Flattening the Curve: Pandemic-Induced Revaluation of Urban Real Estate

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The Atlantic

‘This Is Unprecedented’: Why America’s Housing Market Has Never Been Weirder

New Yorkers Are Fleeing to the Suburbs: ‘The Demand Is Insane’

The pandemic is spurring home sales as prosperous city residents seek more space. One listing had 97 showings and received 24 offers.

TheUpshot

Covid Didn’t Kill Cities. Why Was That Prophecy So Alluring?

A distrust of urban life has persisted in America, finding expression in different ways over time.

Large, But Temporary, Decline in (Superstar) City Premia

- Focus on bid-rent function (or price and rent gradients)
  - Changes in house prices/rents with respect to distance from center of the city
  - Urban premia reflects agglomeration effects, commuting, and amenities

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   - Large cross-sectional differences in both price and rent gradients.

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   - Mechanisms that explain increased suburban valuations; focus on remote work
   - What differences in rent and price gradients mean for future rent expectations in urban vs suburban areas

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Pandemic was a massive temporary shock, but does not appear to herald the permanent demise of the superstar city

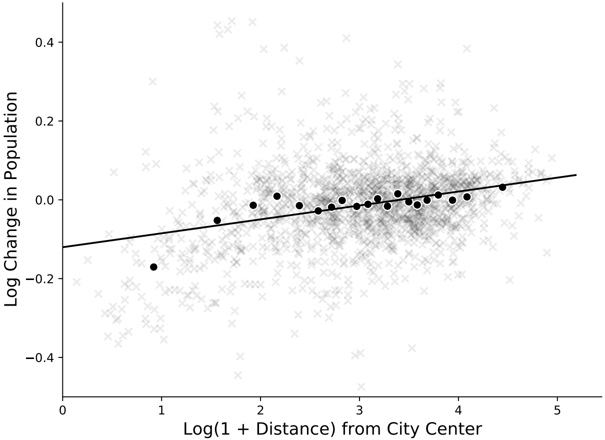
1. Urban Migration

Document Population Moves in the time of Covid

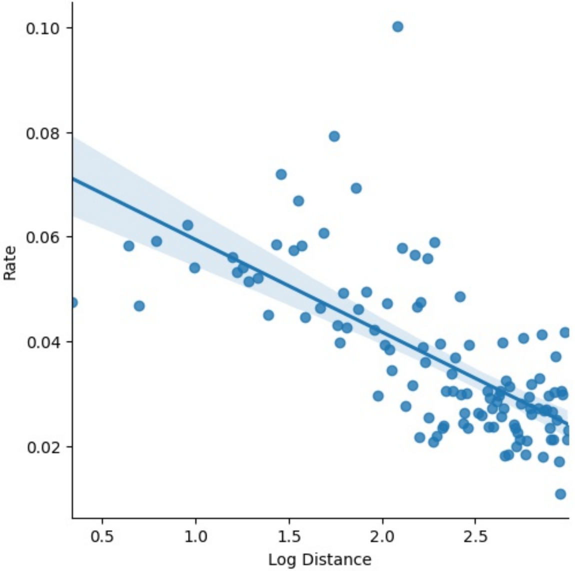
Mobility Gradient Shows Urban Flight

NYC SF vs. Rent vs. Prices Covid gradient

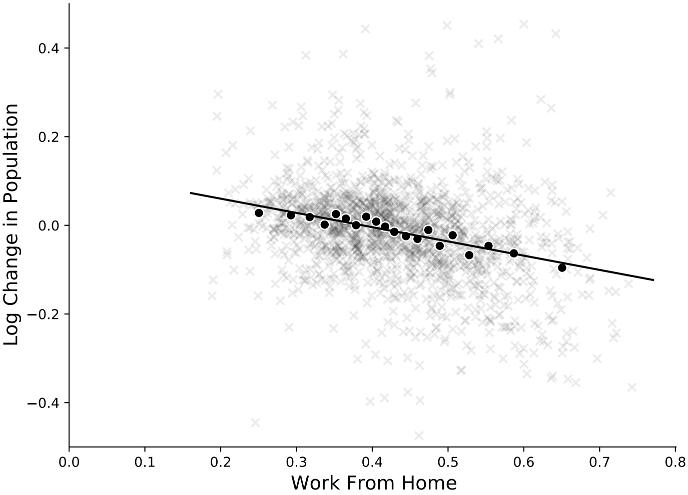
- Covid-19 prompted a large urban flight to suburbs over Feb 2020–Jun 2020
- Venpath cell phone data



Change of Address Outmigration March–Oct 2020, NYC SF



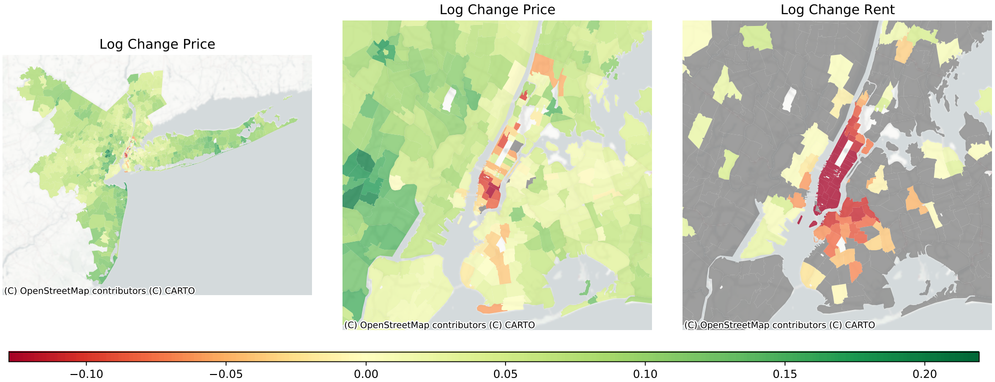
Remote Workers More Likely to Flee



2. Change in Bid-Rent Functions

Flattening the Curve

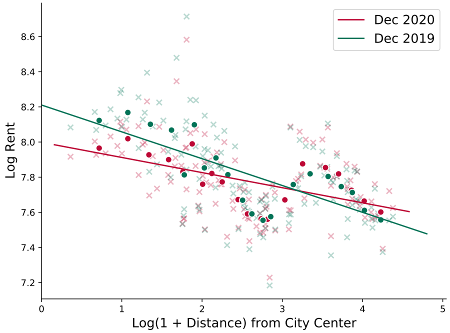
NYC Area Change Dec 2019–Dec 2020 SF Chicago

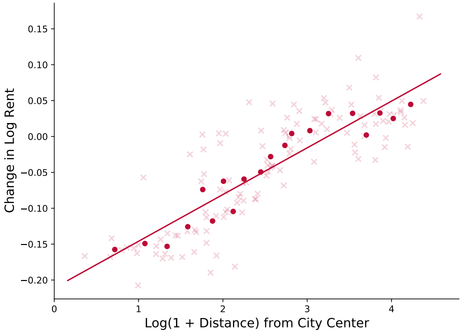


Rent Changes New York

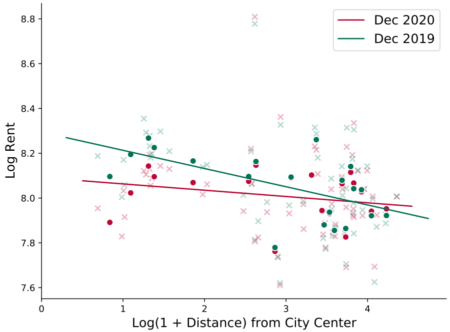
NY Rent Reversal | Pre vs. Post

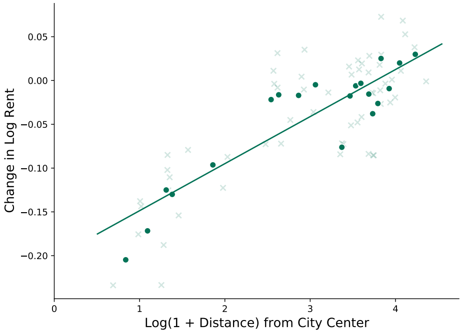
- Rents declined drastically in city centers. Grew strongly in suburbs.





