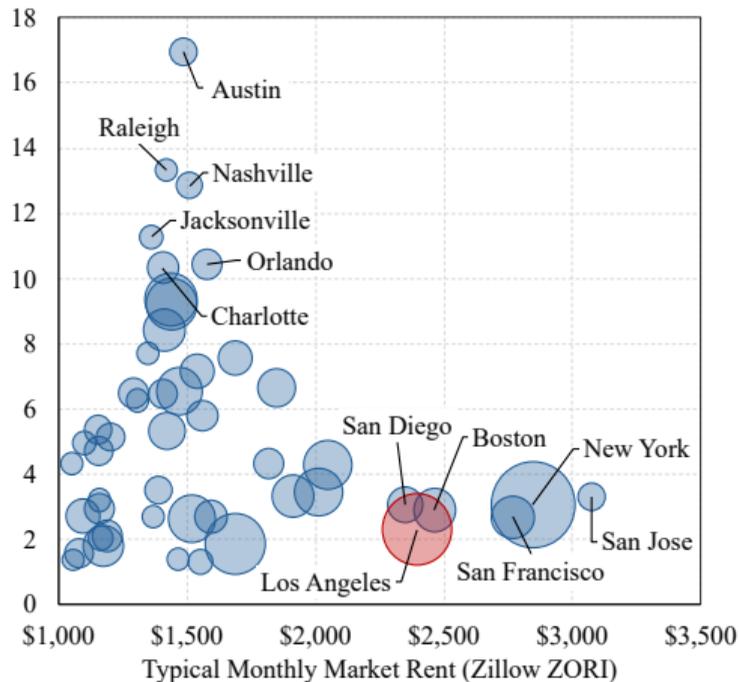
Annual Average Permits Per 1,000 Residents



- Rents offset full urban wage premium  
Diamond & Moretti, '21; Card et al., '21
- Substantial loss to aggregate output  
Hsieh & Moretti, '19; Duranton & Puga, '23
- “Faltering escalator” of urban opportunity  
Ganong & Shoag, '17; Autor, '20

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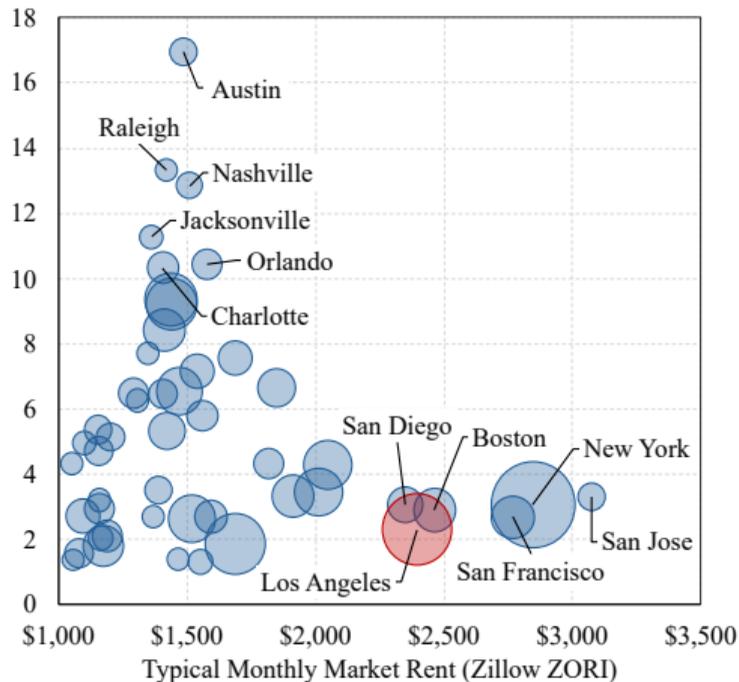
## Economists' answer: regulatory barriers

- Capitalization of total regulatory wedge

Glaeser & Gyourko, '03; Glaeser Gyourko Saks, '05; Gyourko & Krimmel, '21

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Glaeser & Gyourko, '03; Glaeser Gyourko Saks, '05; Gyourko & Krimmel, '21

- Impacts of specific regulations

**Development:** Mayer & Somerville, 2000; Kahn et al., 2010; Jackson, 2016; Anagol et al., 2022; Buchler & Lutz, 2024; Kulka et al., 2024

**Land prices:** Fu & Somerville, '01; Brueckner & Sridhar, '12; Turner et al., '14



“Surviving local opposition often means agreeing to a range of demands that send costs ballooning.”

– Klein & Thompson, *Abundance* (2025)



“This is what developers mean when they talk about being extorted by a city for a building permit.”

– Dougherty, *Golden Gates* (2020)

→ **de-facto burdens versus de-jure constraints**

“Historic laundromat” to 75 units



“Historic laundromat” to 75 units

## Why are permitting costs hard to measure?

- 1 Multidimensional and not directly observed  
→ reflects time, risk, & resources  
(Lyons & Sweeney '25, Gabriel & Kung '25)



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→ contrast with regulatory measurement  
(Quigley & Rosenthal '05, Gyourko et al. '21, Bartik et al. '21)



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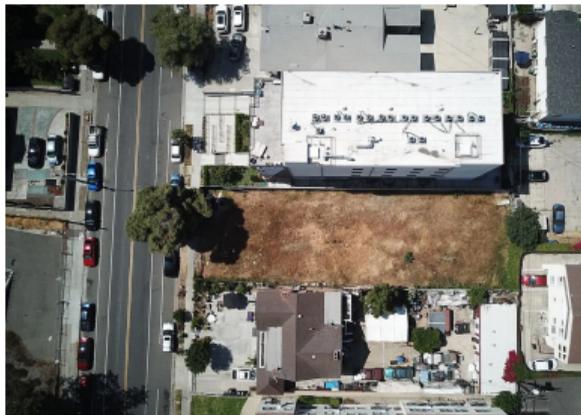
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**This paper:** Measuring regulatory cost in an *implicit market* for building permits

# An Implicit Market for Permits



362 S Commonwealth Ave (90020)

9,339 ft<sup>2</sup> lot

\$160/ft<sup>2</sup>

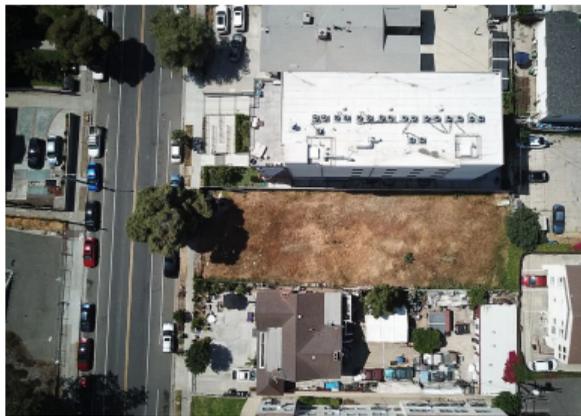


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8,001 ft<sup>2</sup> lot

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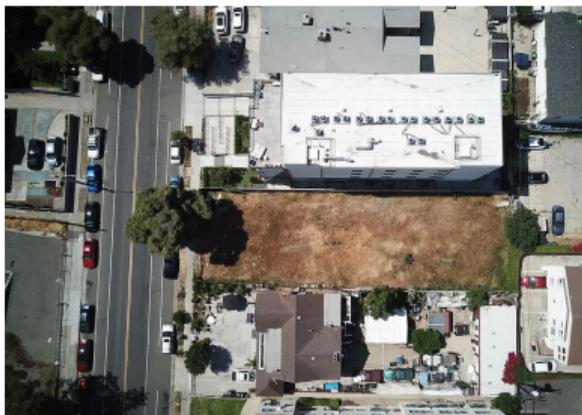
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**Approved** for 5 units

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“Ready-to-issue” (RTI) submarket  
1 in 5 land sales in some neighborhoods

# This Paper

- ① How costly is permitting?

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- **Approach:** Repeat-listing hedonic regression, using “ready-to-issue” submarket
- **Result:** Approval premium = **50%** of raw land value (\$48/ft<sup>2</sup>)
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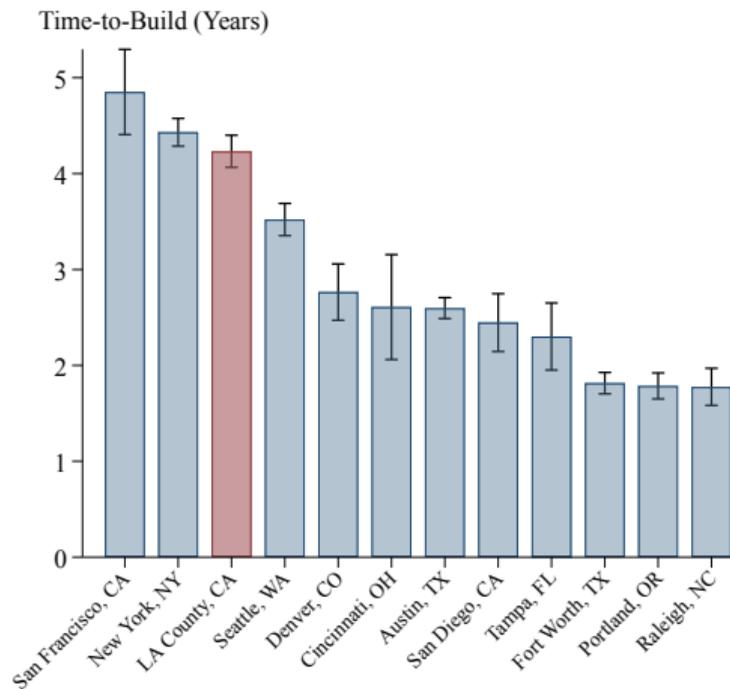
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## ③ What is permitting's share of the regulatory tax on new housing?

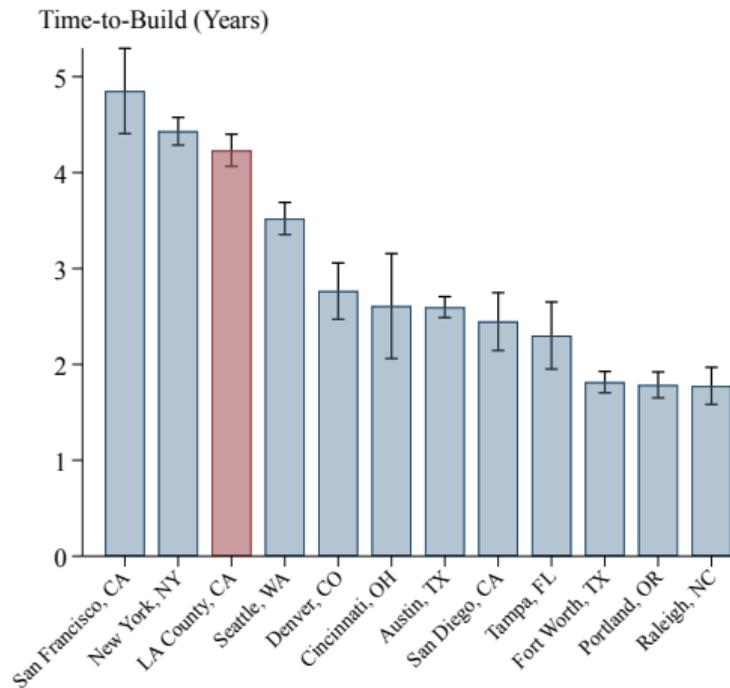
- **Theory:** Land prices capitalize the Glaeser–Gyourko wedge
- **Result:** 32% citywide, similar even in the highest-cost areas of the city

- ① **Setting and Data**
- ② Theoretical Framework
- ③ Approval Premium
- ④ Time-to-Build Effects
- ⑤ Permitting Share
- ⑥ Conclusion

## Years to complete a 30-unit apartment building (median-density neighborhood, in 2019)

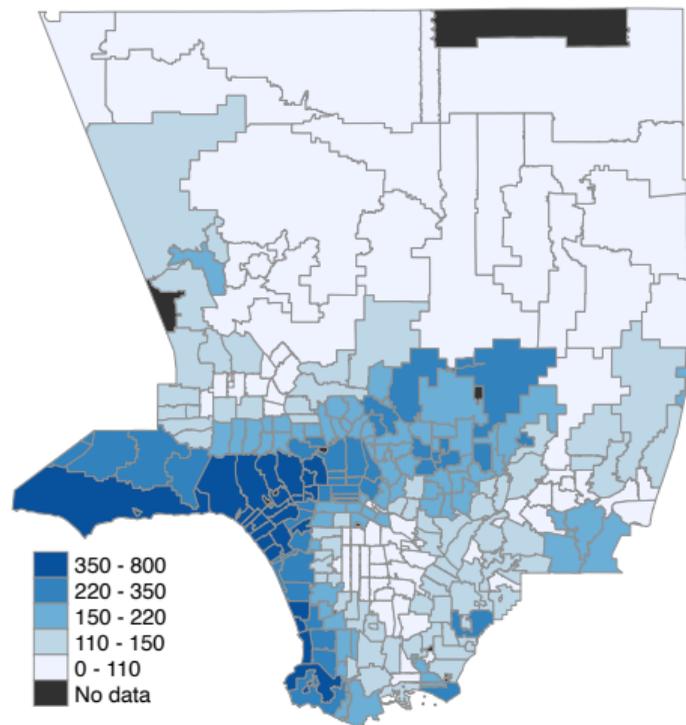


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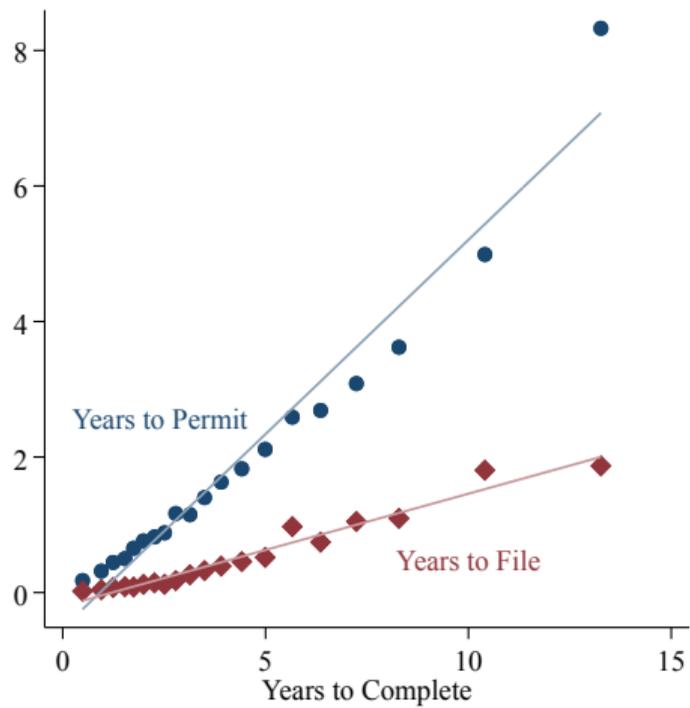


Time-to-Permit

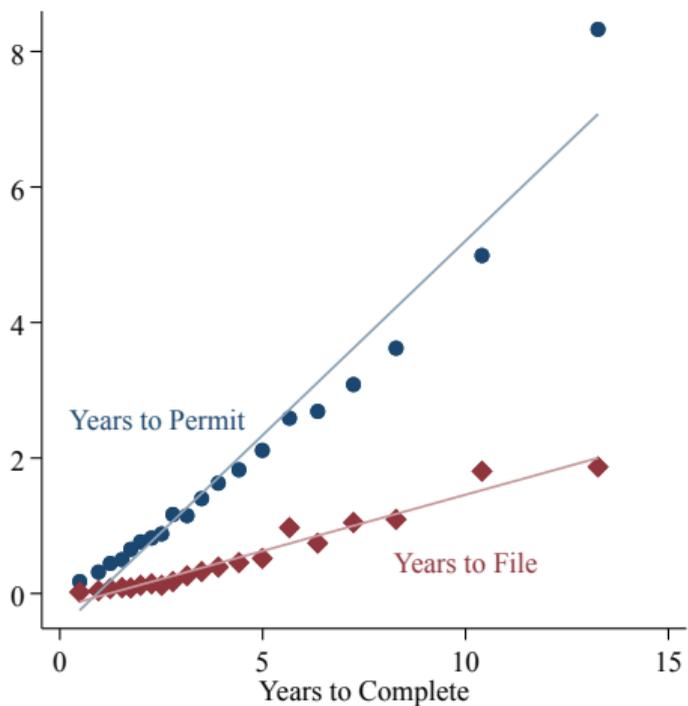
## % rent-cost gap by LA zipcode (Glaeser & Gyourko, '03)



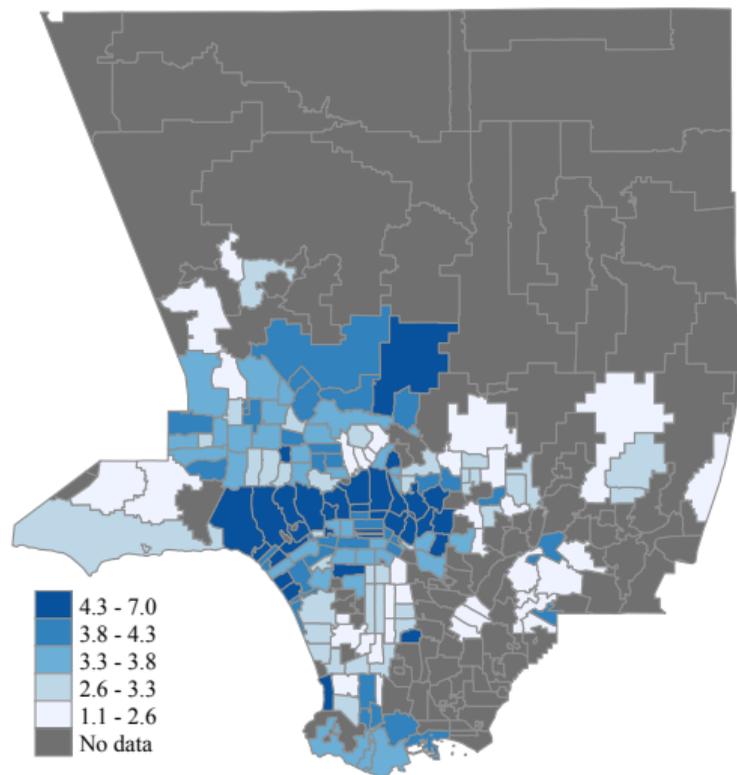
## Time-to-build versus time-to-permit



## Time-to-build versus time-to-permit



## Years to complete apartment buildings



# Data: Listed Properties in Los Angeles County

Source: Multiple Listing Service (MLS), 1995–2025

**LoopNet** Log In

**3019 E 4th St**  
0.31 Acres of Commercial Land Offered at \$1,995,000 in Los Angeles, CA 90063

Commercial Land Parcels / California / Los Angeles / 3019 E 4th St, Los Angeles, CA 90063

INVESTMENT HIGHLIGHTS

- 36 Unit (26,970 SF) Approved RTI.
- Plans can be converted to Affordable Housing
- Heavy Foot/Car Traffic, 3 miles away from Downtown LA.
- \$196 a foot Construction Bid for Affordable Housing

EXECUTIVE SUMMARY

Approved RTI plans for 36 one bedroom unit. The property also offers affordable housing opportunities, that can will also allow for 50+ units. Boyle Heights, historically known as Paredón Blanco is a neighborhood in Los Angeles, California, located east of the Los Angeles River and host to USC + UCLA Medical Center. The city is served by several major

freeways, including the 5, 10, 101, and 60 making it easily accessible to other parts of the city. The neighborhood is also served by several Metro bus lines and the Yellow Line rapid transit busway. Overall, Boyle Heights is a diverse and vibrant neighborhood that offers a mix of residential and commercial amenities.