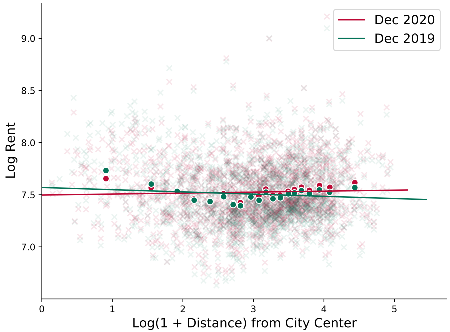
Rent Changes San Francisco

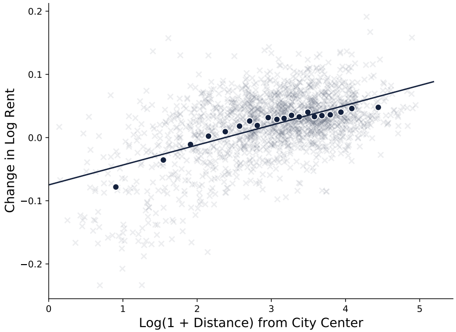




Rent Changes Top 30 MSAs

USA Rent Reversal | Pre vs. Post | LA

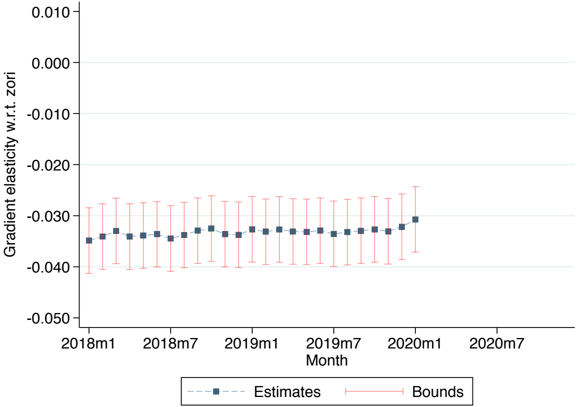




Complete Reversal of Rent Gradient Top 30 MSAs

Top 49 MSAs | Extended | NYC | SF | LA

$$\ln \text{Rent}_{ijt} = \delta_t \left(\text{Month}_t \times \underbrace{\left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j))\right]}_{\text{Distance to City Center}}\right) + \beta X_{ij} + \alpha_t \text{Month}_t + \alpha_j \text{MSA}_j + e_{ijt}$$



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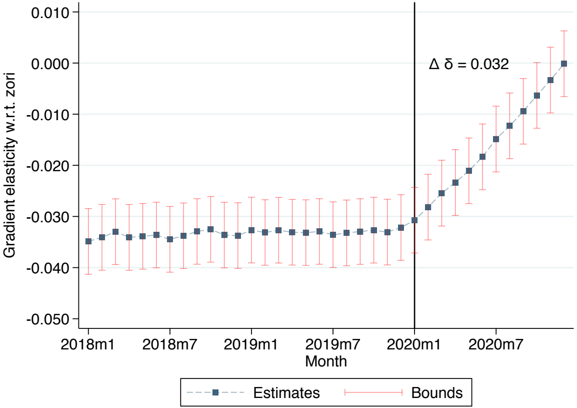
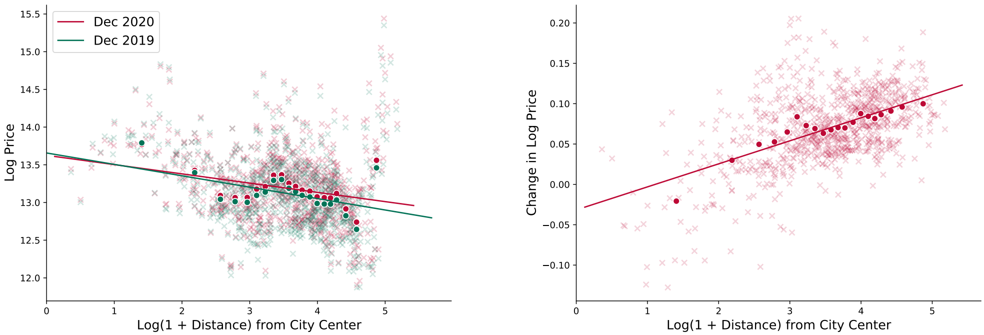
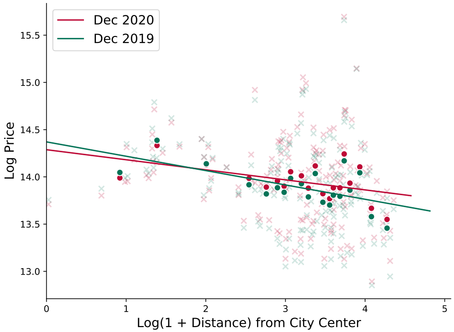


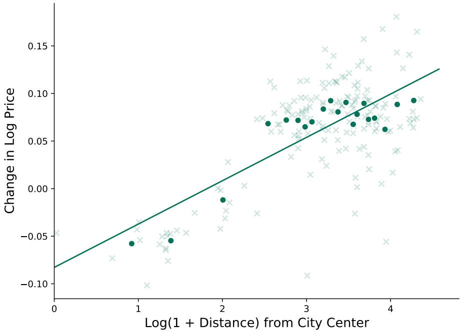
Price Changes New York NY Price Reversal

- Prices also saw stronger growth in suburbs.

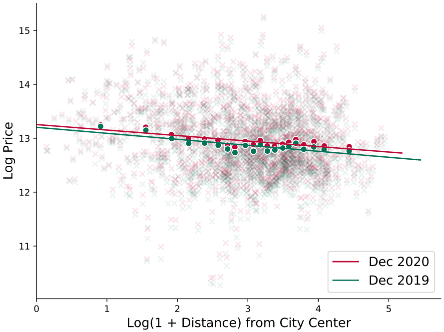


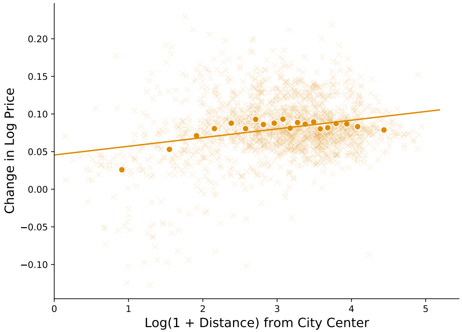
Price Changes San Francisco





Price Changes Top 30 MSAs USA Price Reversal LA

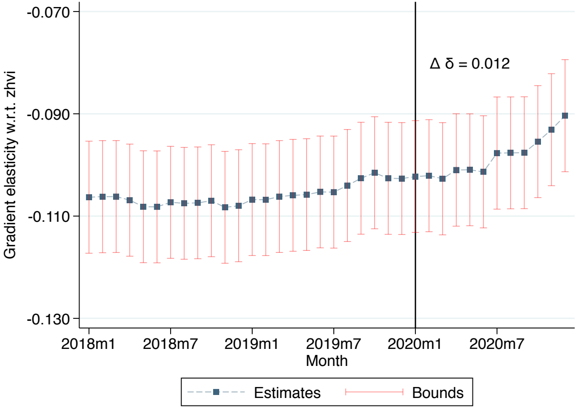




Partial Reversal of Price Gradient Top 30 MSAs

Top 49 MSAs | Extended | NYC | SF | LA

$$\ln \text{Price}_{ijt} = \delta_t(\text{Months}_t \times \underbrace{\left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j))\right]}_{\text{Distance to City Center}}) + \beta X_{ij} + \alpha_t \text{Month}_t + \alpha_j \text{MSA}_j + e_{ijt}$$



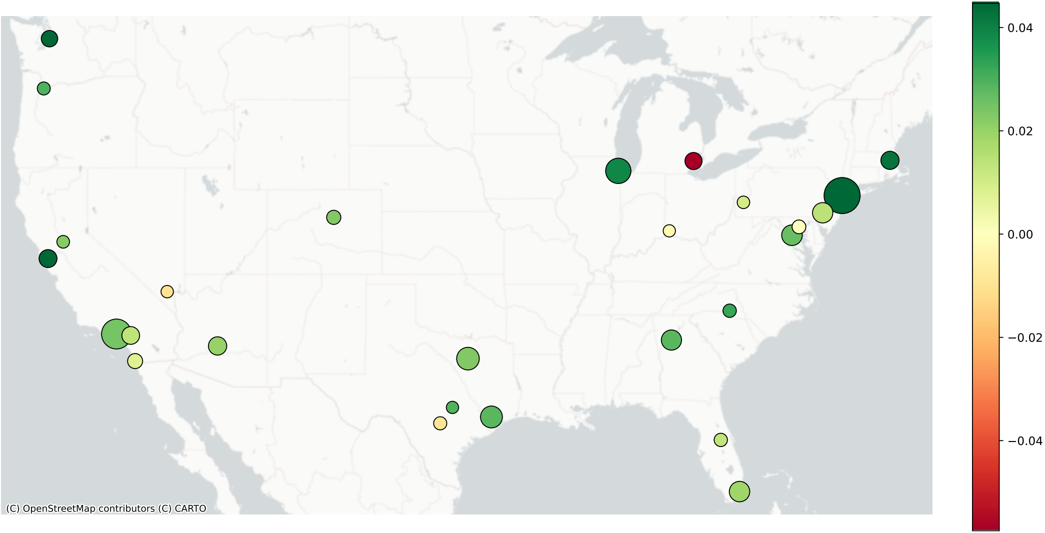
Other Outcomes:

- Prices
  - Listing Prices
  - Listing Price Per Sq. Ft.
- Quantities
  - Active Listings
  - Median days on market
- Prices Against Active Listing Changes
- Price Against Change in Days on Market
- Submarkets:
  - 1, 2 Bedroom
  - Co-op/Condo
  - Single Family

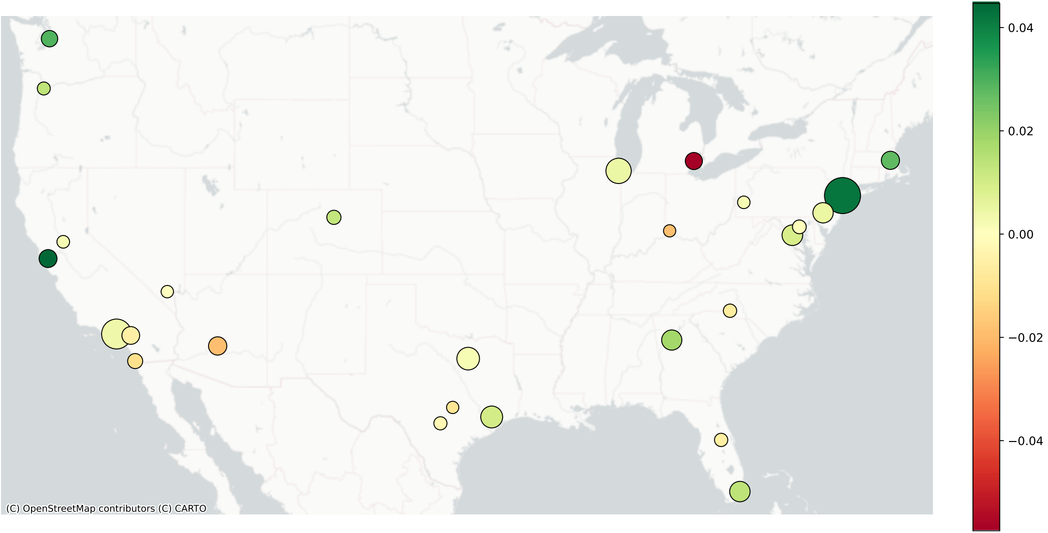
4. Explaining Changes in Real Estate Gradients

Urban Premia Reverses in Presence of Remote Work and Land Scarcity

National Change in Rent Gradients



National Change in Price Gradients



Explaining the Variation in Rent Gradient Changes MSA level (j)

$$\underbrace{\Delta\delta_j}_{\substack{\text{Change in Rent Gradient} \\ \text{Dec2020-Dec2019}}} = \alpha + \beta_1 \text{WFH}_j + \beta_2 \text{Policy Stringency}_j + \beta_3 \text{Supply Inelasticity}_j + \varepsilon_j$$

Work from Home	0.369***			0.291**	0.369***
	(0.106)			(0.114)	(0.104)
Stringency Measure		0.192**		0.115	
		(0.0697)		(0.0786)	
Supply Inelasticity Index			0.0290	0.00202	
			(0.0190)	(0.0189)	
Orthogonalized Stringency Index					0.119
					(0.0706)
Orthogonalized Supply Inelasticity					0.00202
					(0.0189)
Observations	30	30	30	30	30
R^2	0.304	0.213	0.077	0.372	0.372

Explaining the Variation in Price Gradient Changes MSA level (j) Across MSAs

$$\underbrace{\Delta\delta_j}_{\substack{\text{Change in Price Gradient} \\ \text{Dec2020-Dec2019}}} = \alpha + \beta_1 \text{WFH}_j + \beta_2 \text{Policy Stringency}_j + \beta_3 \text{Supply Inelasticity}_j + \varepsilon_j$$

Work from Home	0.291***			0.238**	0.291***
	(0.0880)			(0.0959)	(0.0873)
Stringency Measure		0.128**		0.0325	
		(0.0597)		(0.0660)	
Supply Inelasticity Index			0.0323**	0.0179	
			(0.0150)	(0.0158)	
Orthogonalized Stringency Index					0.0654
					(0.0592)
Orthogonalized Supply Inelasticity					0.0179
					(0.0158)
Observations	30	30	30	30	30
R^2	0.280	0.140	0.141	0.343	0.343

Remote Work Lowers Rents ZIP-Level

10 percentage point increase in remote work at ZIP-level →
1–2.8 percentage point decrease in rents Dec 2020-Dec 2019

Log(Distance)	0.0298***		0.0255***	0.0260***	0.0154***	0.0176***
	(6.15)		(5.40)	(6.57)	(4.35)	(5.76)
Work from Home		-0.266***	-0.281***	-0.215***	-0.102***	-0.160***
		(-8.29)	(-8.80)	(-11.84)	(-2.90)	(-6.19)
Median Household Income ('000)					0.000605***	0.000509***
					(5.60)	(7.80)
Median Age					0.00114***	0.00108***
					(3.42)	(4.41)
Percent of Black Households					0.00896	0.0212*
					(0.42)	(1.90)
Share of High Income Households					-0.610***	-0.346***
					(-7.01)	(-6.67)
Log(Restaurants & Bars)					-0.0118***	-0.00718***
					(-3.71)	(-3.75)
MSA fixed effects	✓	✓		✓		✓
Observations	1697	1697	1697	1697	1697	1697
R squared	0.580	0.524	0.468	0.674	0.553	0.709

Remote Work Also Lowers Prices ZIP-Level

10 percentage point increase in remote work at ZIP-level $\rightarrow$
0.6–2.1 percentage point decrease in prices Dec 2020-Dec 2019

Log(Distance)	0.0118***		0.00705*	0.00835**	0.00303	0.00689**
	(3.05)		(1.80)	(2.54)	(0.98)	(2.51)
Work from Home		-0.210***	-0.210***	-0.194***	-0.0593	-0.128***
		(-9.99)	(-6.02)	(-10.60)	(-1.49)	(-3.72)
Median Household Income ('000)					0.000199**	0.000116
					(2.20)	(1.46)
Median Age					-0.0000524	0.000315
					(-0.12)	(1.35)
Percent of Black Households					-0.00774	0.0290***
					(-0.42)	(3.01)
Share of High Income Households					-0.347***	-0.129**
					(-4.55)	(-2.19)
Log(Restaurants & Bars)					-0.0102***	-0.00360**
					(-3.19)	(-2.13)
MSA fixed effects	✓	✓		✓		✓
Observations	1697	1697	1697	1697	1697	1697
R squared	0.500	0.598	0.233	0.623	0.296	0.642

3. Beliefs About Rent Growth

Predicting Urban Recovery

Decomposing Future Expected Rent Growth Changes

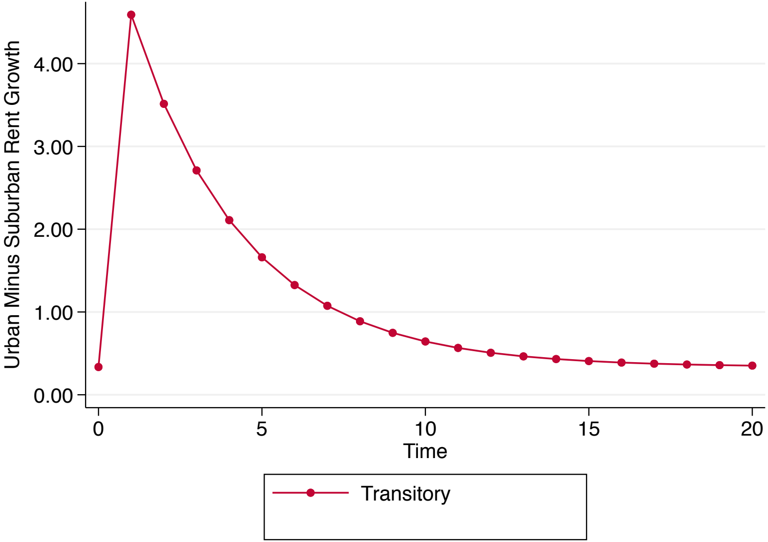
- Campbell-Shiller decomposes pd ratio into expected future cash flows (g) and discount rates (x)
- Invert this relationship, to back out g from observable pd ratio and assumption on x:
- Assume expected rent growth and discount rates follow AR(1) with persistence (ρ_g, ρ_x)