Call  
Message

CONTACT

David Nalbandyan  
PREMIER REALTY INVESTMENT CAPITAL MANAGEMENT

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**Linkages:** transactions, permits, assessments, zoning

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Message

# Measuring Preapproval

Keywords

LLM

Human Validation

**Ready-to-Issue** The description explicitly states all necessary plans and permits are fully approved, paid for, and issued.

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“Street to street lot with city lights and mountain views. Price includes plans for 3,400sq. ft. post & beam home. Planning permission, Mulholland Scenic Hwy permission. Sewer and street improvement engineering plans. Ready to build immediately.”

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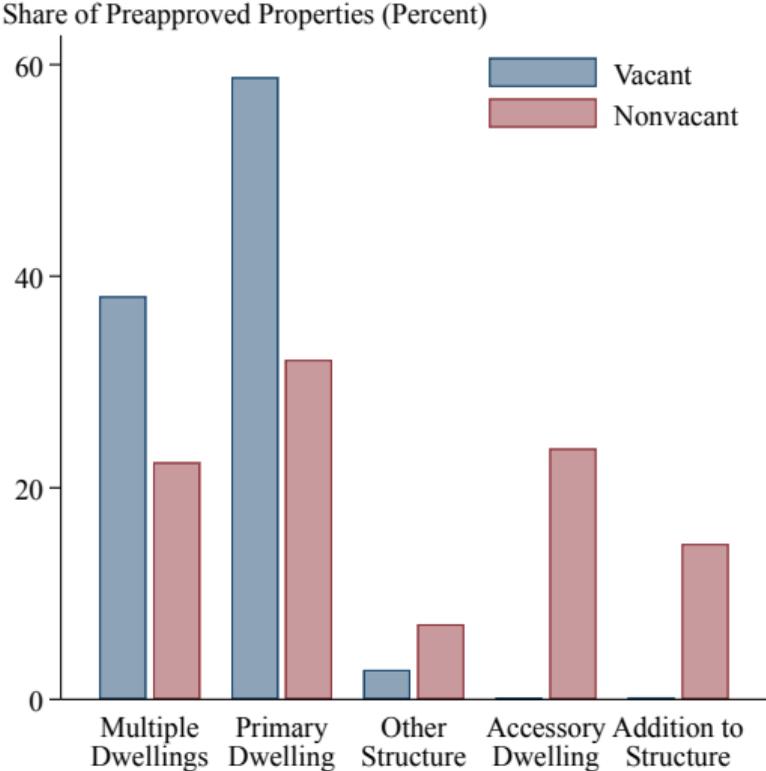
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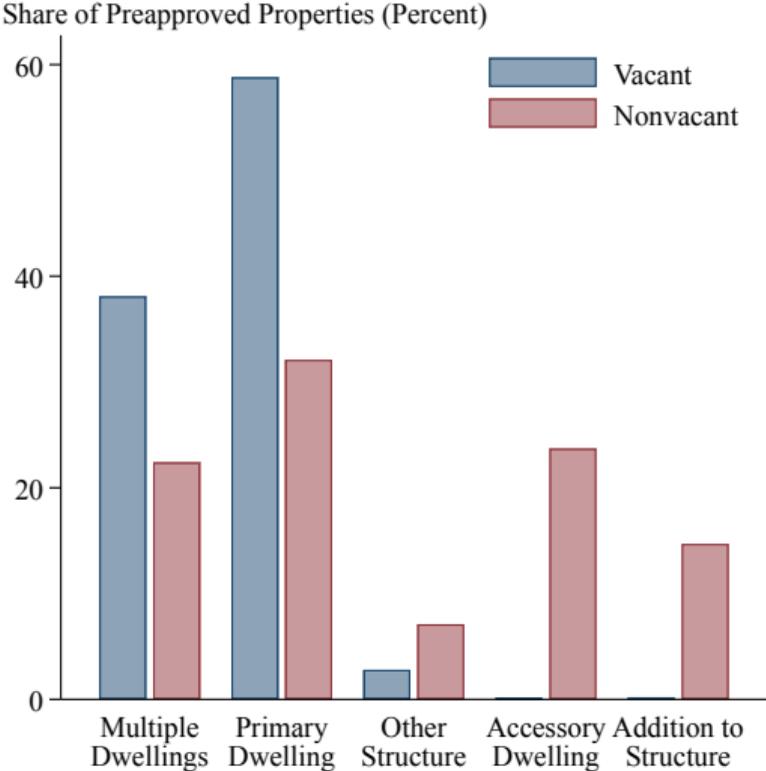
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“Spectacular upslope site overlooking Lake Hollywood with big future potential. Raw site with no utilities or street improvements. 8350 square feet. Seller may assist.”

# Preapproval: The “What”



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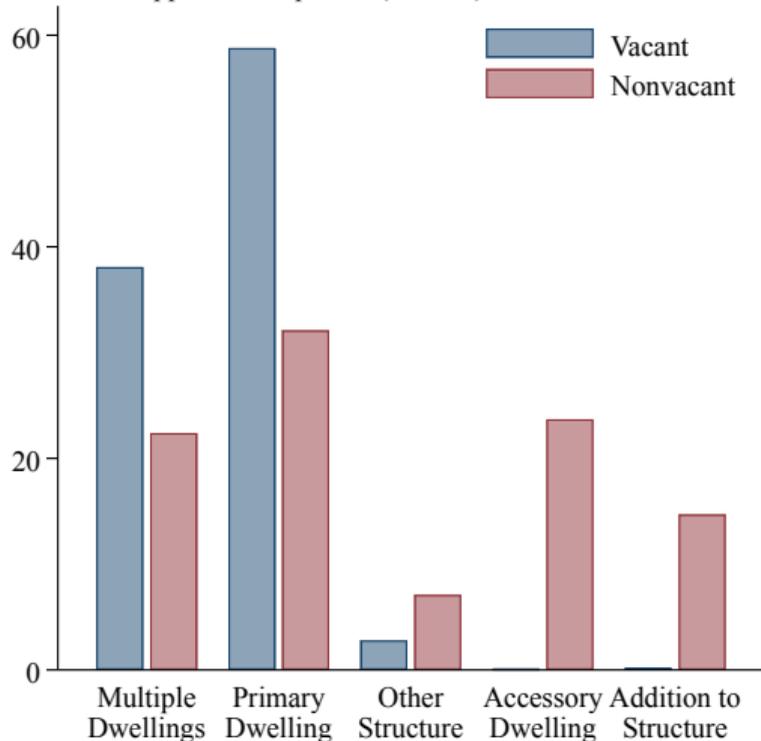


## Validating LLM output

- 1 Inter-rater disagreement: human-LLM  $\approx$  human-human →
- 2 Instrument human via LLM →

# Preapproval: The “What”

Share of Preapproved Properties (Percent)



## Validating LLM output

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## More detailed measurement

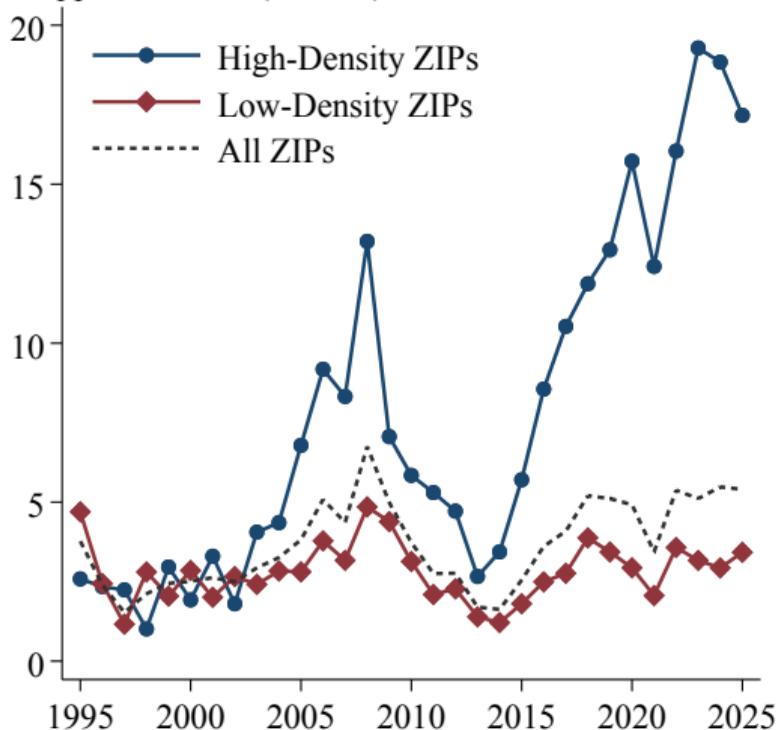
- Anticipated highest-and-best use →
- Classifier confidence (subjective rating)
- Text embeddings as controls (RoBERTa)

# Preapproval: The “When” and “Where”

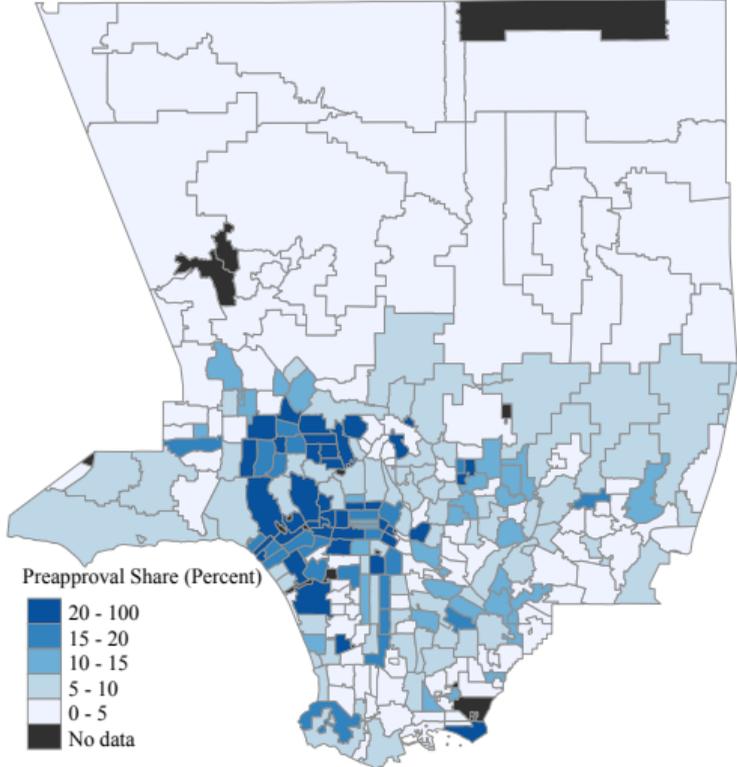
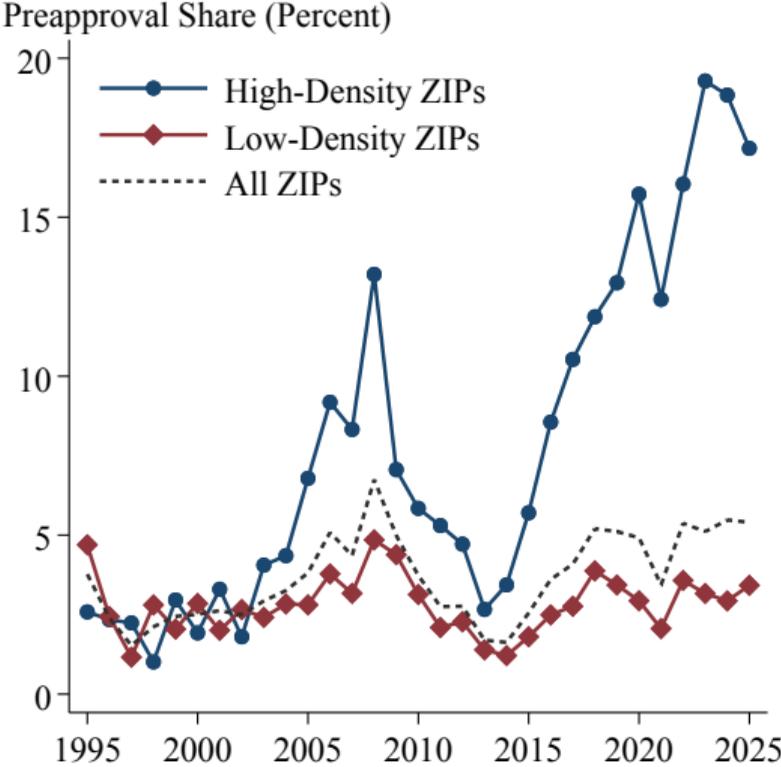
More When

More Where

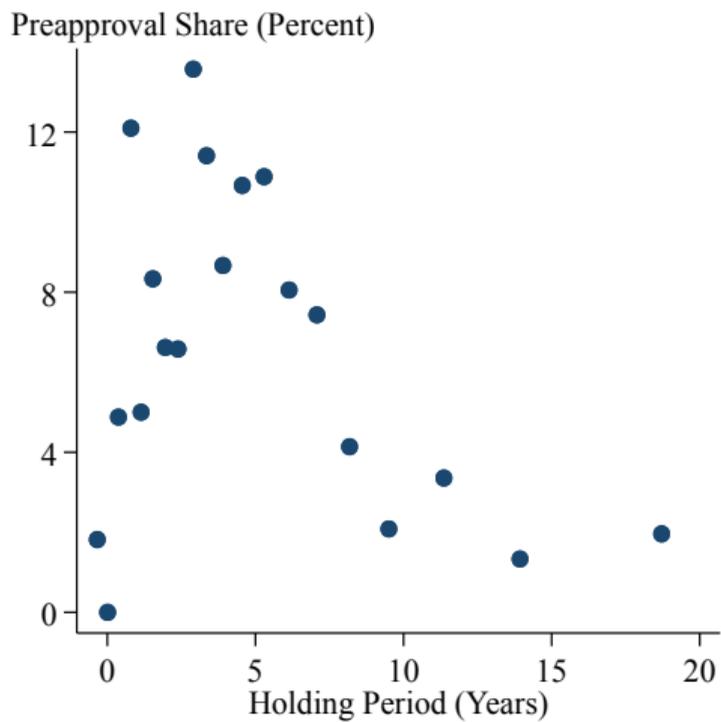
Preapproval Share (Percent)



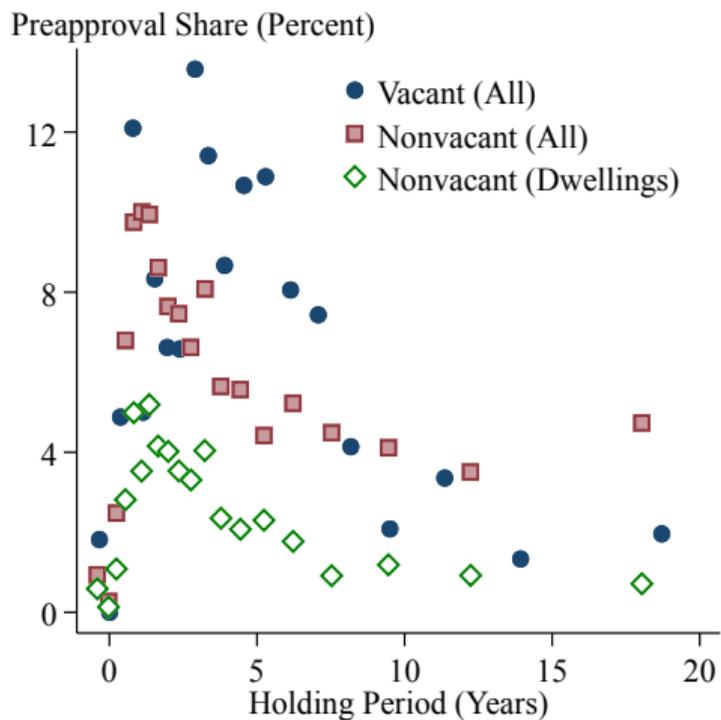
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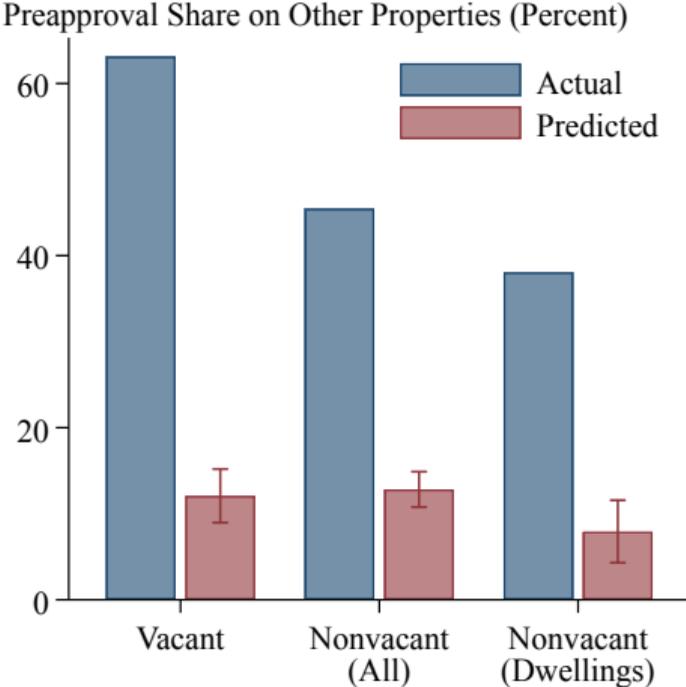
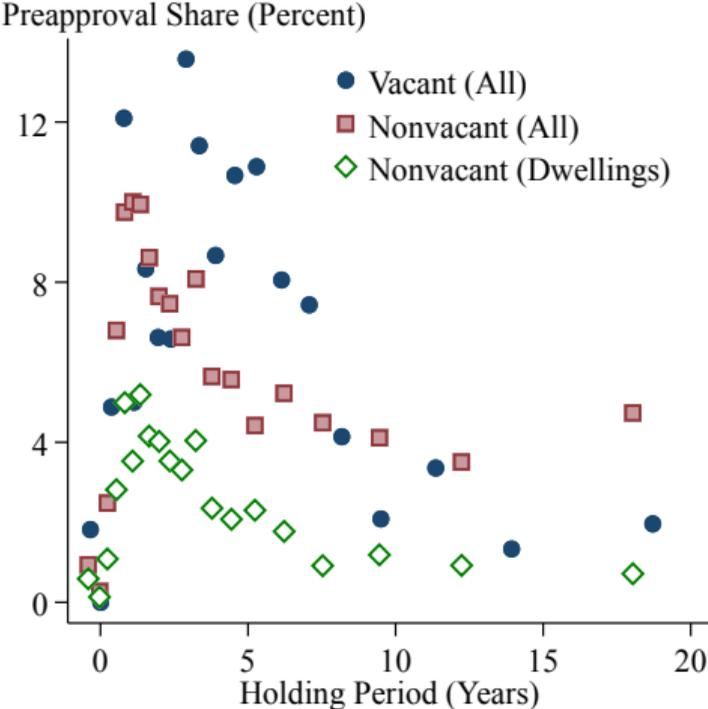
## Preapproval: The “Who”



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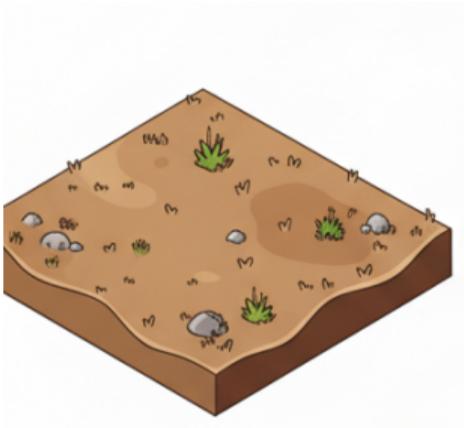