For ZIP code i in MSA j:

$$\underbrace{g_{ij,t}}_{\substack{\text{current belief}\\ \text{rent growth}}} = \underbrace{\overline{g_{ij}}}_{\substack{\text{long-run}\\ \text{expected growth}}} + \underbrace{(1-\rho^j\rho_g)\left(pd_{ij,t} - \overline{pd_{ij}}\right)}_{\substack{\text{deviation price-rent}\\ \text{from LR mean}}} + \underbrace{\frac{1-\rho^j\rho_g}{1-\rho^j\rho_x}\left(x_{ijt} - \overline{x_{ij}}\right)}_{\substack{\text{deviation expected return}\\ \text{from LR mean}}}$$

Backing out Expected Rent Growth ($\Delta x^j = 0.01$)

Full Table | $\Delta x^j = 0$ | Expectations Data



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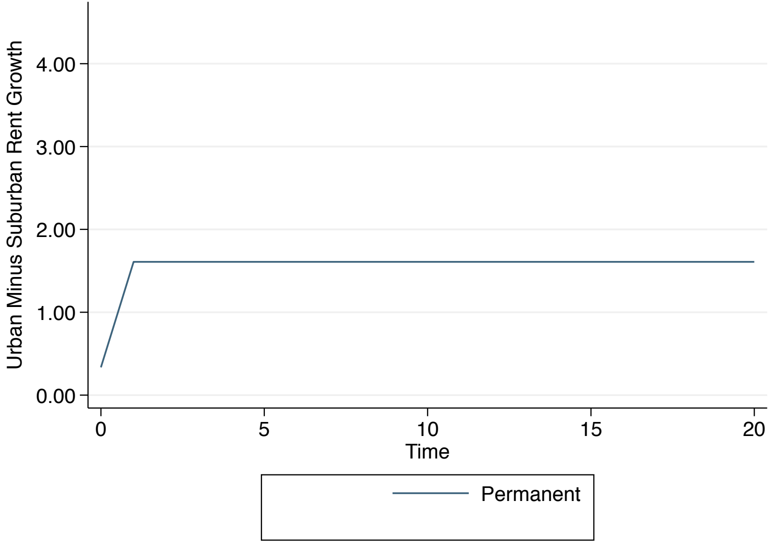

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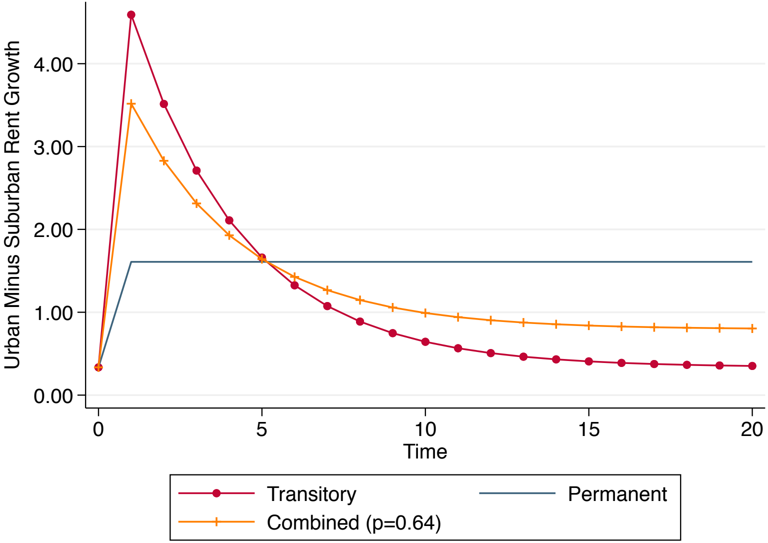
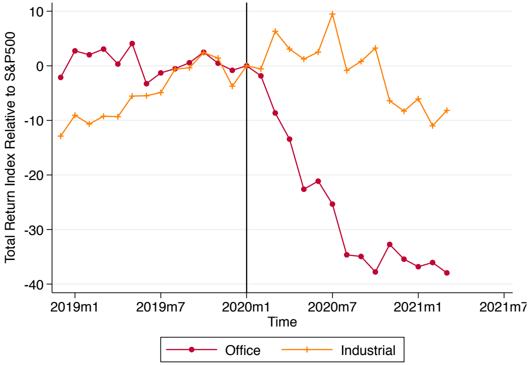
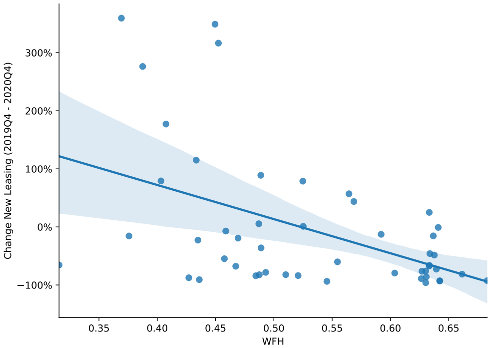


Concluding Thoughts

- Pandemic-triggered urban flight has benefited the suburban real estate sector, hurt the urban core.
- Work from home opportunities explain much of the disappearance of urban rent premium.
- House prices and rents suggest that much, but not all, of the WFH phenomenon is expected to be transitory. Urban rent revival expected.
- How this plays out will affect housing affordability debate and fiscal health of (superstar) cities.
- Follow-up work: Implications for urban office.

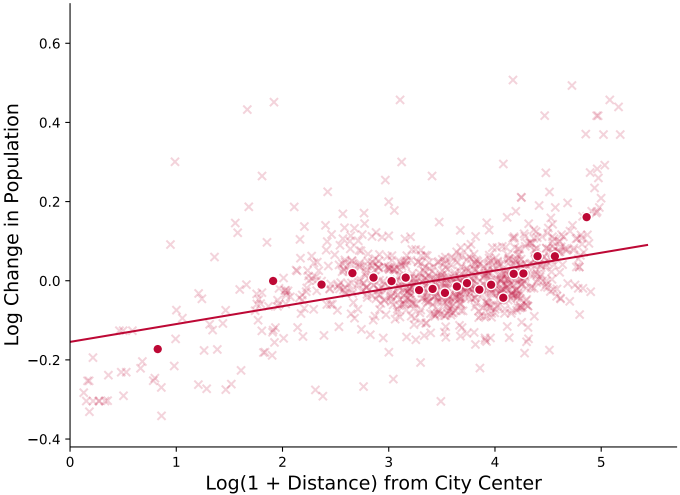
Market Indications for Changing Demand of Commercial Office Space





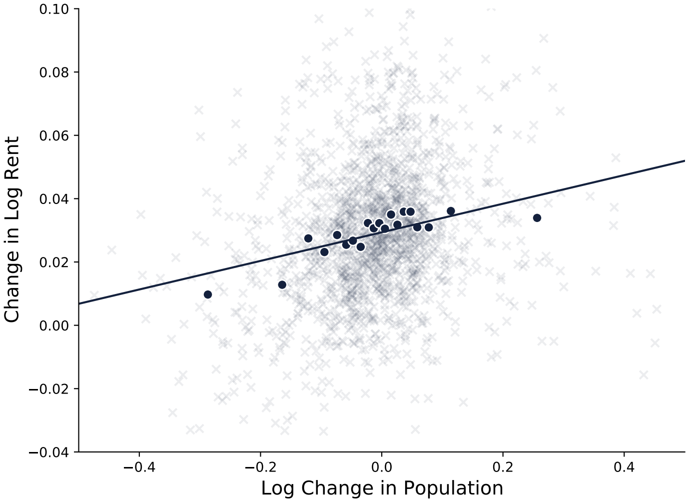
Thanks!