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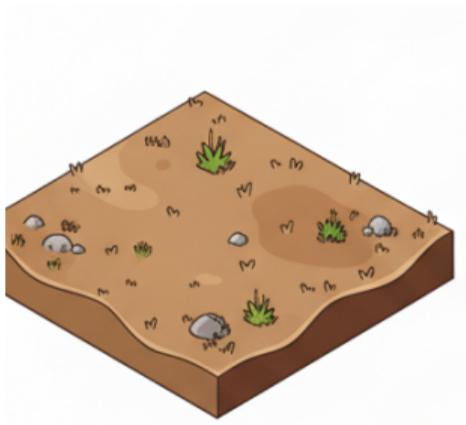


	Vacant Properties		Nonvacant Properties	
	Not Preapproved	Preapproved	Not Preapproved	Preapproved
<i>Panel A: Median Property Characteristics</i>				
Price	299,000	948,000	772,000	1,150,000
Living Area (sqft.)	0	0	1,743	1,797
Lot Area (sqft.)	21,880	9,975	7,410	7,500
<i>Panel B: Mean Neighborhood Characteristics (Tract/Zipcode)</i>				
Population Density	2,755	7,190	9,998	9,293
% Poor	8.9	8.9	10.4	9.5
% Non-Hispanic White	43.4	43.4	25.0	33.4
% Hispanic	34.2	24.7	35.2	26.2
% College Graduate	35.4	50.5	37.4	46.5
% Renters	27.7	37.2	44.9	42.2
Land Price (\$/sqft.)	110.0	156.1	144.3	156.1
Observations	86,428	4,039	90,722	6,076

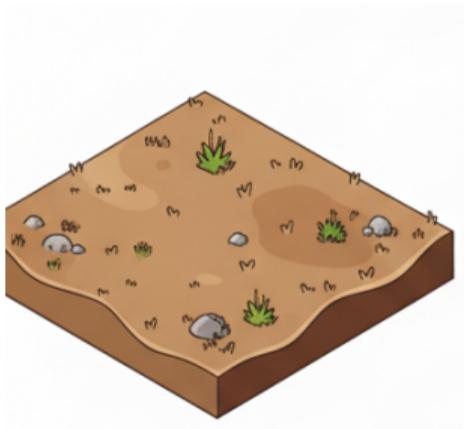
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permitting effort  $c_j(q_j) \rightarrow$  arrival rate  $q_j$

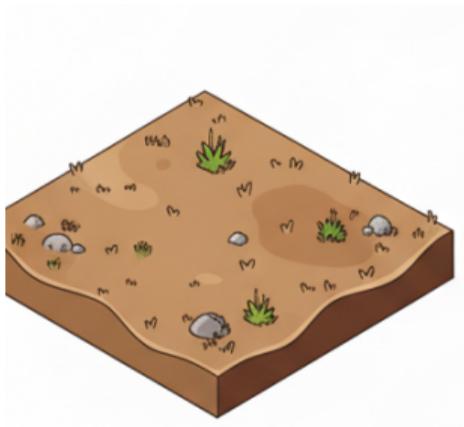


permitting effort  $c_j(q_j) \rightarrow$  arrival rate  $q_j$



landowners sell only parcel  $j$   
to a developer

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developers choose capital  $h$   
on permitted land, up to  $\bar{h}_j$

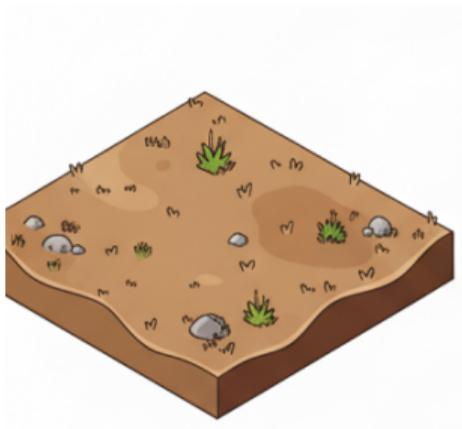
permitting effort  $c_j(q_j) \rightarrow$  arrival rate  $q_j$



**Households**



Choose location to max flow utility



landowners sell only parcel  $j$   
to a developer

developers choose capital  $h$   
on permitted land, up to  $\bar{h}_j$

# Developer's Problem

## Approved Land

$$\pi_j(\bar{h}_j) = \max_h \left\{ \frac{r_j(h)h}{1 - \beta(1 - \delta)} - k_j(h) \right\} \quad \text{s.t.} \quad h \leq \bar{h}_j$$

- $h$  : housing units
- $r_j(h)$  : rent price
- $k_j(h)$  : constr. cost
- $c_j(q)$  : permitting effort
- $\bar{h}_j$  : quantity limit
- $\beta$  : discount factor
- $q_j$  : permit arrival
- $\delta$  : demolition rate

# Developer's Problem

## Approved Land

$$\pi_j(\bar{h}_j) = \max_h \left\{ \frac{r_j(h)h}{1 - \beta(1 - \delta)} - k_j(h) \right\} \quad \text{s.t.} \quad h \leq \bar{h}_j$$

## Raw Land

$$v_{0,j}(\bar{h}_j) = \max_q \left\{ \beta \left[ q\pi_j(\bar{h}_j) + (1 - q - c_j(q))v_{0,j}(\bar{h}_j) \right] \right\}$$

- $h$  : housing units
- $r_j(h)$  : rent price
- $k_j(h)$  : constr. cost
- $c_j(q)$  : permitting effort
- $\bar{h}_j$  : quantity limit
- $\beta$  : discount factor
- $q_j$  : permit arrival
- $\delta$  : demolition rate

# Theoretical Results

- 1 Relative to its counterfactual raw price, approved land trades at a premium of

$$\theta_j = \frac{p_{1,j}(\bar{h}_j) - p_{0,j}(\bar{h}_j)}{p_{0,j}(\bar{h}_j)} = \frac{1 - \beta}{\beta q_j^*} + \frac{c_j(q_j^*)}{q_j^*}.$$

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- ② Preapproval increases the present value of rental income by the fraction

$$\frac{\sum_{t=0}^{\infty} \beta^t (F_{1,j}(t) - F_{0,j}(t))}{\sum_{t=0}^{\infty} \beta^t F_{0,j}(t)} = \frac{1 - \beta}{\beta q_j^*},$$

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- ③ The permitting share of the housing cost wedge is:

$$\frac{\tau_j(\bar{h}_j)}{R_j(\bar{h}_j) - k_j(\bar{h}_j)} = \frac{\theta_j(\bar{h}_j)}{1 + \theta_j(\bar{h}_j)}.$$

- ① Setting and Data
- ② Theoretical Framework
- ③ **Approval Premium**
- ④ Time-to-Build Effects
- ⑤ Permitting Share
- ⑥ Conclusion

## Approval Premium: Measurement

$$\log p_{it} = \alpha_j + \alpha_t + \beta \text{RTI}_{it} + u_{it}$$

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- **Identification challenge #1:** unobserved attributes (Greenstone 2017)
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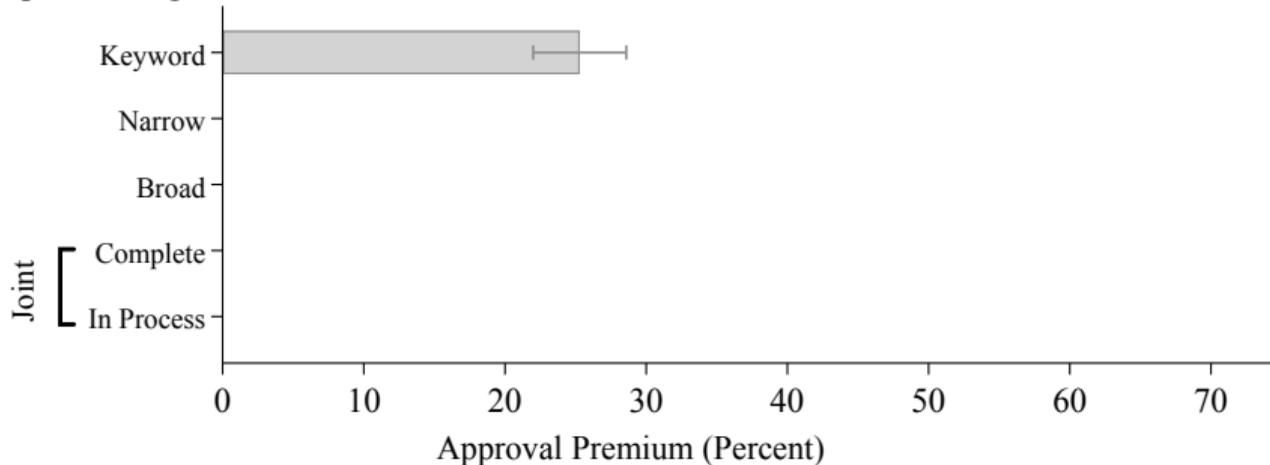
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  - Robust to time-interacted neighborhood & text embedding controls →
- **Identification challenge #2:** capitalization of anticipated approval
  - Threat of bias in hedonic panel design (Kiel & McClain 1995, Bishop & Murphy 2019)
  - We show price response coincides with arrival of approval information

### Cross-Section



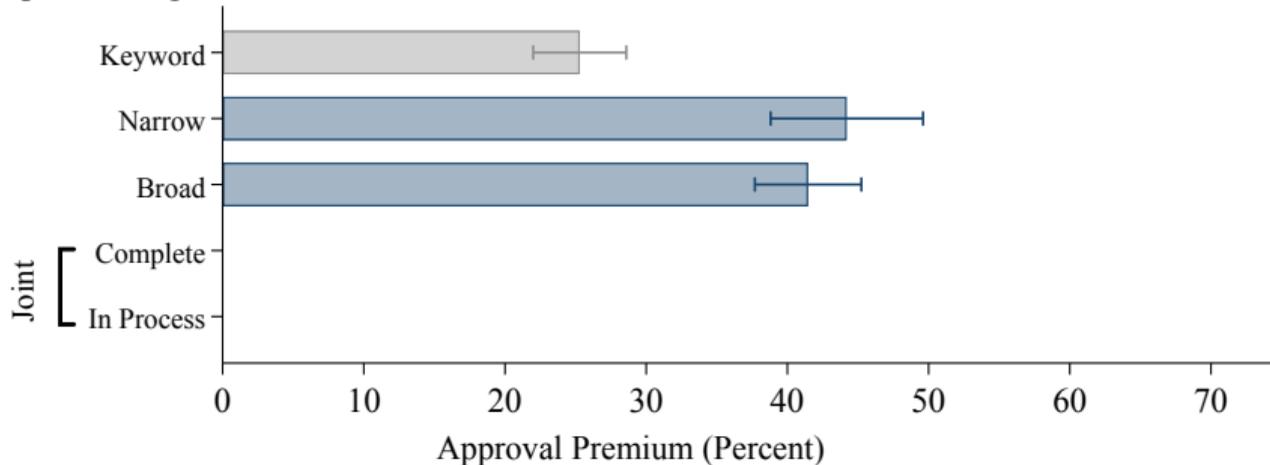
### Repeat-Listing DID



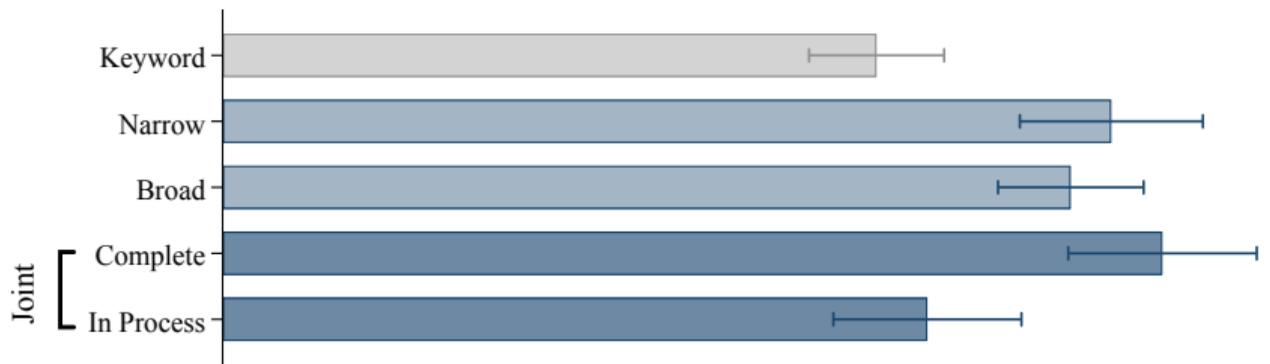
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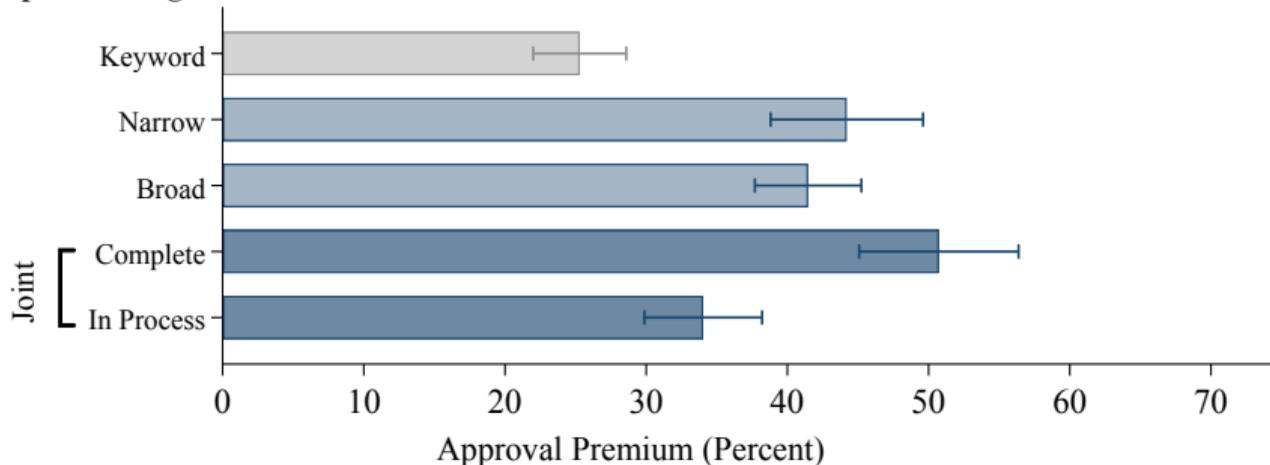
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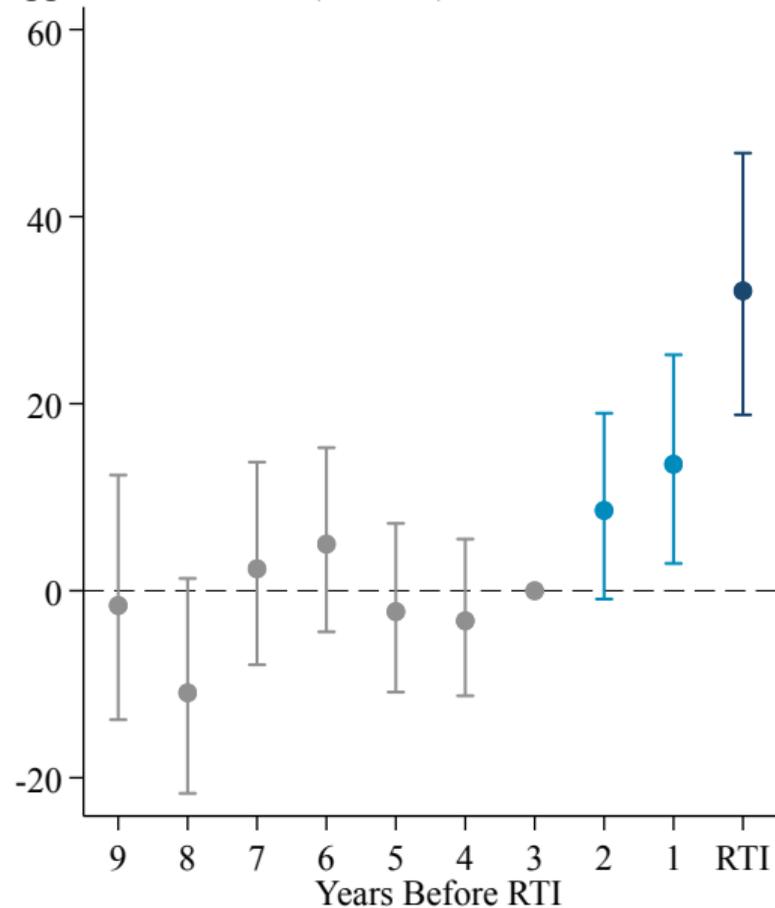
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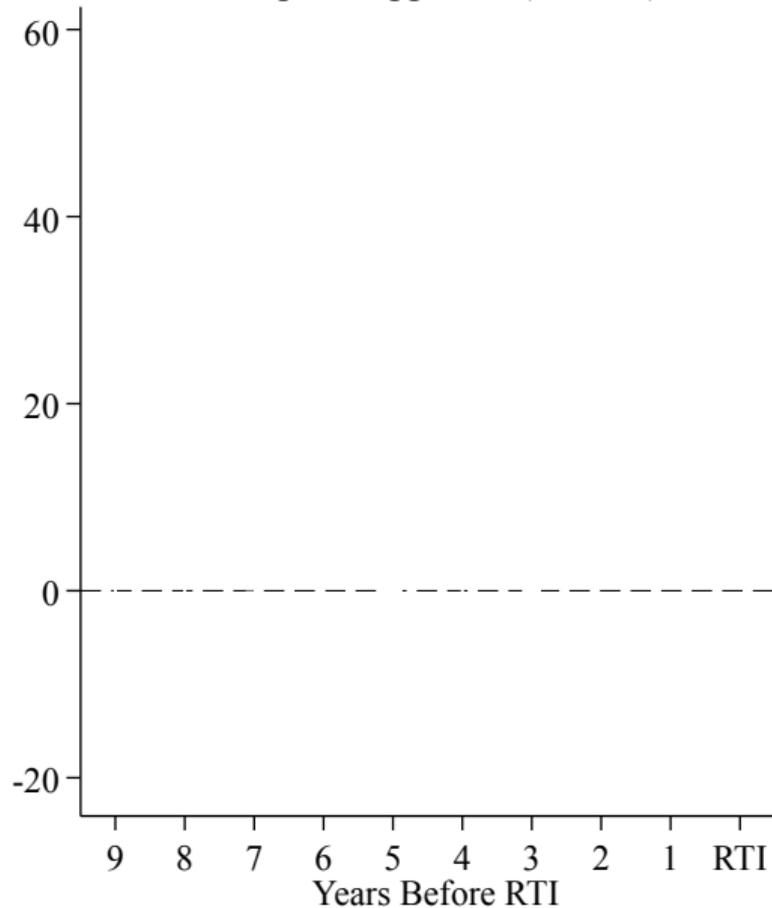
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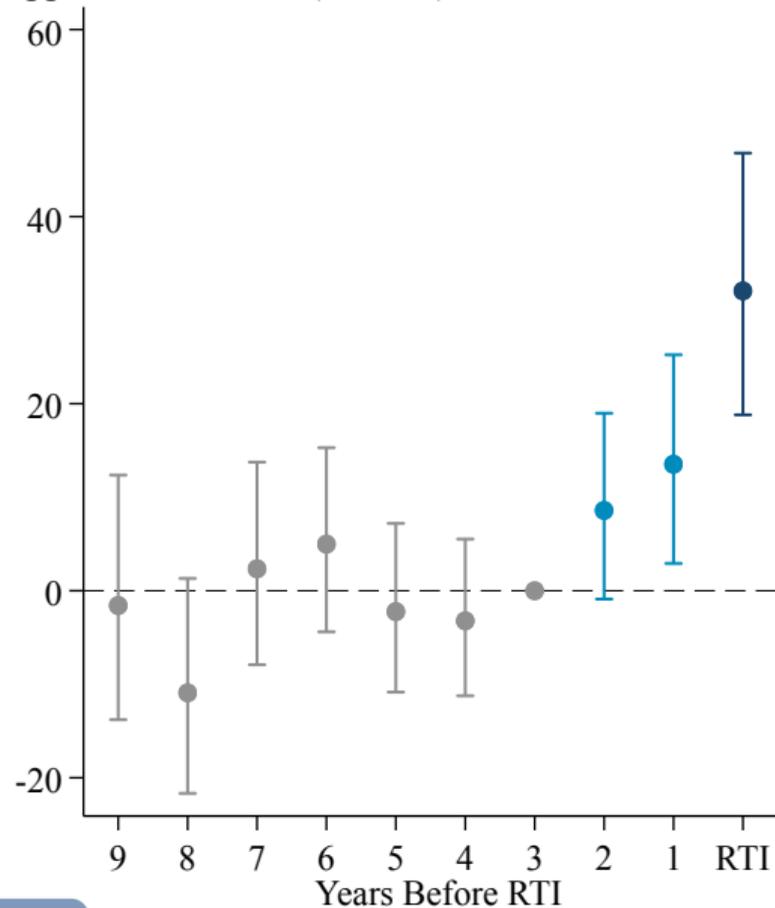
Approval Premium (Percent)