Mobility Gradient Shows Urban Flight New York Back

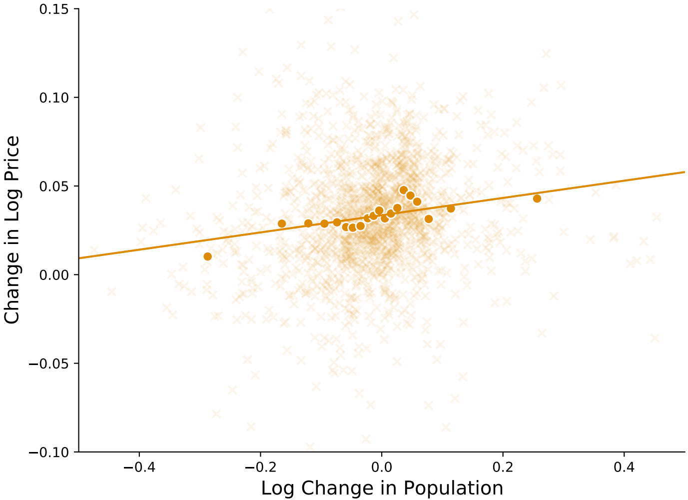


Mobility Gradient Shows Urban Flight San Francisco Back

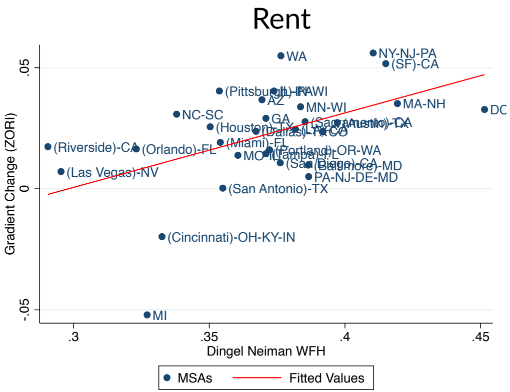
Mobility Flight Against Rents Back

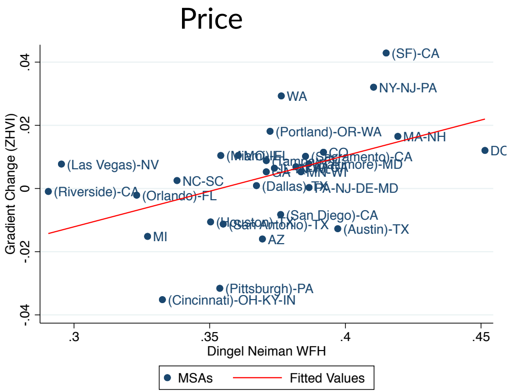


Mobility Flight Against Prices Back

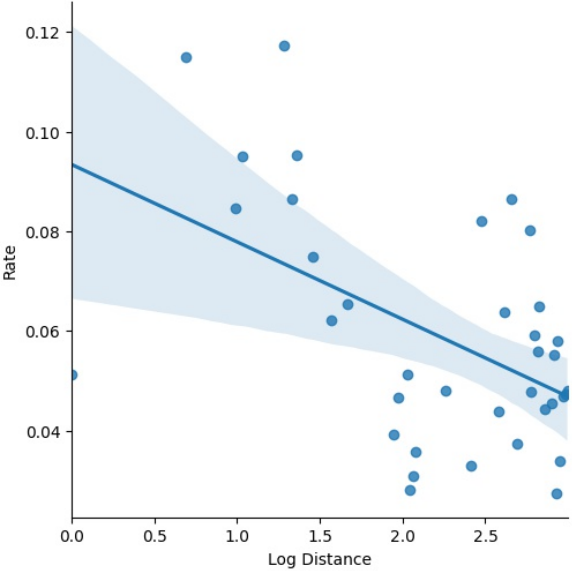


Work from Home Associations

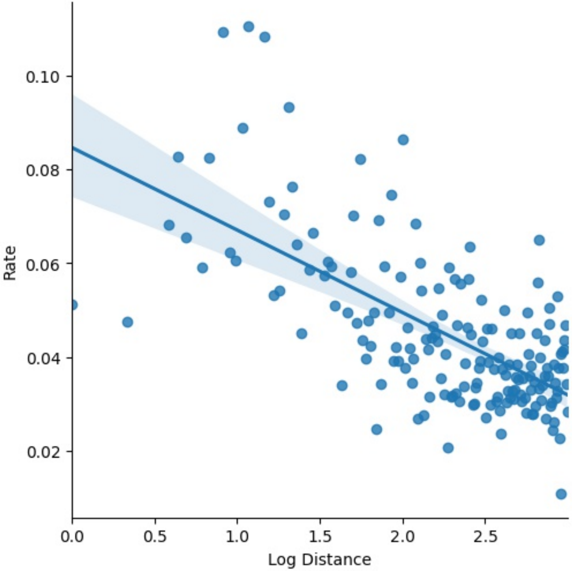




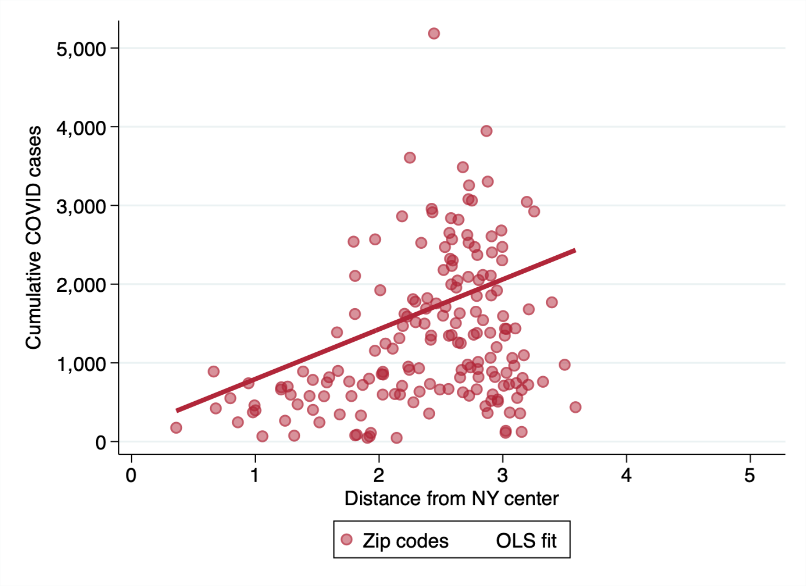
Migration, SF Back



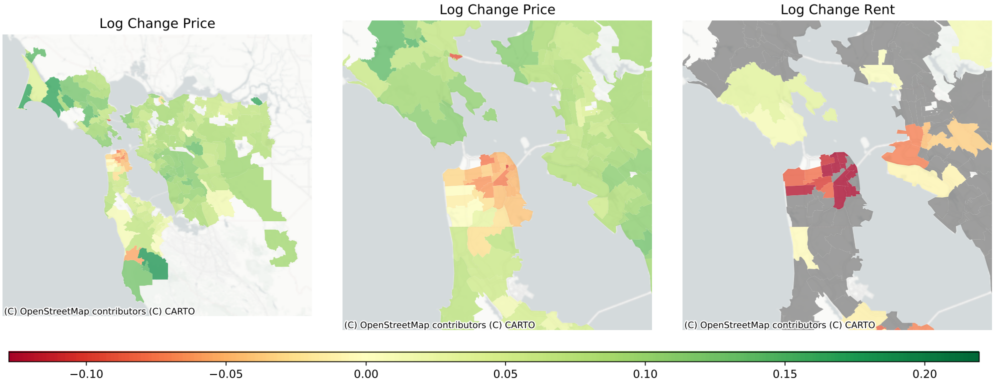
Top 6 Metros Back



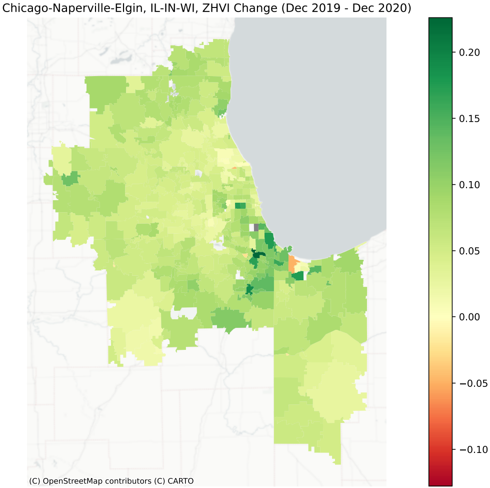
Density Negatively Associated with COVID-19 Cases Back



San Francisco Back

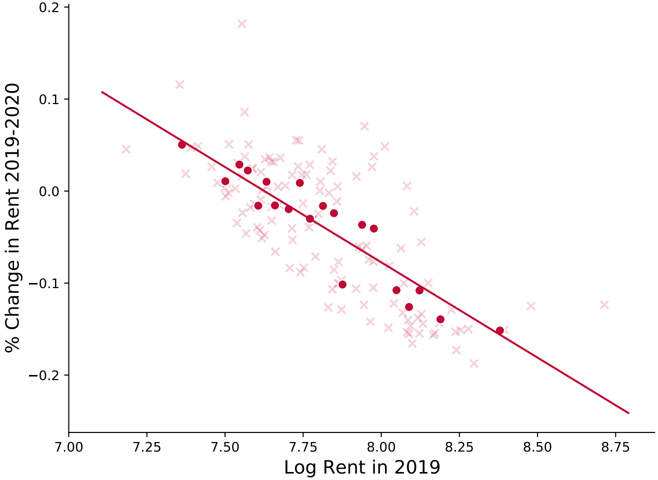


Chicago Back

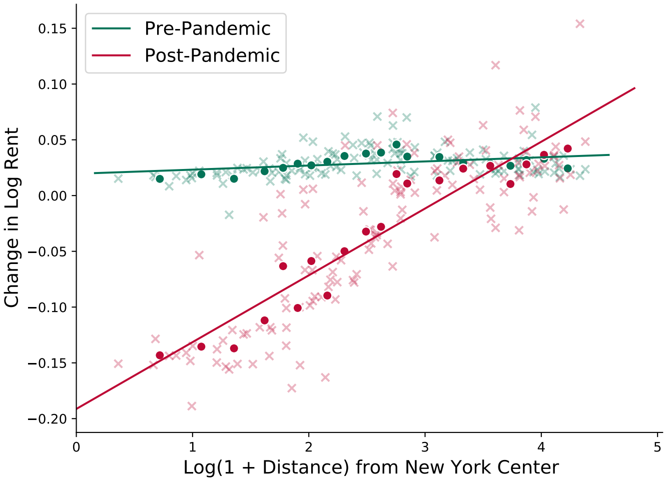


Rents Reverting in Most Expensive Areas New York

Back

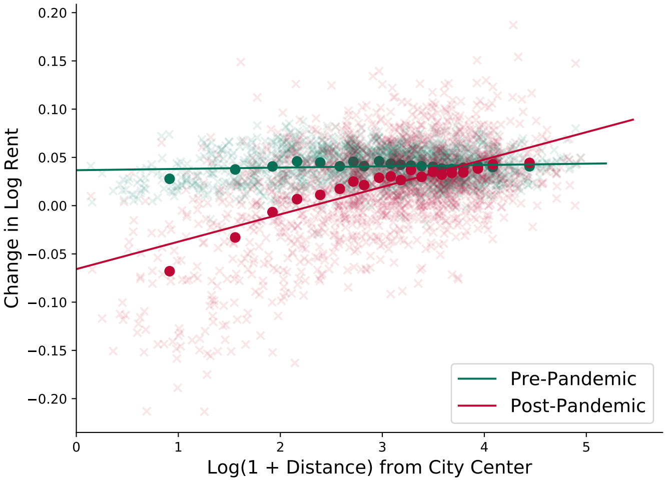


NY: Changes in Rent Growth Back

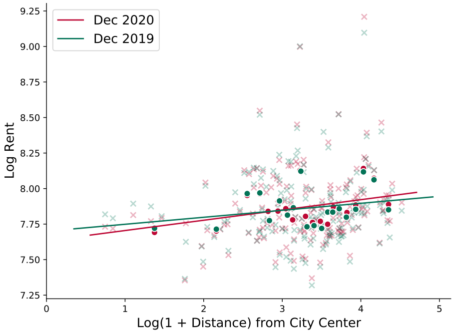


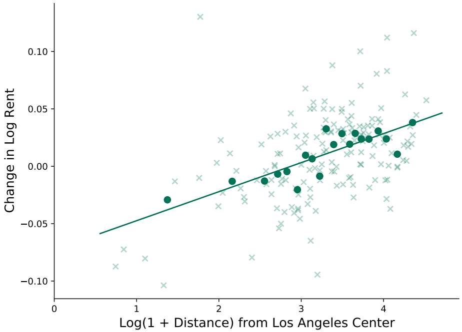
Rents Reverting in Most Expensive Areas Top 30 MSAs Back

Rent Growth Nationwide Back



Rent Changes Los Angeles Back

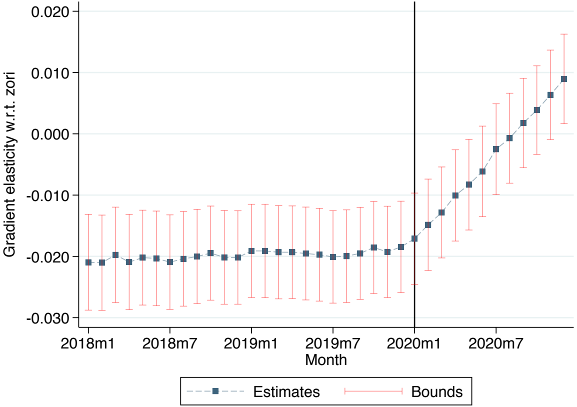




Gradient for Top 49 MSAs

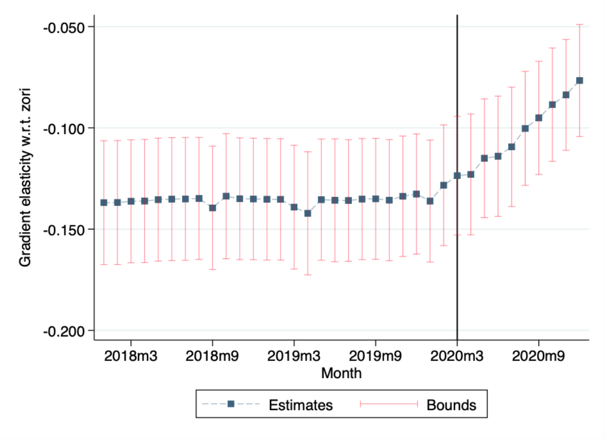
Back

$$\ln \mathrm{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



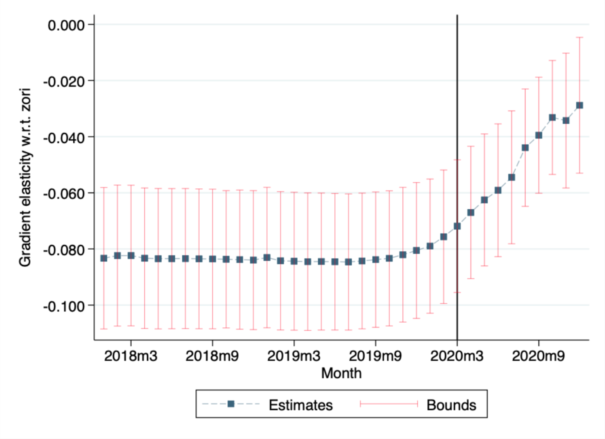
NYC Gradient Back

$$\ln \text{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



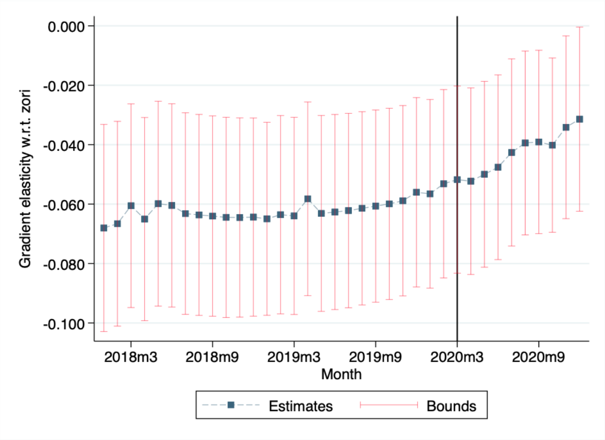
SF Gradient Back

$$\ln \mathrm{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j))\right] + \beta X_{ij} + e_{ijt}$$