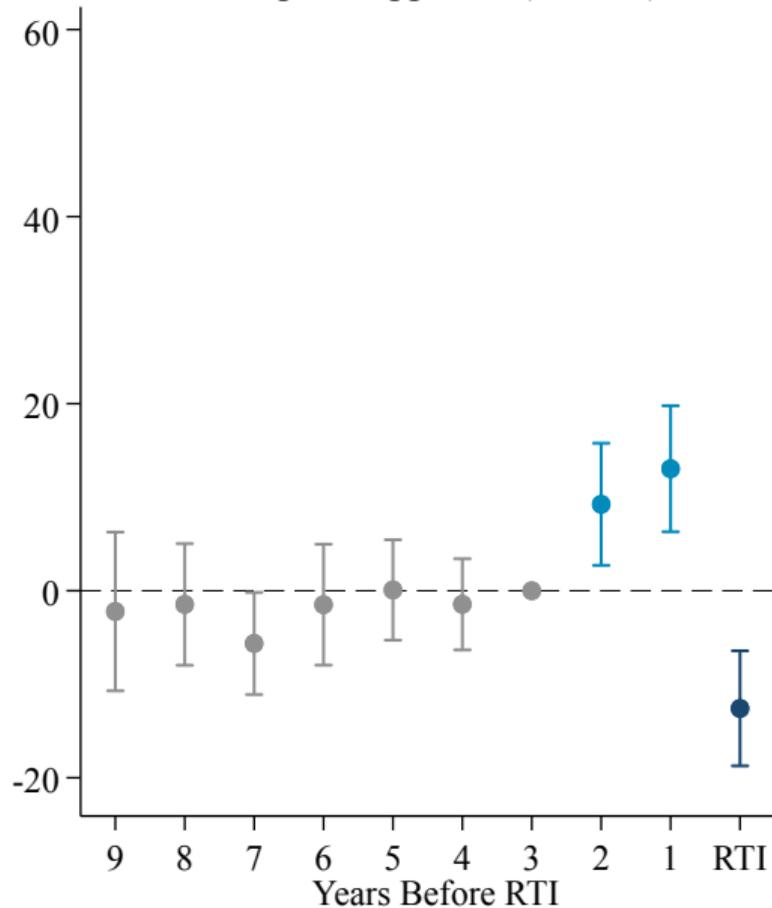
Share With Incomplete Approval (Percent)



Approval Premium (Percent)



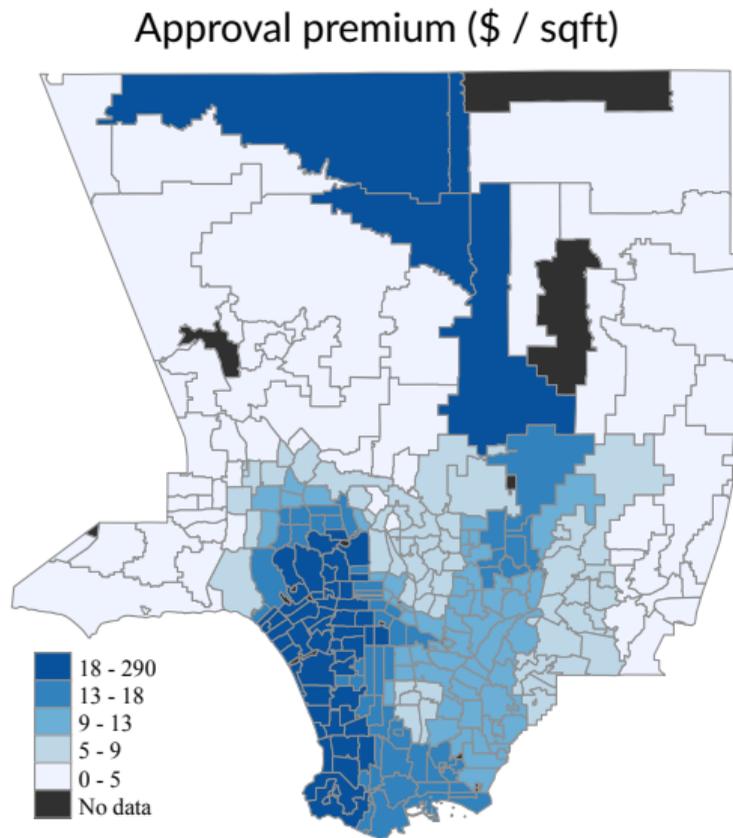
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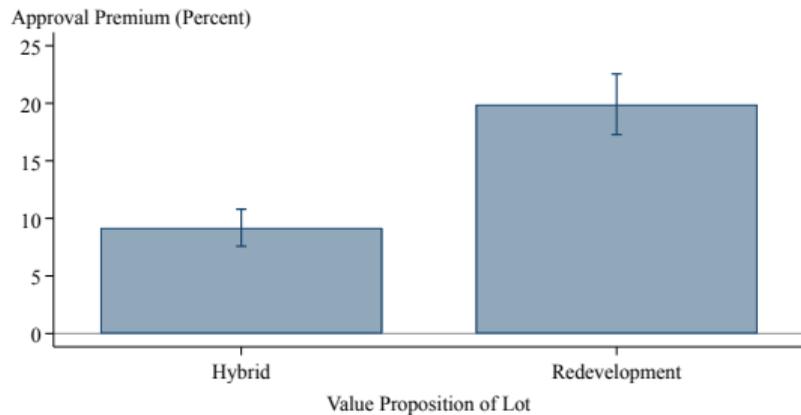


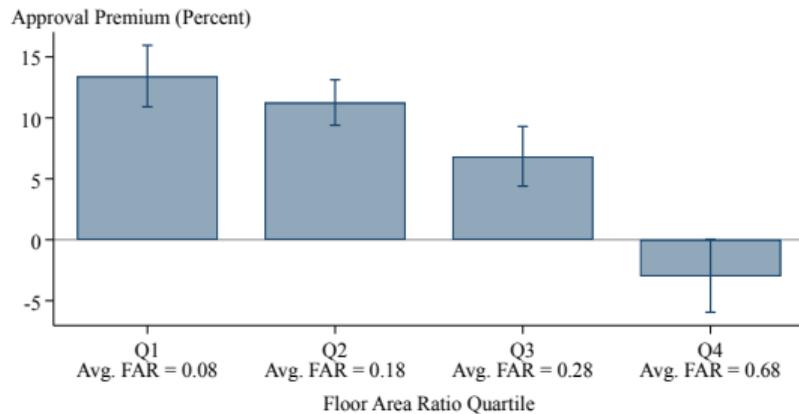
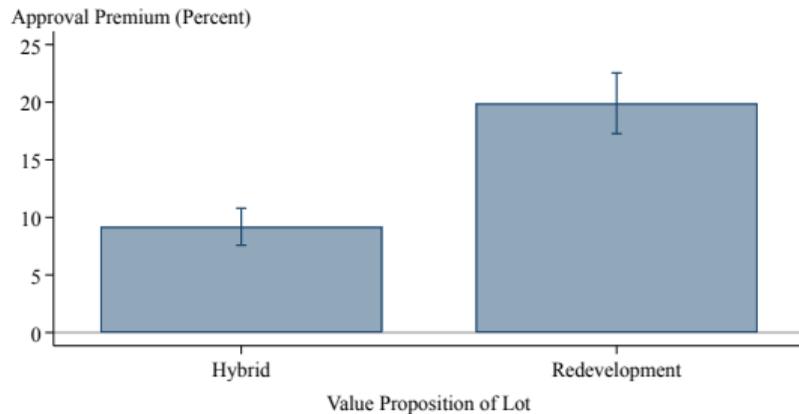
# Heterogeneity in Approval Premia

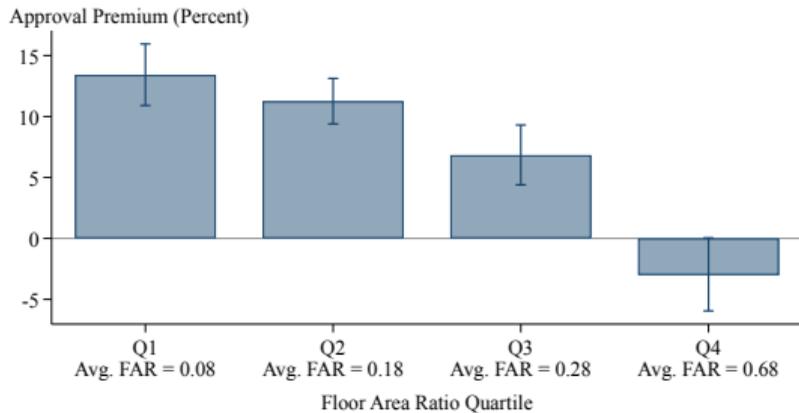
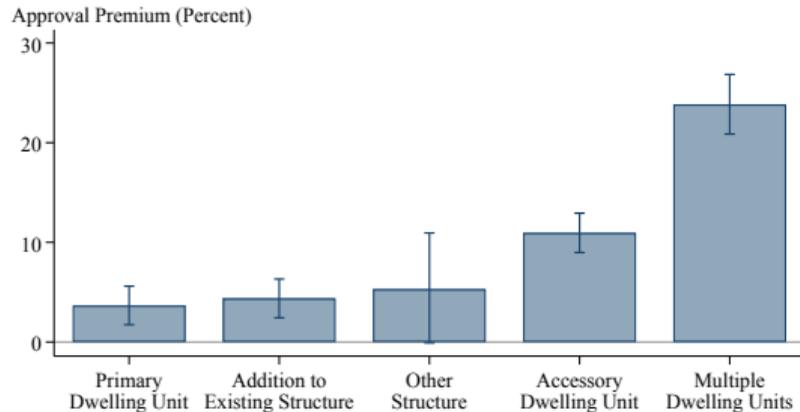
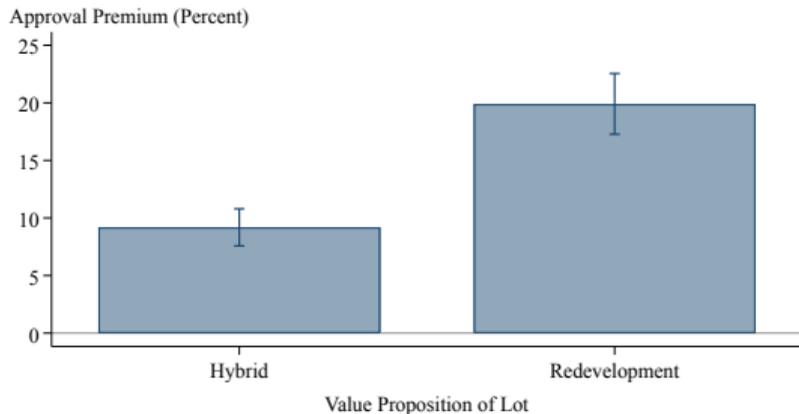
- Over time →
- By zoning district type →
- By neighborhood characteristic →
- Selection into identification →

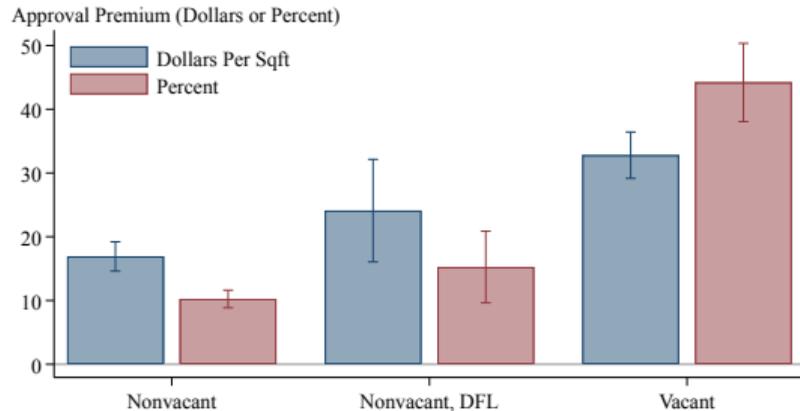
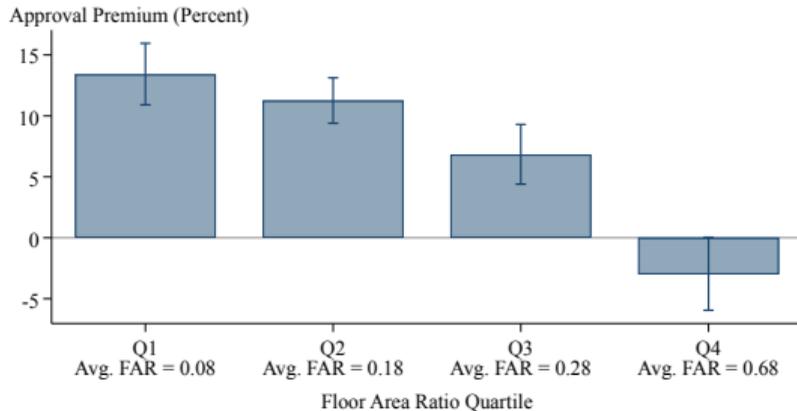
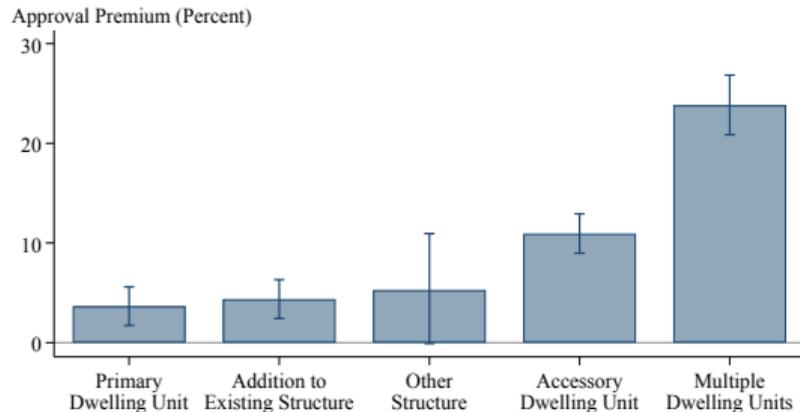
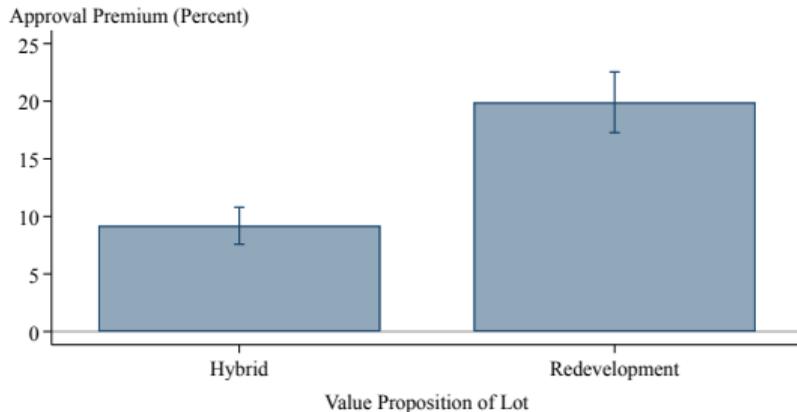
Premium (%)











- ① Setting and Data
- ② Theoretical Framework
- ③ Approval Premium
- ④ **Time-to-Build Effects**
- ⑤ Permitting Share
- ⑥ Conclusion

## Buying Time

Completion hazard at  $t$  quarters from sale (sale-year cohort  $s$ )

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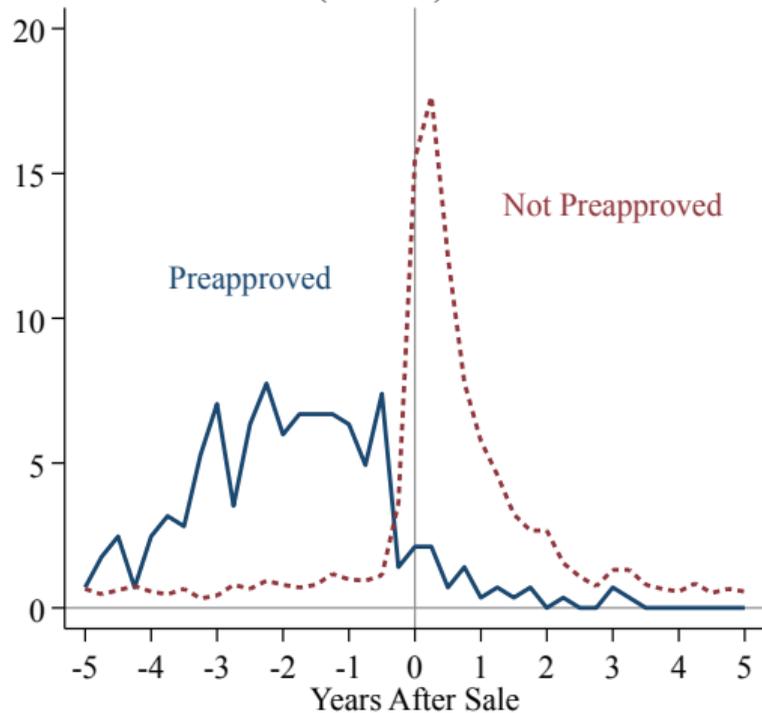
**Counterfactual completion rate by horizon  $T$**  (cumulative)

$$\hat{F}_{\text{cf}}^{[0, T]} = 1 - \prod_{t=0}^{T-1} (1 - (\bar{q}_t - \hat{\beta}_t))$$