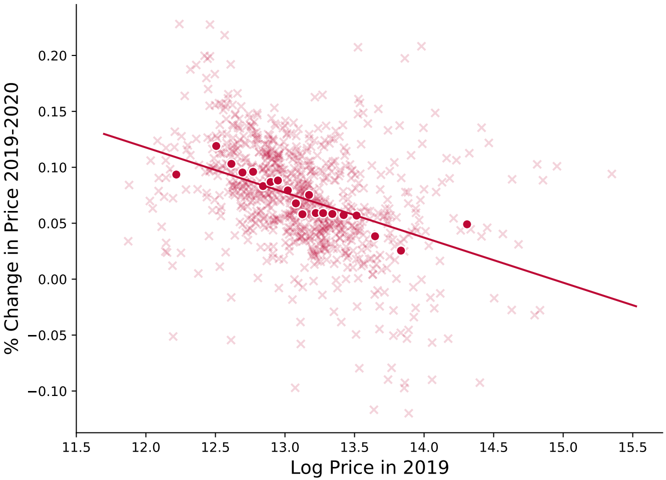
LA Gradient Back

$$\ln \mathrm{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$

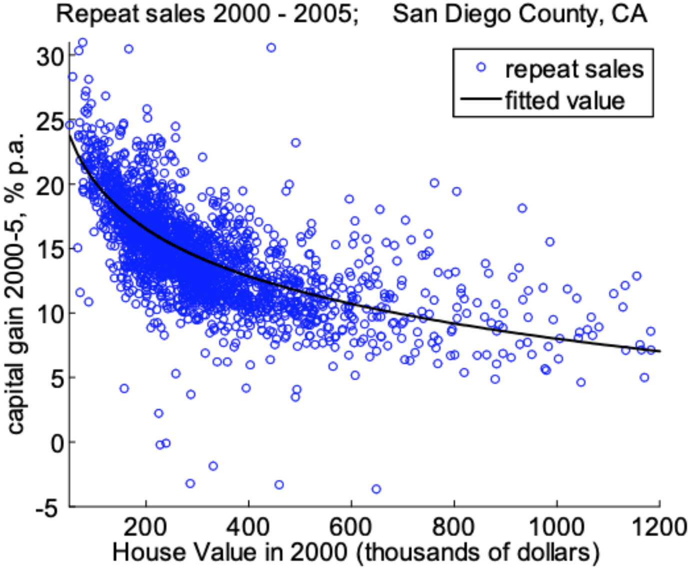


Prices Increasing in Cheapest Areas New York Back

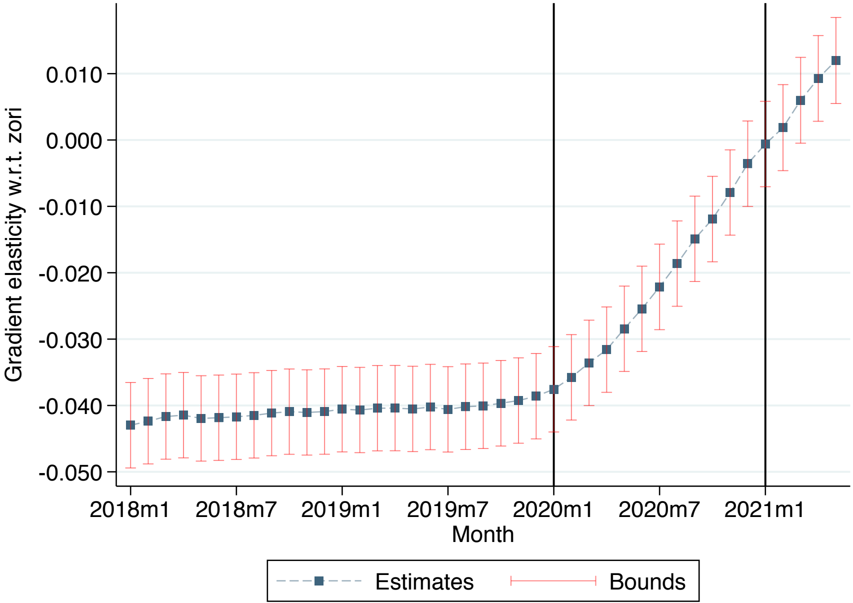
Comparison with Landvoigt Piazzesi Schneider (2015)



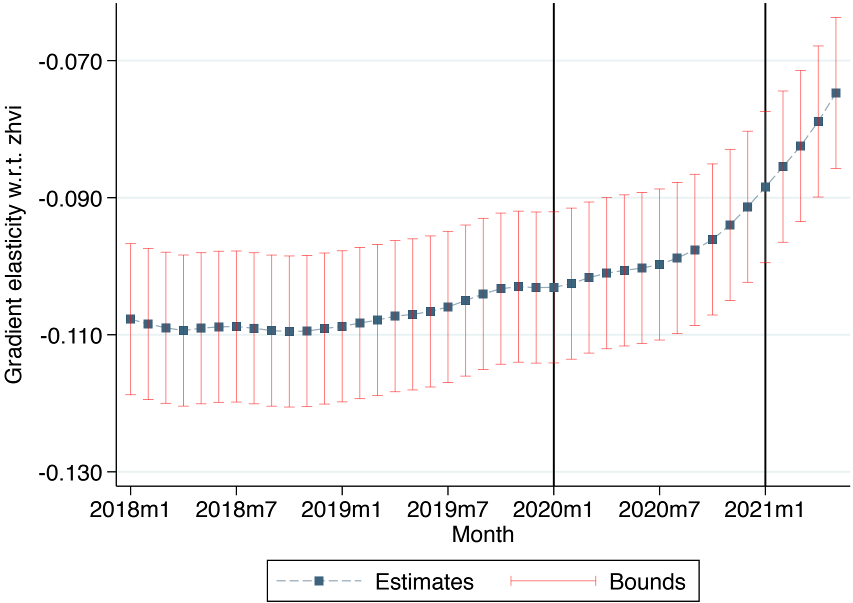
Landvoigt Piazzesi Schneider (2015) Back



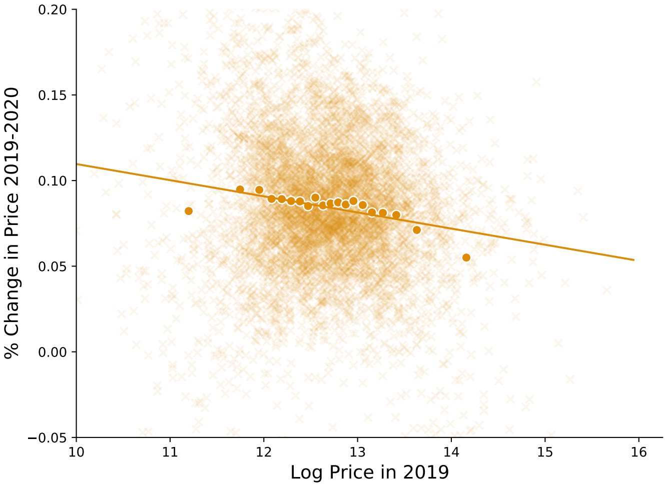
Change in Rent Gradient – Through May 2021 Back



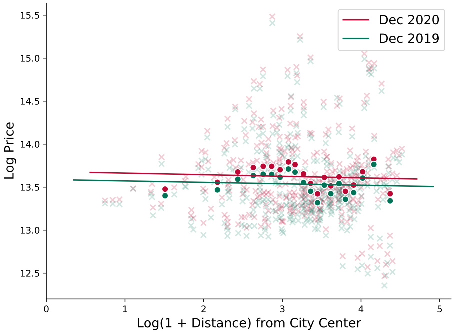
Change in Price Gradient – Through May 2021 Back

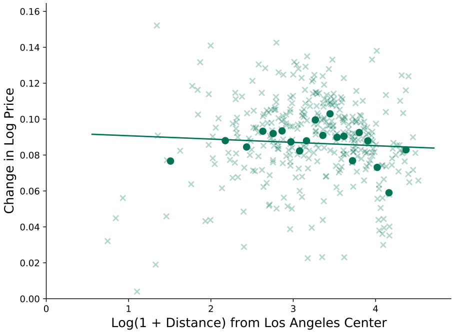


Prices Increasing in Cheapest Areas Top 30 MSAs Back



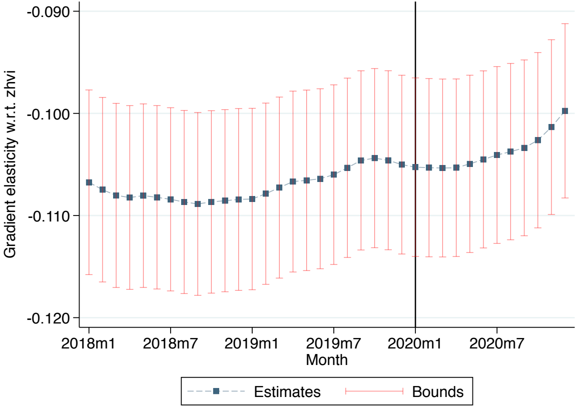
Price Changes Los Angeles Back





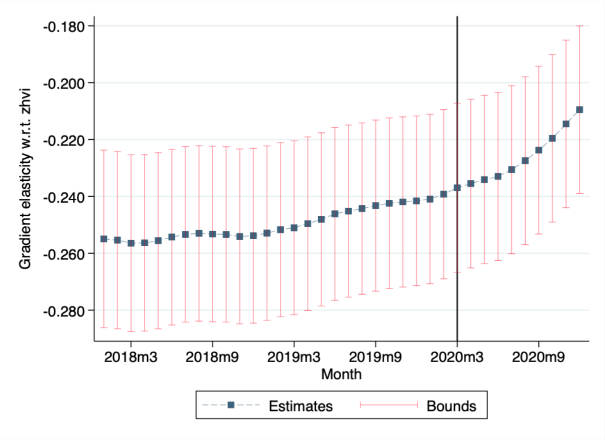
Gradient for Top 49 MSAs Back

$$\ln \mathrm{Price}_{ijt} = \alpha_{jt} + \delta_{jt} \left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j)) \right] + \beta X_{ij} + e_{ijt}$$