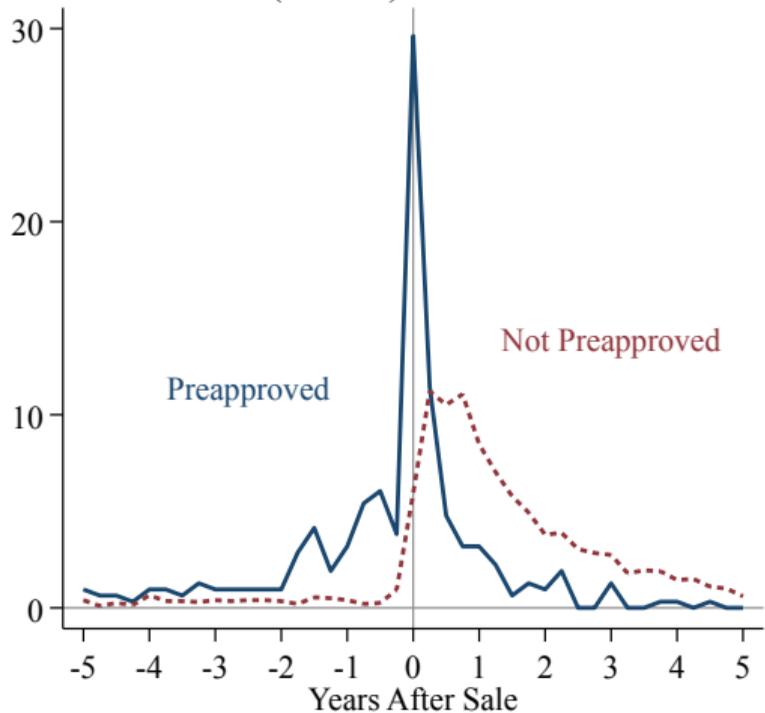
**Dynamic effects on completion**

$$\hat{\Delta}(T) = F^{[0, T]} - \hat{F}_{\text{cf}}^{[0, T]}$$

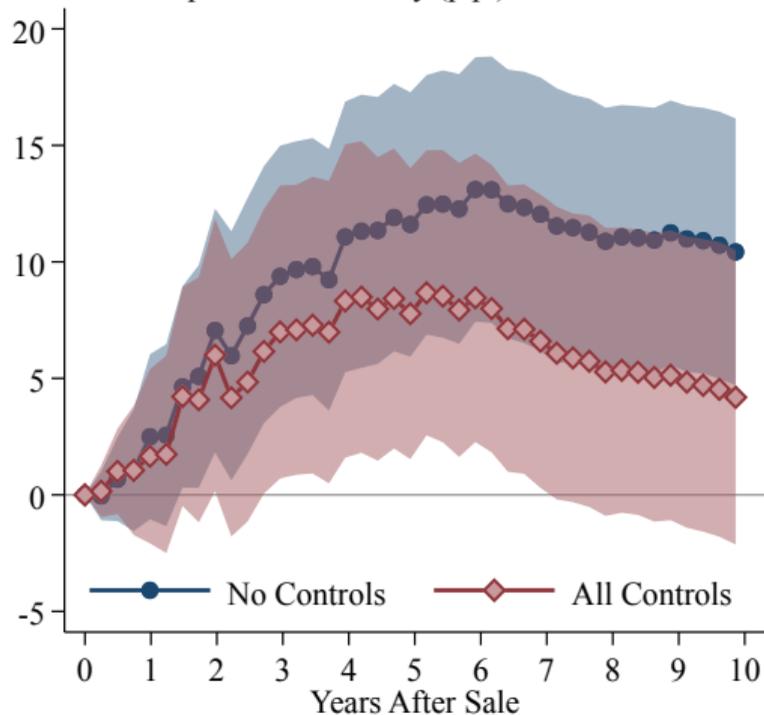
Share of Submissions (Percent)



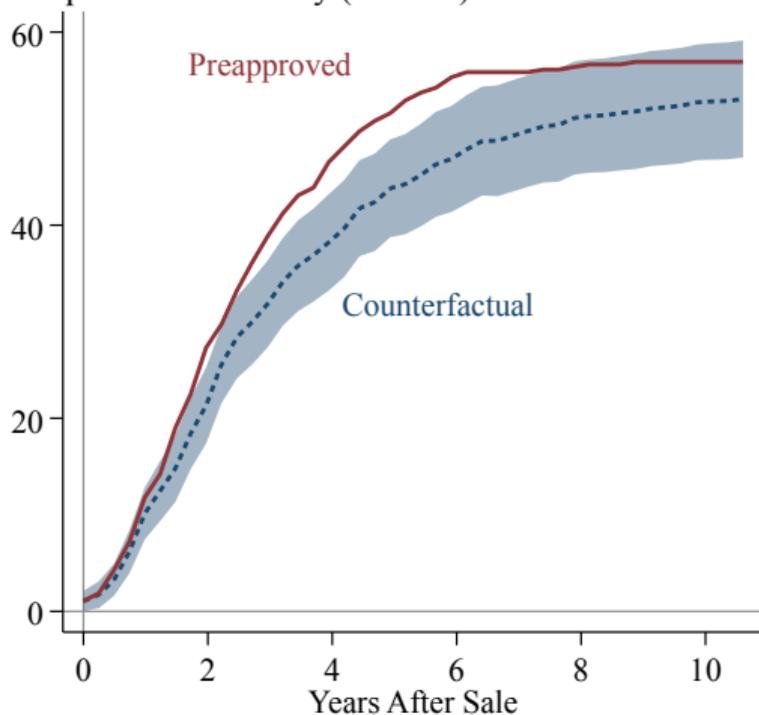
Share of Issuances (Percent)



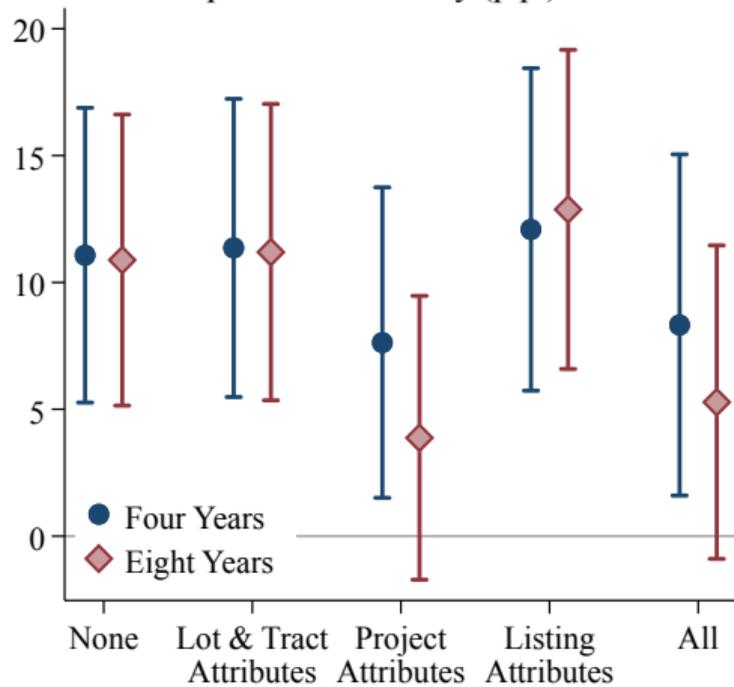
Effect on Completion Probability (p.p.)



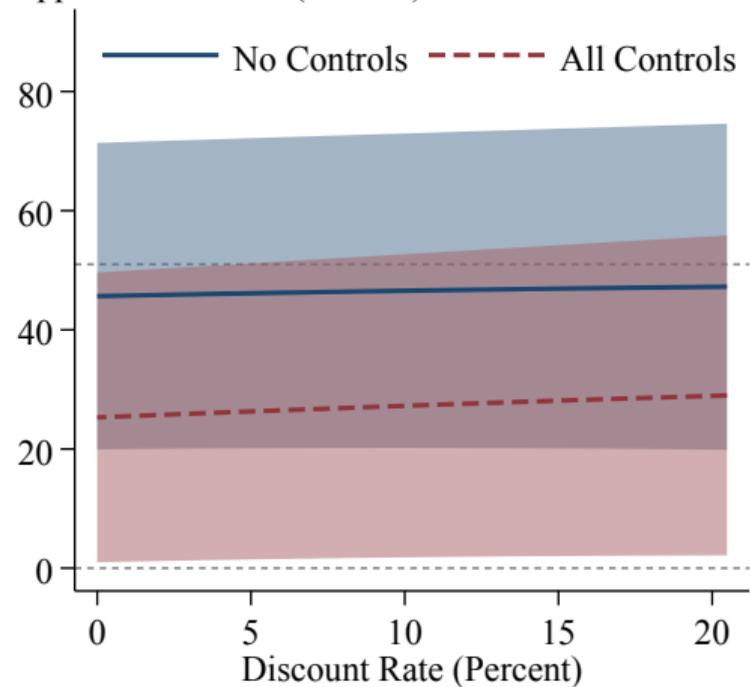
Completion Probability (Percent)



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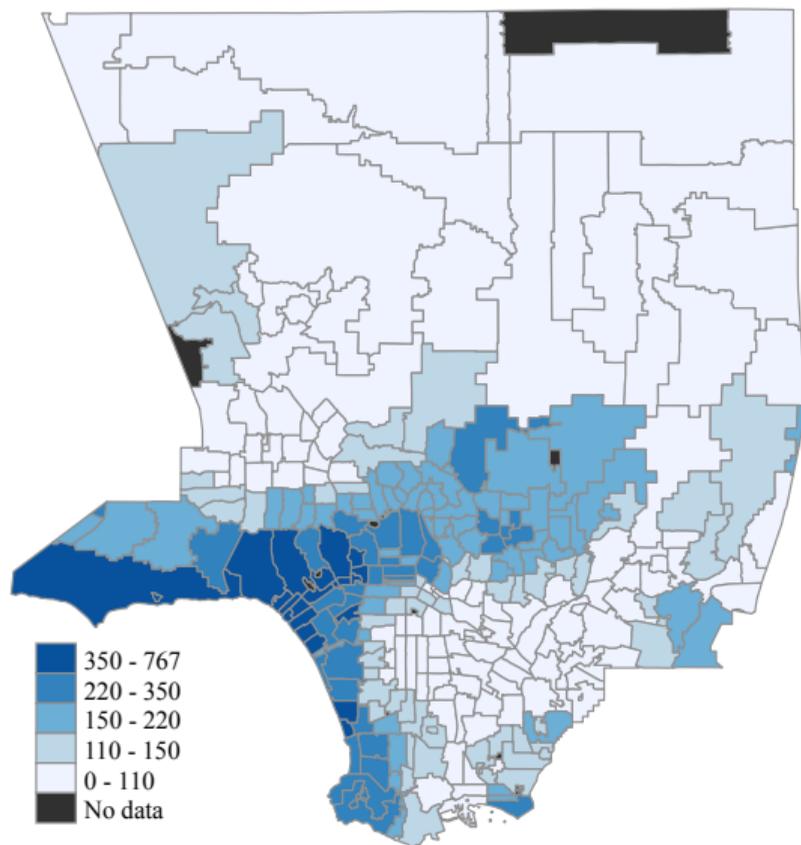
Approval Premium (Percent)



# Plan

- ① Setting and Data
- ② Theoretical Framework
- ③ Approval Premium
- ④ Time-to-Build Effects
- ⑤ **Permitting Share**
- ⑥ Conclusion

## Housing Cost Wedge



### Construction cost imputation

(Glaeser & Gyourko, '03; Gyourko & Saiz, '06)

$$k_j = \sum_k p_k x_{j,k}$$

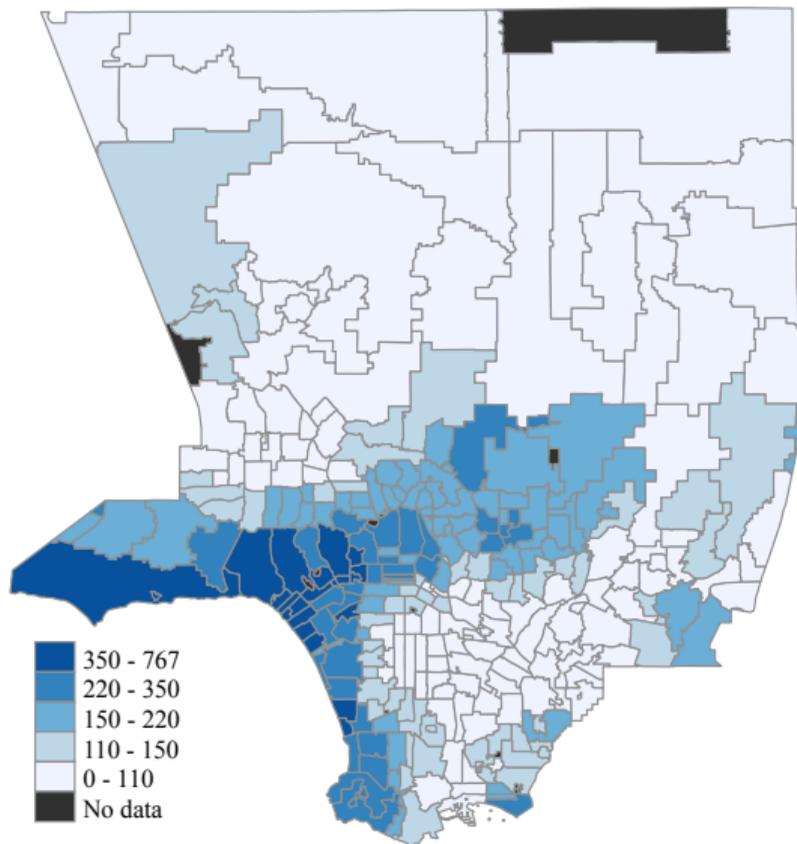
- $p_k$  from RS Means
- $x_{j,k}$  from listings (not ACS)

Housing cost wedge for property  $j$ :

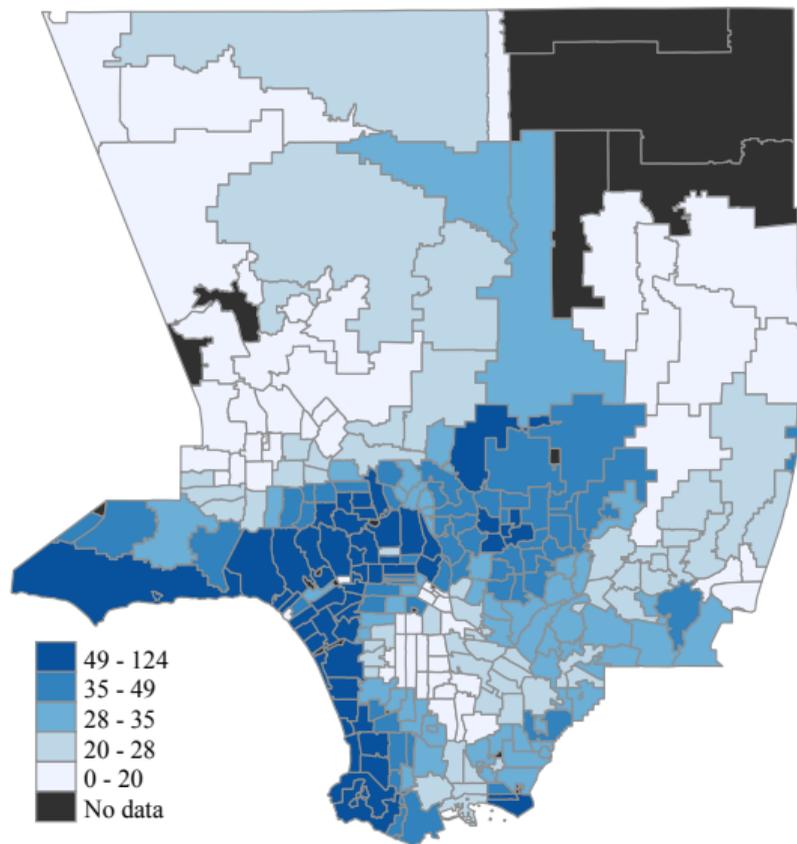
$$\omega_j = (R_j - k_j) / k_j$$

↪ compute zipcode-level medians

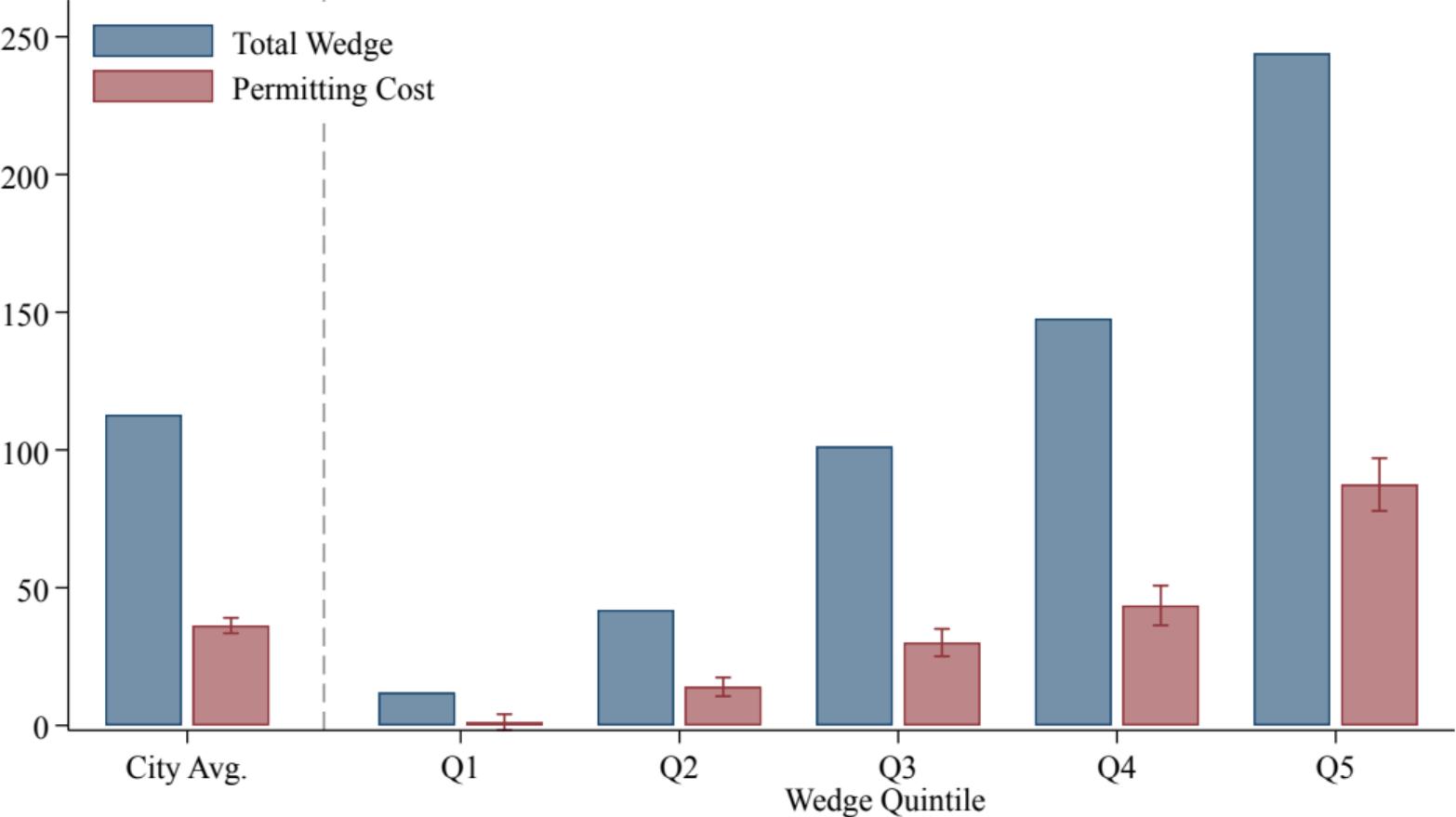
### Housing Cost Wedge



### Contribution of Permitting Cost to Wedge



Share of Construction Cost (Percent)



# Plan

- ① Setting and Data
- ② Theoretical Framework
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## Conclusion

**This paper:** Is permitting the problem?

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  - Accounts for 32% of citywide average rent-to-cost gap in LA

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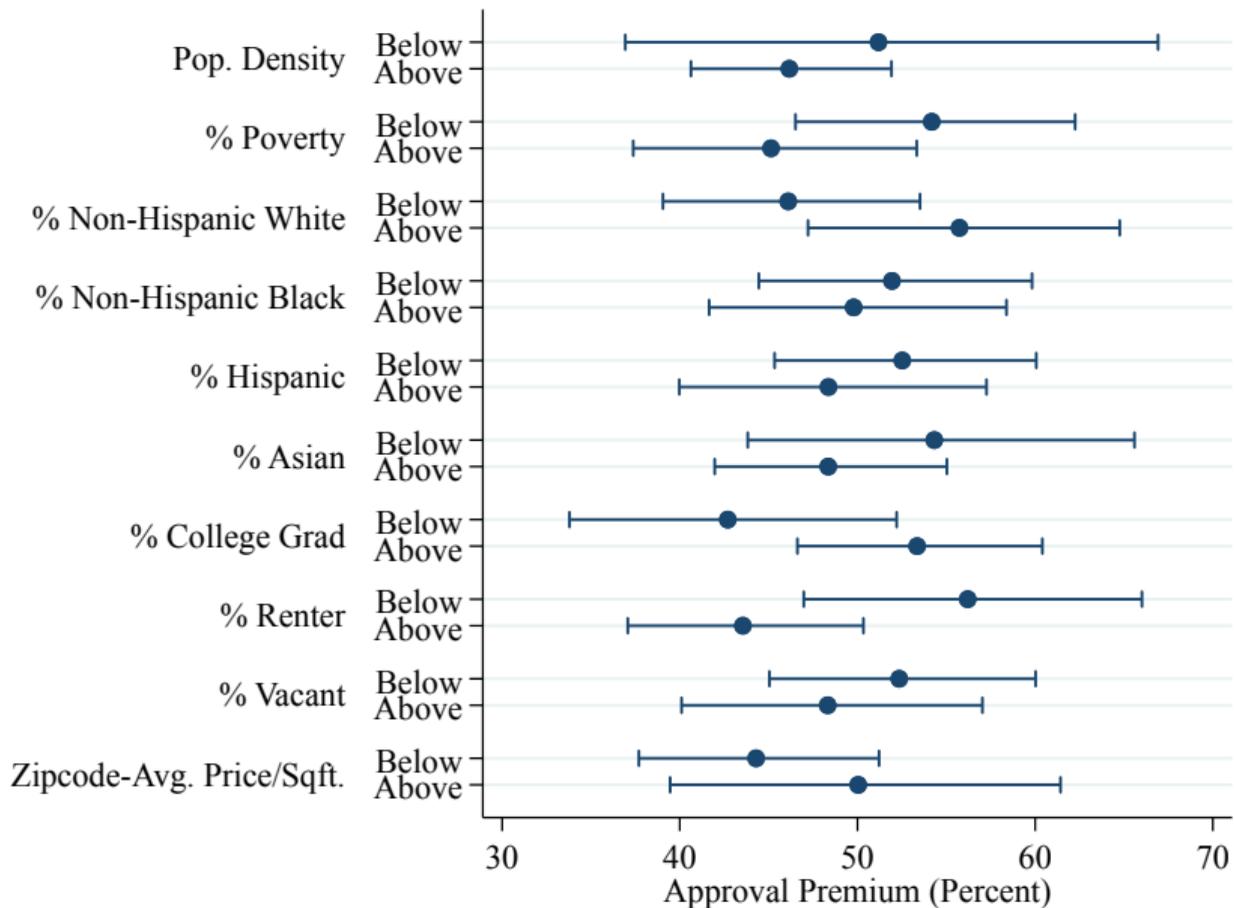
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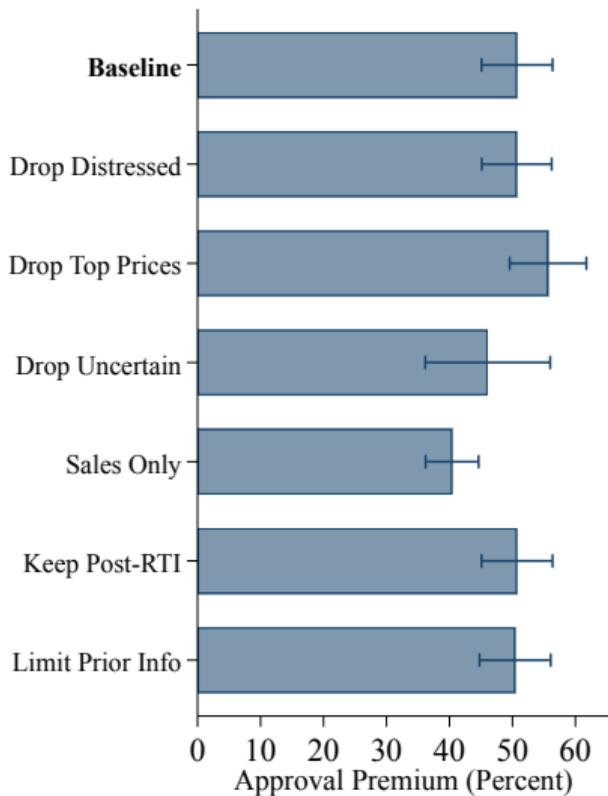
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  - **Time-to-build effects:** 10 p.p. increase in 4-year completion rate
    - Permitting cost can be attributed to pure wait (don't need large capitalized hassle)
- Sweeping reforms (LA → Raleigh) could save equivalent of 21% of construction cost

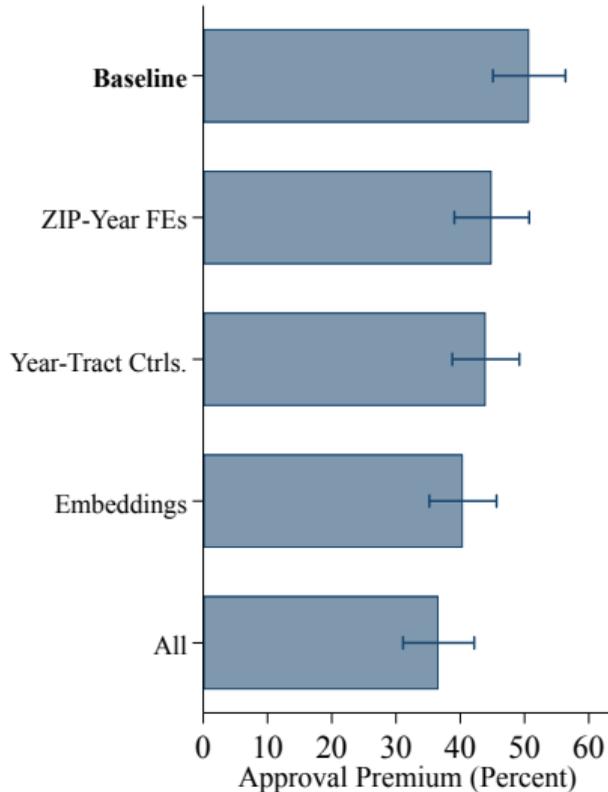


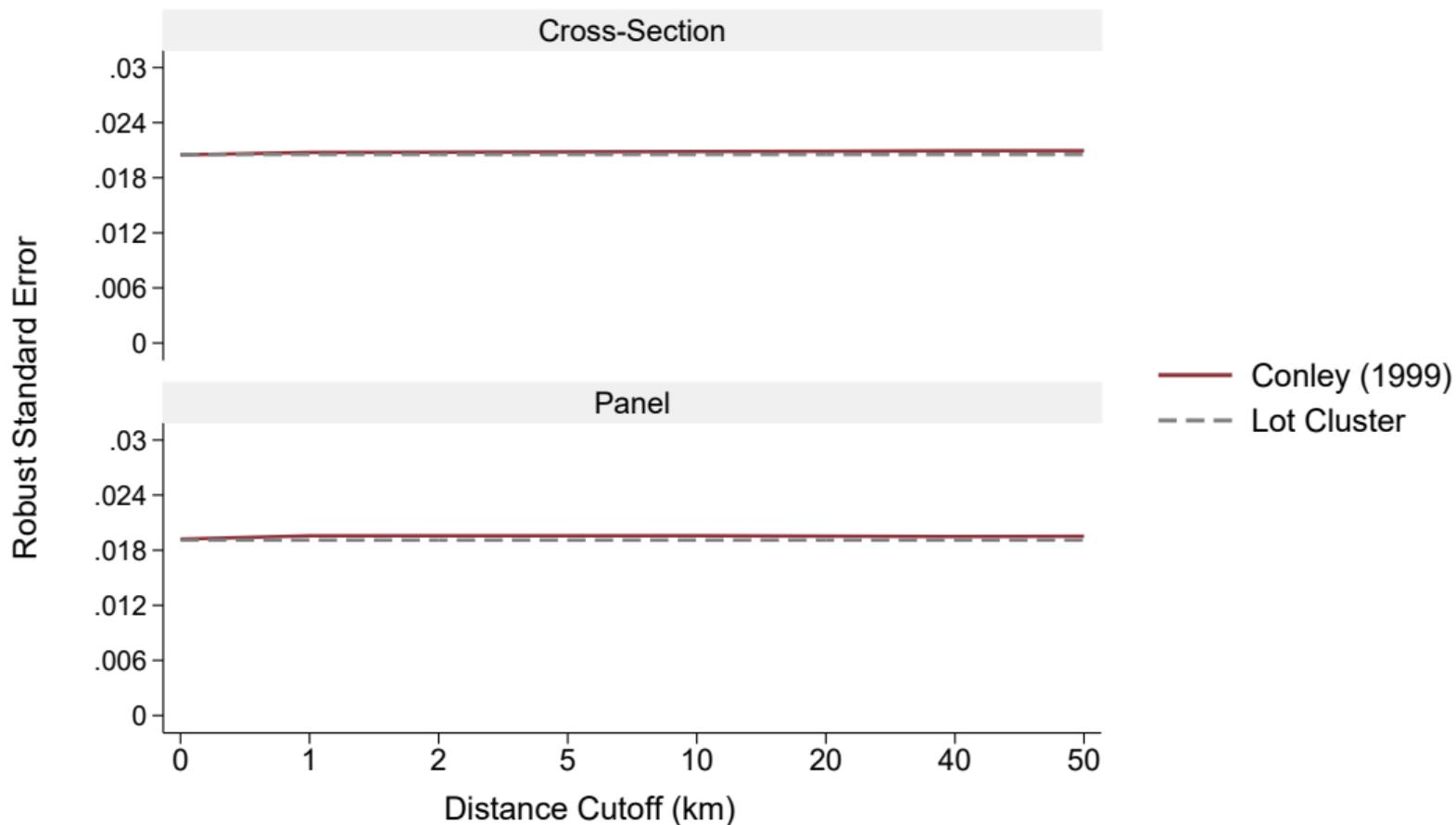
	Cross-Section		Repeat-Sales DID	
	Mean	Median	Mean	Median
	(1)	(2)	(3)	(4)
<i>Panel A: Univariate Specification</i>				
Per Lot	905,417*** (55,506)	480,436*** (21,521)	701,644*** (45,037)	347,151*** (16,564)
Per Square Foot	62.0*** (2.6)	36.4*** (1.3)	43.7*** (2.2)	25.0*** (1.2)
<i>Panel B: Joint Specification (Full RTI)</i>				
Per Lot	936,876*** (56,145)	497,129*** (21,731)	769,932*** (47,292)	380,937*** (17,049)
Per Square Foot	64.2*** (2.6)	37.7*** (1.3)	48.0*** (2.3)	27.4*** (1.2)

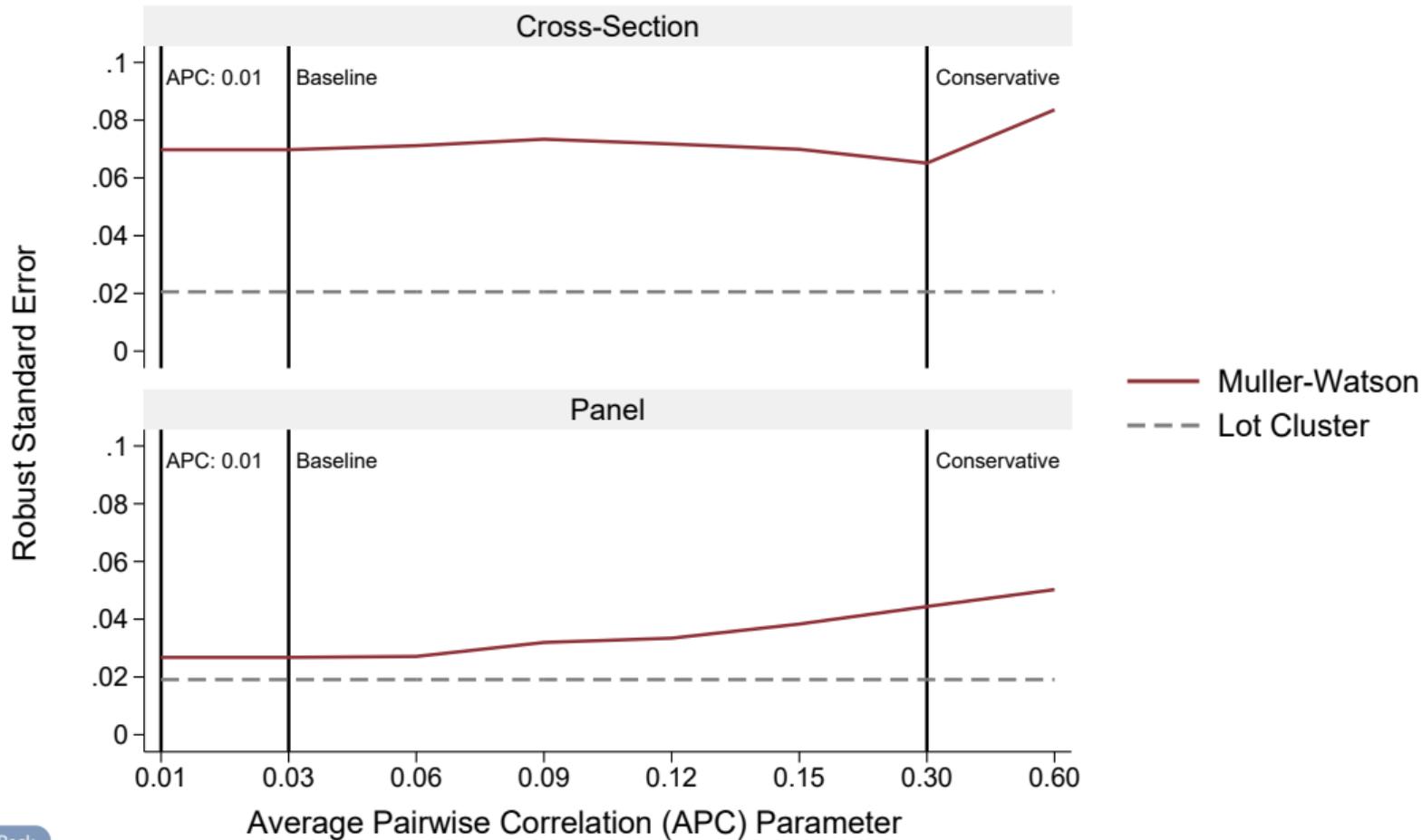
## Sample Definition

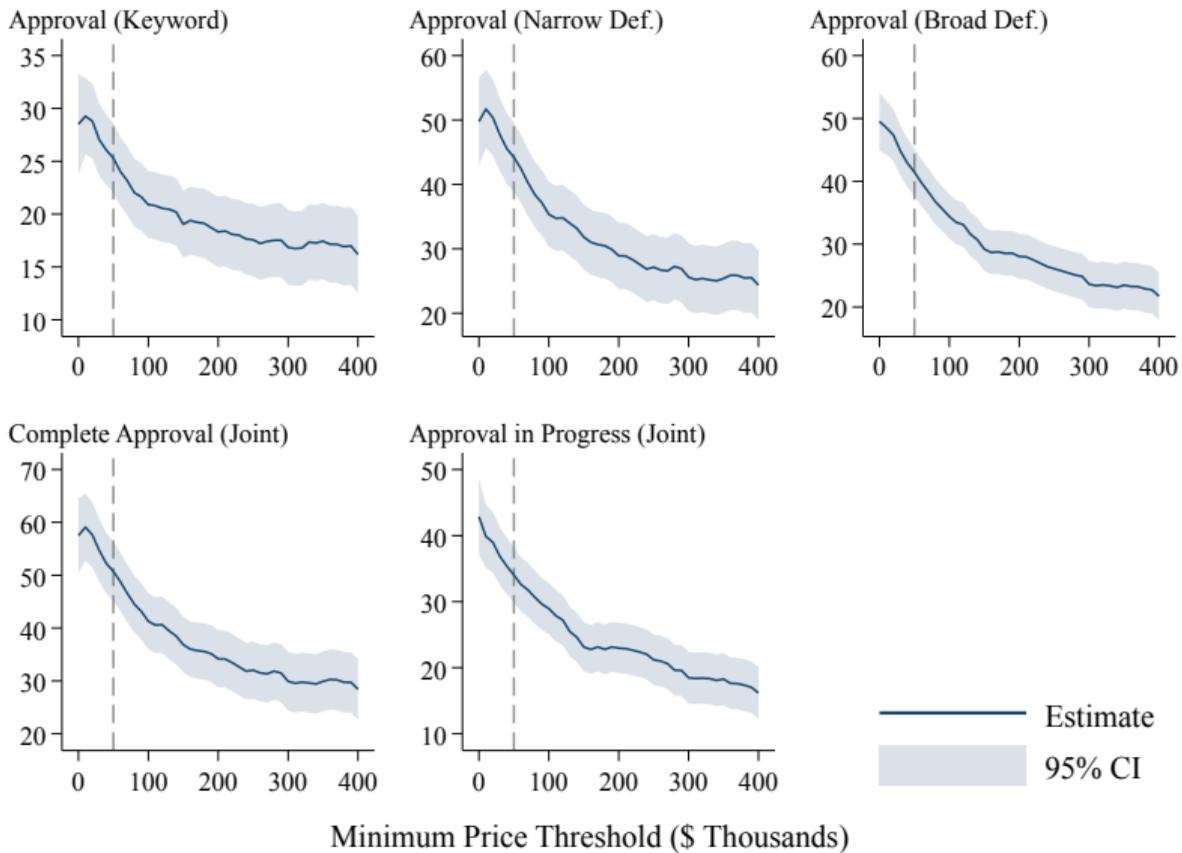


## Controls









*Human-LLM Comparisons*

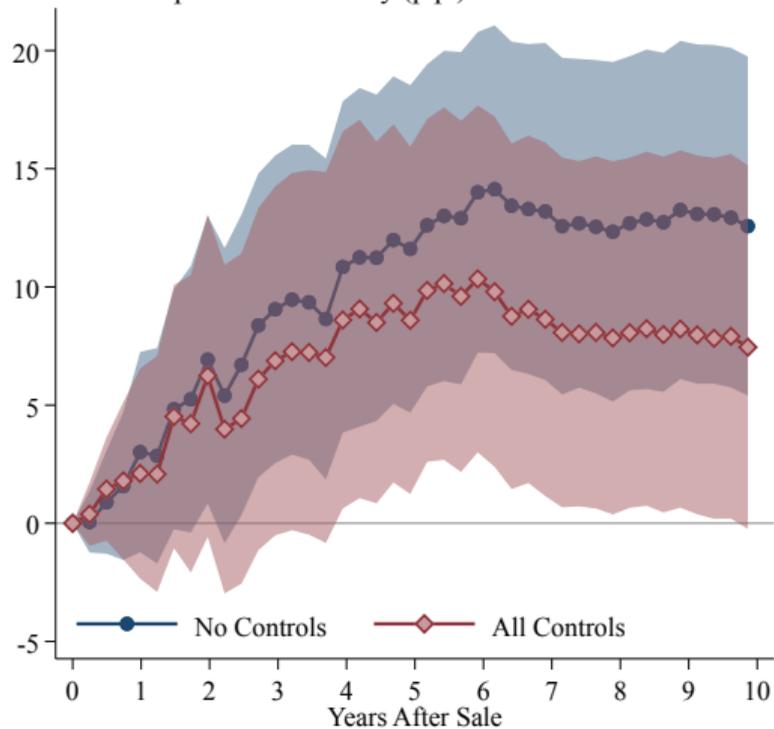
Pooled Coefficient	0.78 (0.01)	0.89 (0.02)	0.27 (0.03)
Coefficient Range	[0.78, 0.89]	[0.87, 0.92]	[0.19, 0.71]
Num. Regressions	4	4	4
Num. Ratings	3,721	2,256	1,465

*Human-Human Comparisons*

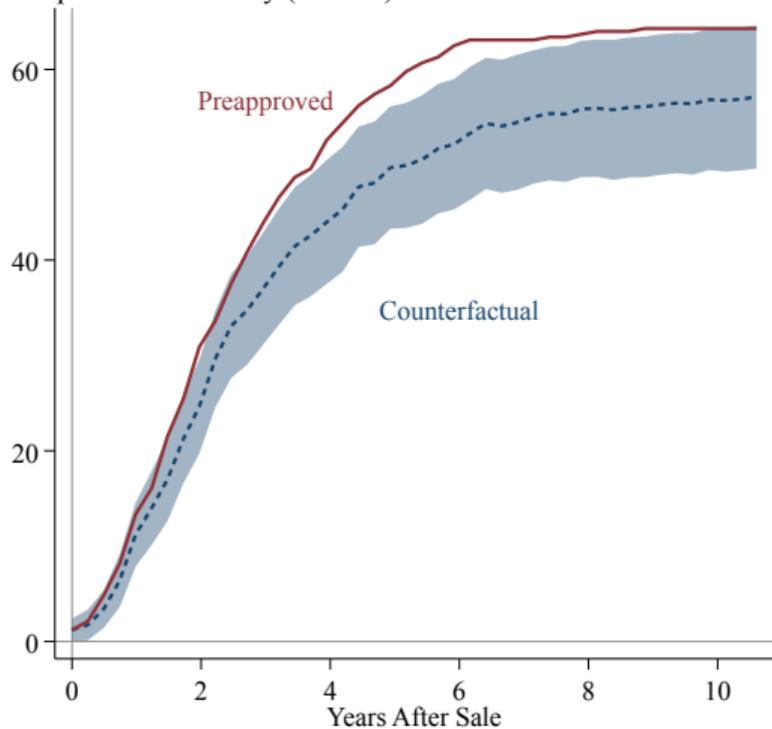
Pooled Coefficient	0.71 (0.02)	0.80 (0.02)	0.29 (0.07)
Coefficient Range	[0.63, 0.78]	[0.72, 0.88]	[0.24, 0.48]
Num. Regressions	6	6	6
Num. Ratings	5,946	4,756	1,190

	(1)	(2)	(3)	(4)	(5)	(6)
	Cross Section			Repeat Sale		
	Keyword	LLM	Human	Keyword	LLM	Human
1. OLS	0.322*** (0.088)	0.308*** (0.084)	0.310*** (0.088)	0.409*** (0.105)	0.487*** (0.165)	0.598*** (0.120)
2. First Stage	0.552*** (0.030)	0.682*** (0.023)		0.542*** (0.098)	0.605*** (0.157)	
3. IV	0.583*** (0.160)	0.451*** (0.124)		0.755*** (0.183)	0.805*** (0.159)	
Num. Listings	2,347	2,347	2,347	1,265	1,265	1,265
Num. Parcels	1,620	1,620	1,620	537	537	537

Effect on Completion Probability (p.p.)

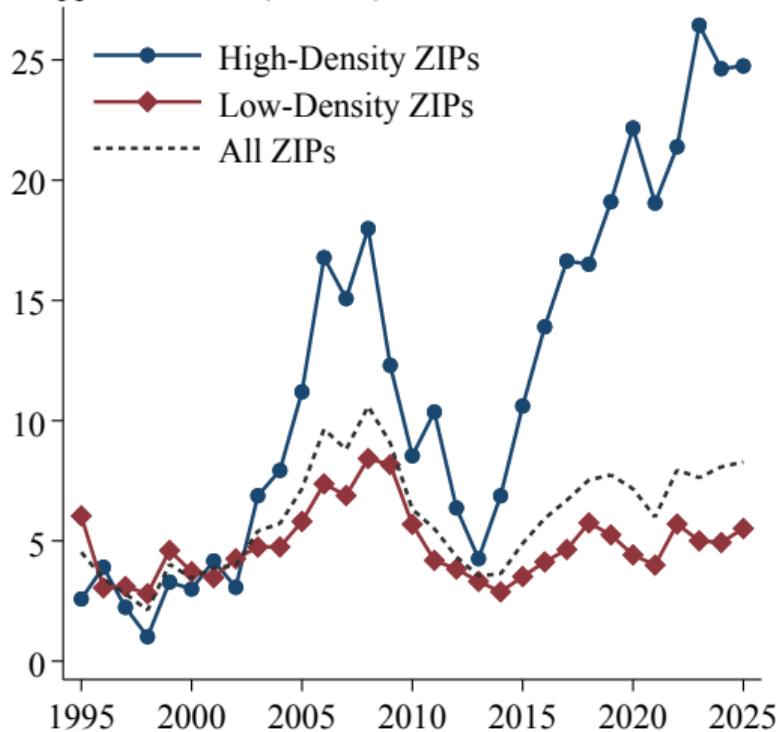


Completion Probability (Percent)

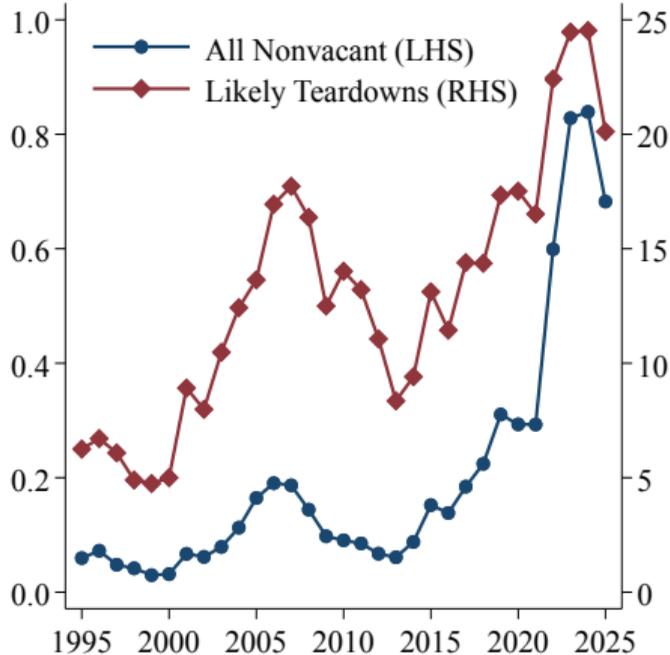


# Preapproval: More on When

Preapproval Share (Percent)



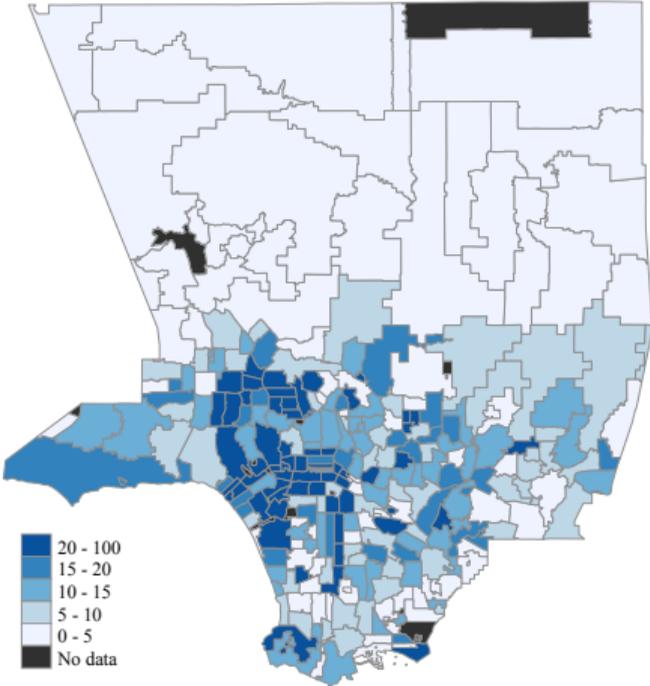
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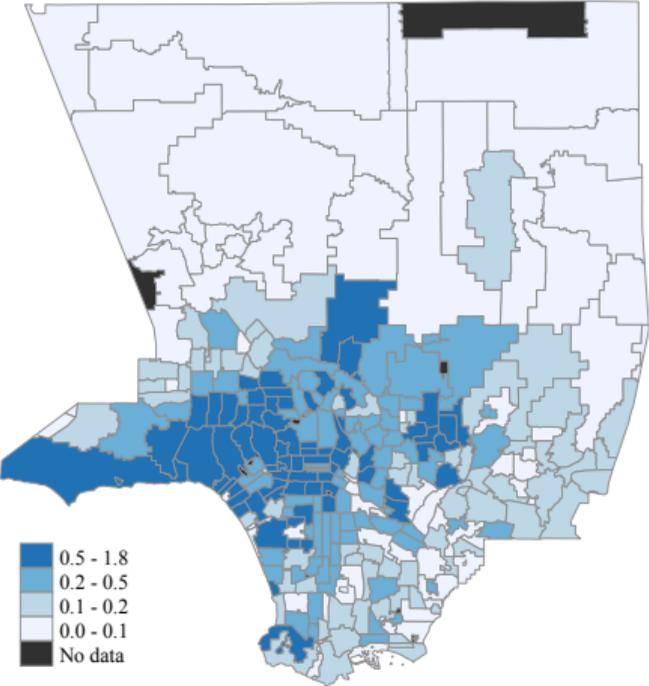
# Preapproval: More on Where

Back

### % Preapproved (Completed & in Progress)



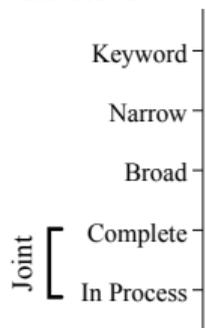
### % Preapproved (Nonvacant Sample)



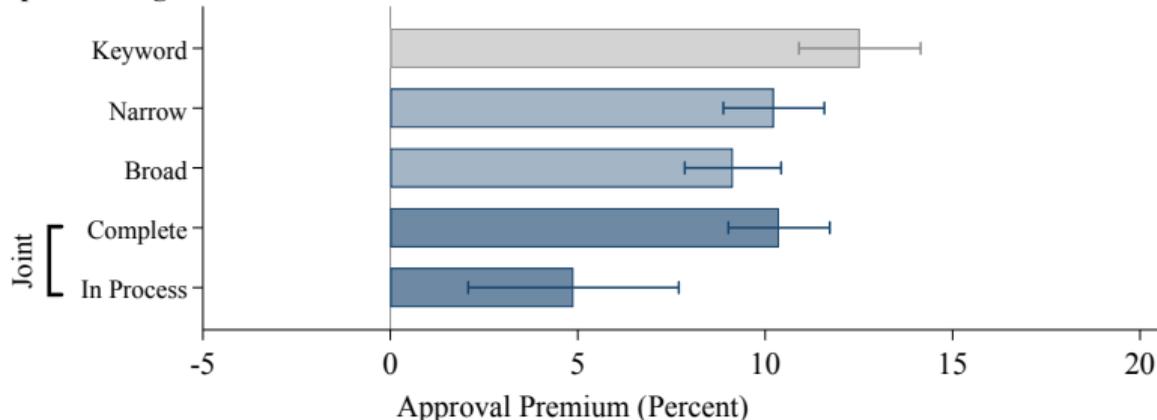
# Approval Premium: Nonvacant Sample

Back

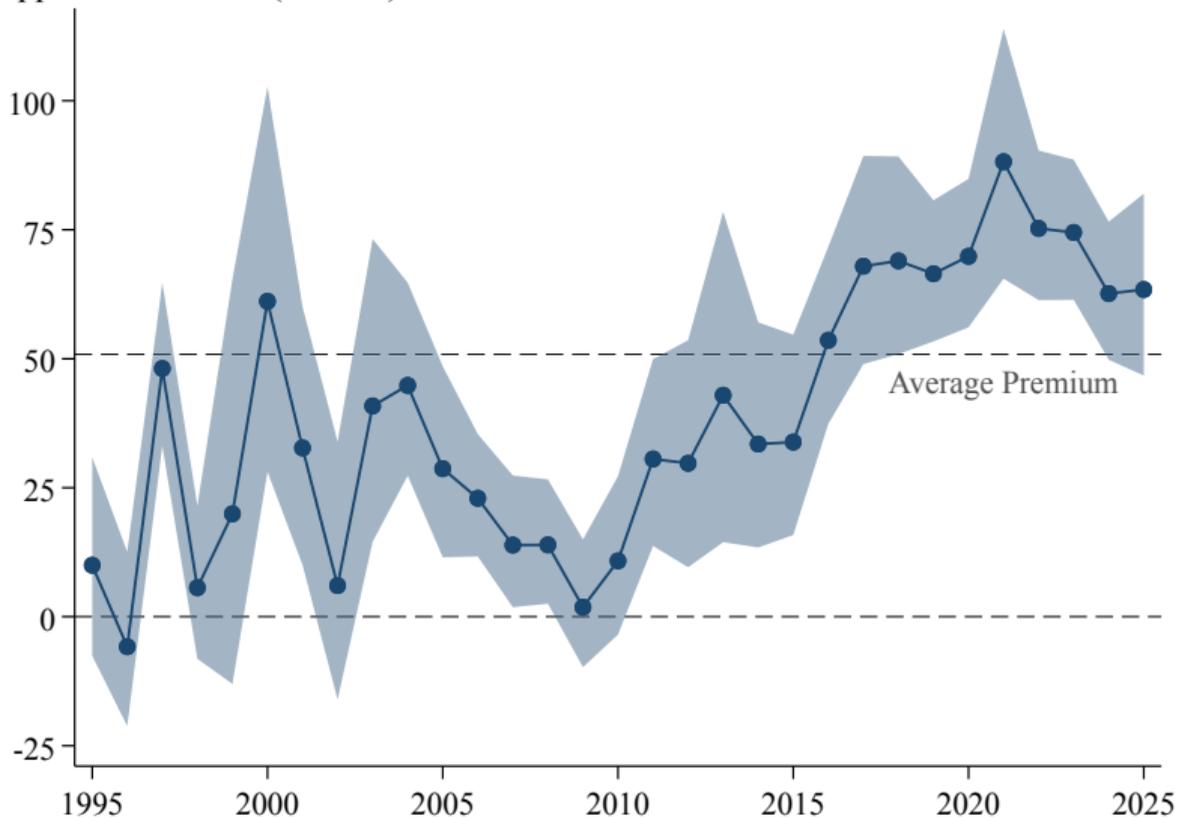
## Cross-Section



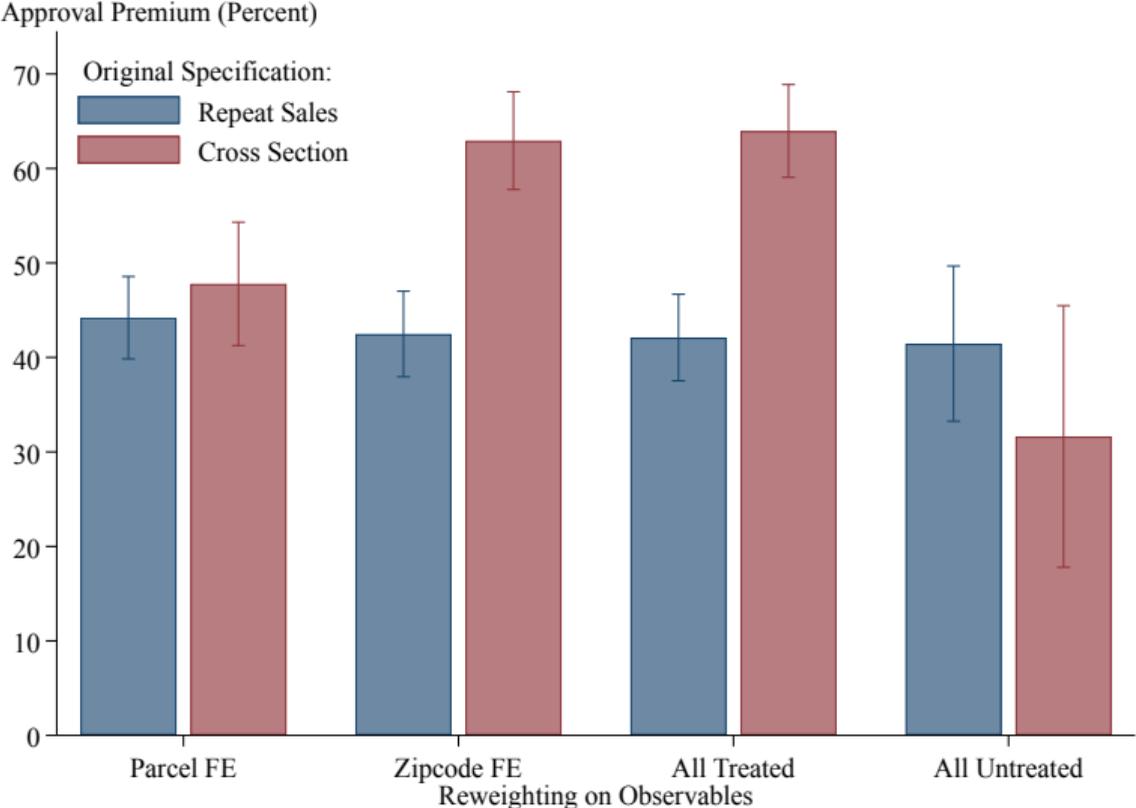
## Repeat-Listing DID



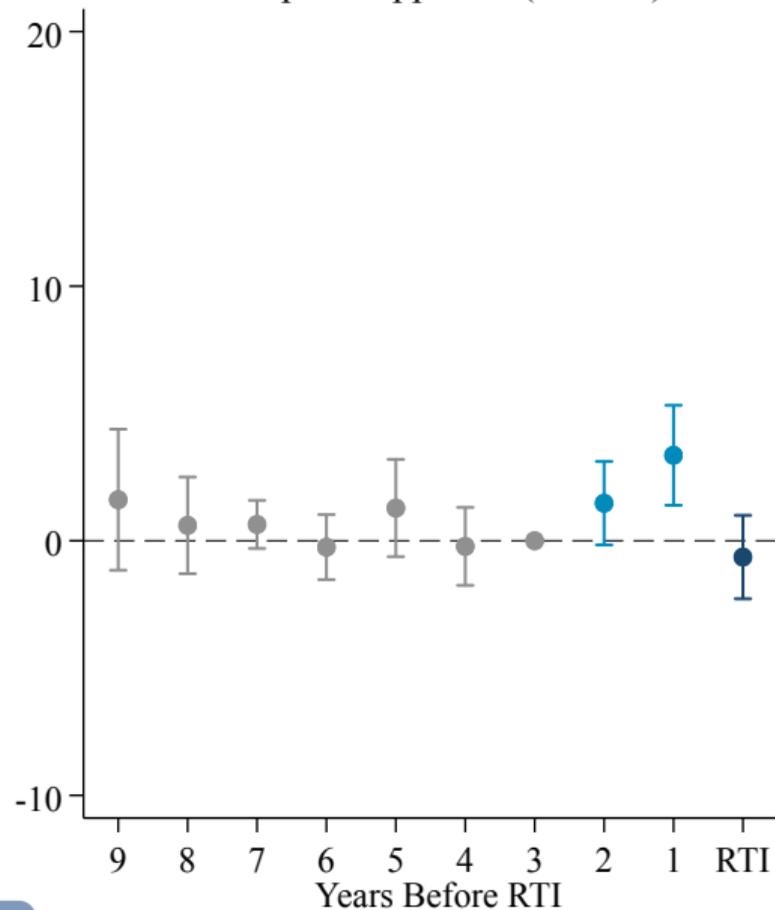
### Approval Premium (Percent)



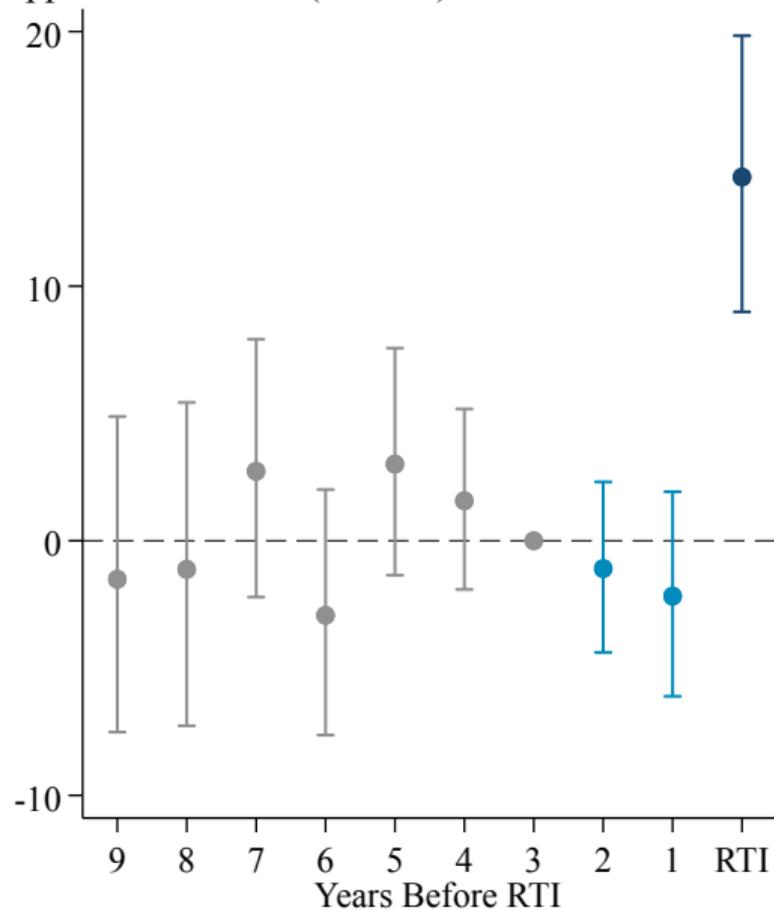
# Reweighting for Selection into Identification



Share With Incomplete Approval (Percent)

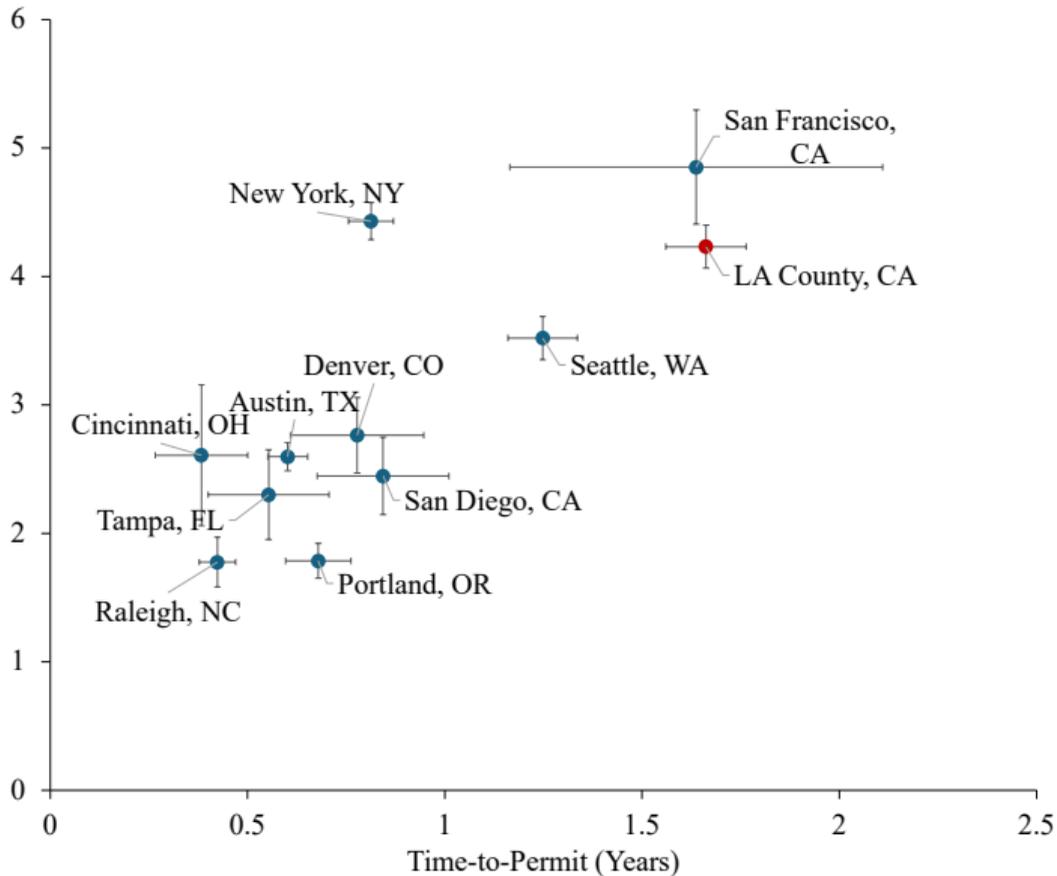


Approval Premium (Percent)

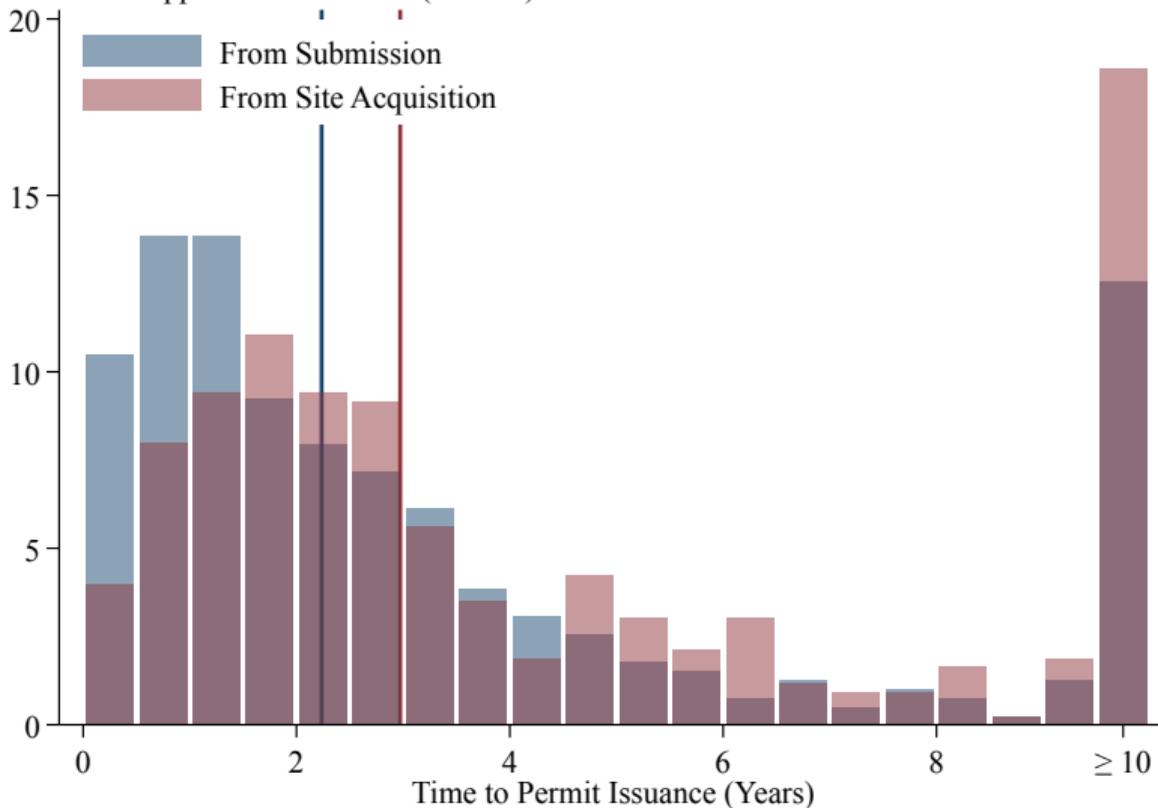


	(1)	(2)	(3)	(4)
	LLM Rating			
	Yes	In Progress	No	Total
Human Rating				
Yes	92.3 (1,255)	58.3 (447)	7.6 (395)	20.9 (2,097)
In Progress	3.1 (29)	28.6 (244)	2.9 (97)	5.2 (370)
No	4.6 (63)	13.1 (100)	89.5 (1,819)	73.9 (1,982)
Total	100.0 (1,347)	100.0 (791)	100.0 (2,311)	100.0 (4,449)

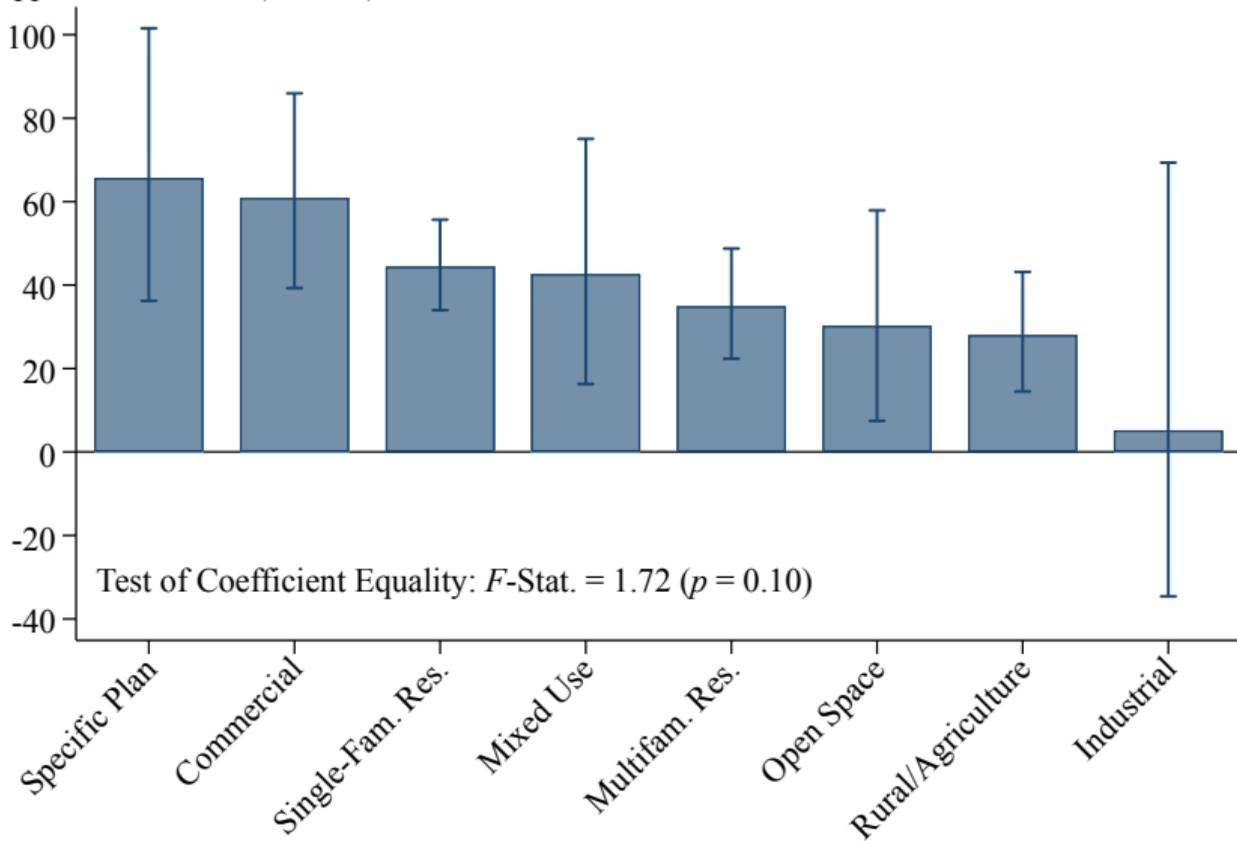
Time-to-Build (Years)



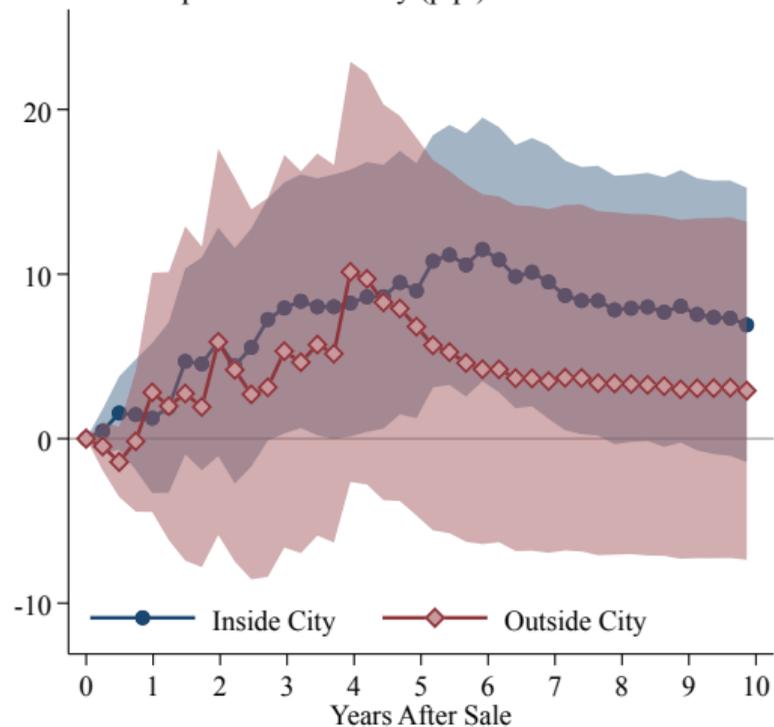
Share of Preapproved Land Sales (Percent)



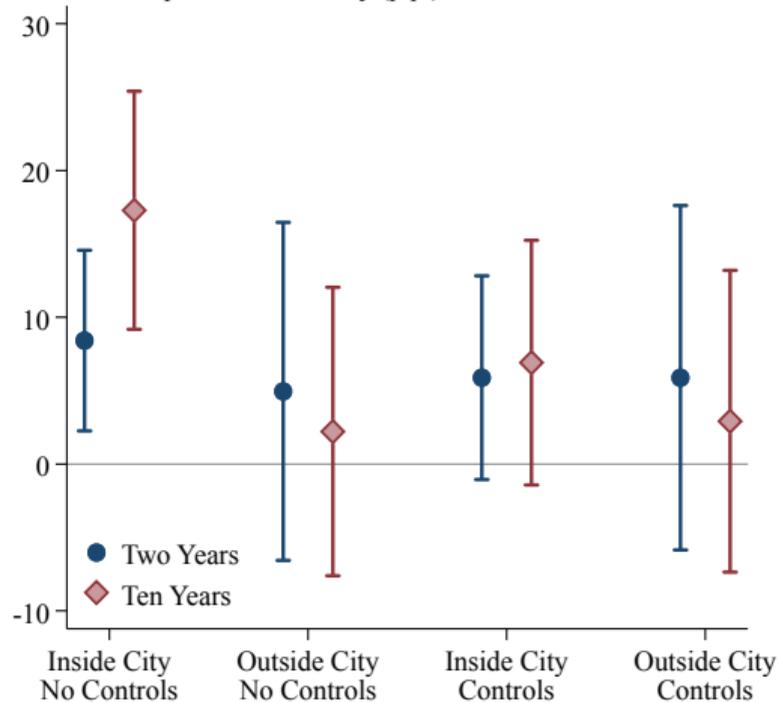
### Approval Premium (Percent)



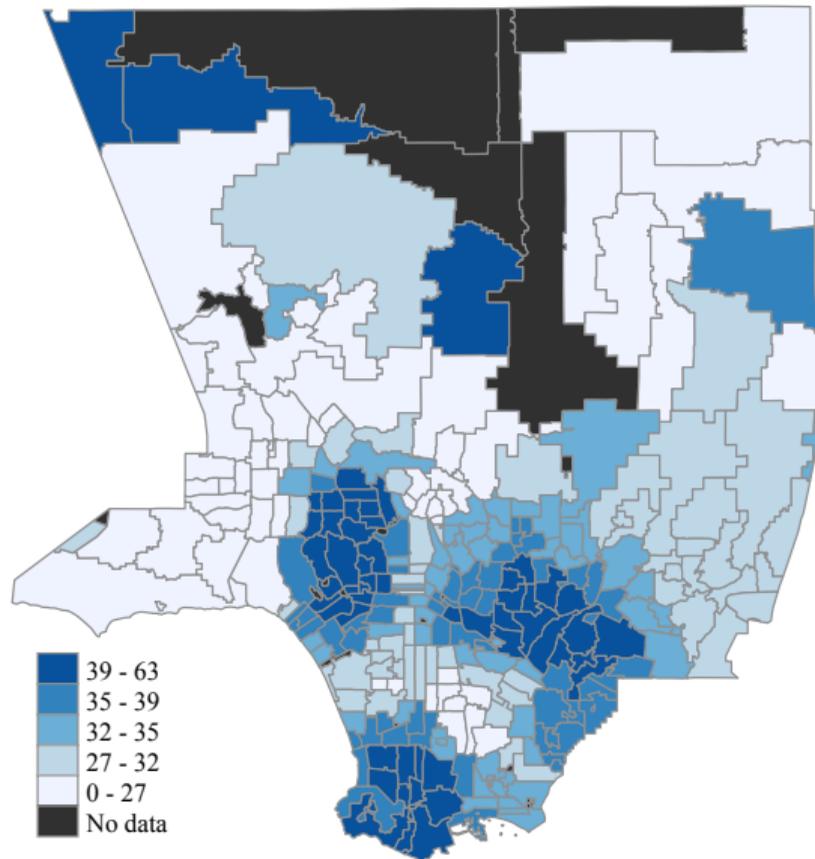
Effect on Completion Probability (p.p.)



Effect on Completion Probability (p.p.)



## Approval premium (%)



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### Time Saved (Years)