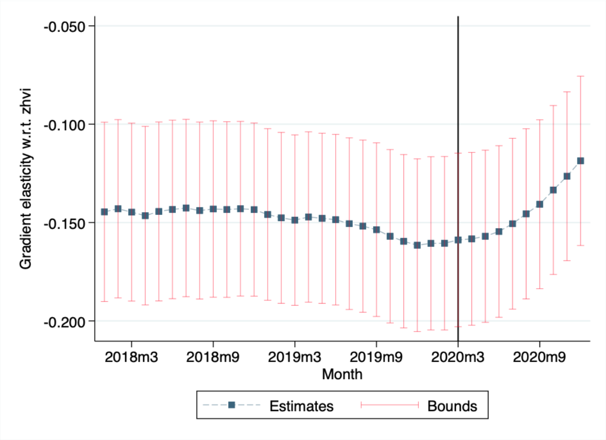
NYC Gradient Back

$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



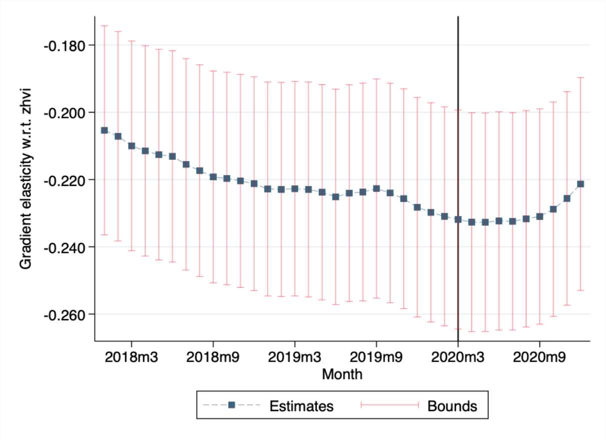
SF Gradient Back

$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt} \left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j)) \right] + \beta X_{ij} + e_{ijt}$$

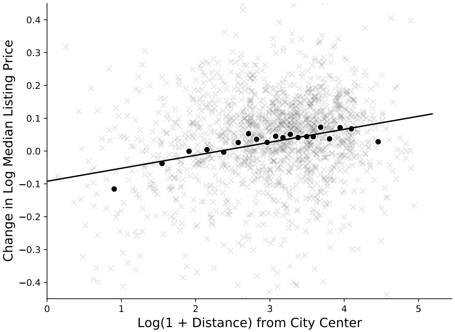


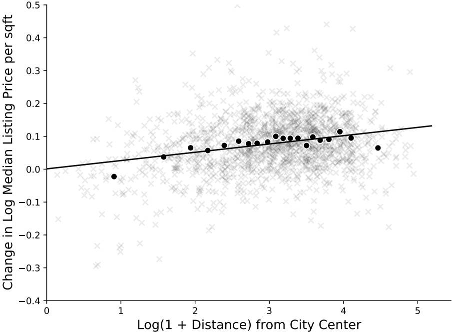
LA Gradient Back

$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}^z_{ij}, \mathbf{z}^m_j))\right] + \beta X_{ij} + e_{ijt}$$

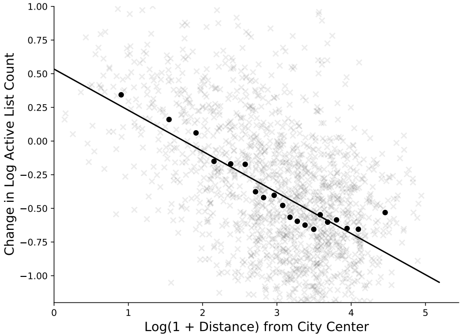


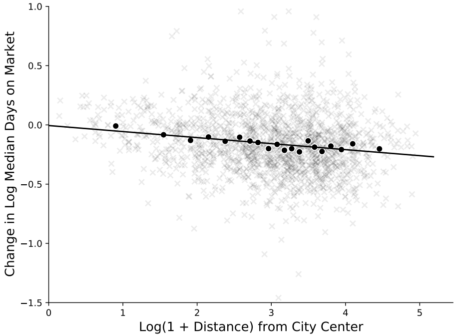
Change in Listing Prices Top 30 MSAs Back



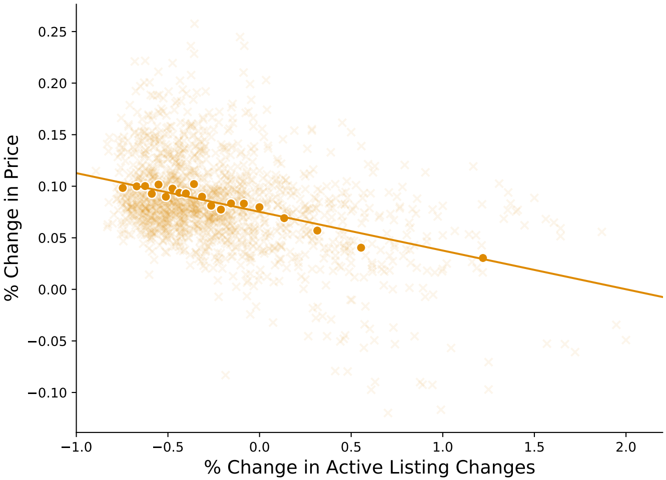


Change in Quantities Top 30 MSAs Back



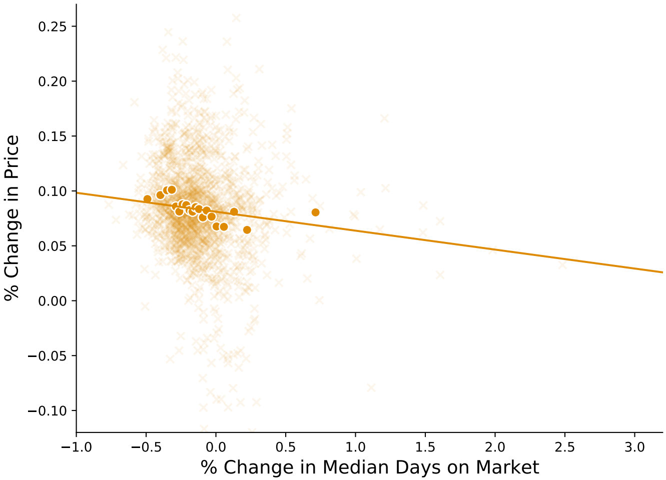


Price change against active listing changes Top 30 MSAs Back

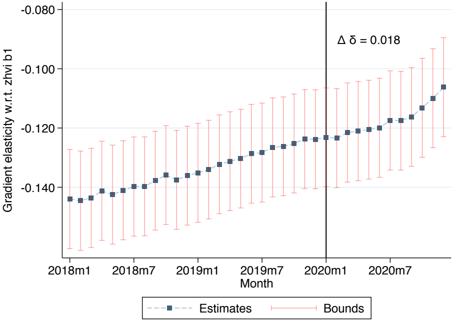


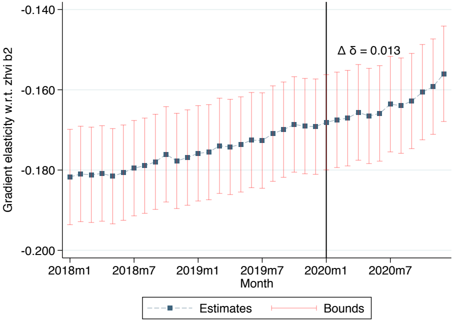
Price Against Change in Days on Market Top 30 MSAs

Back

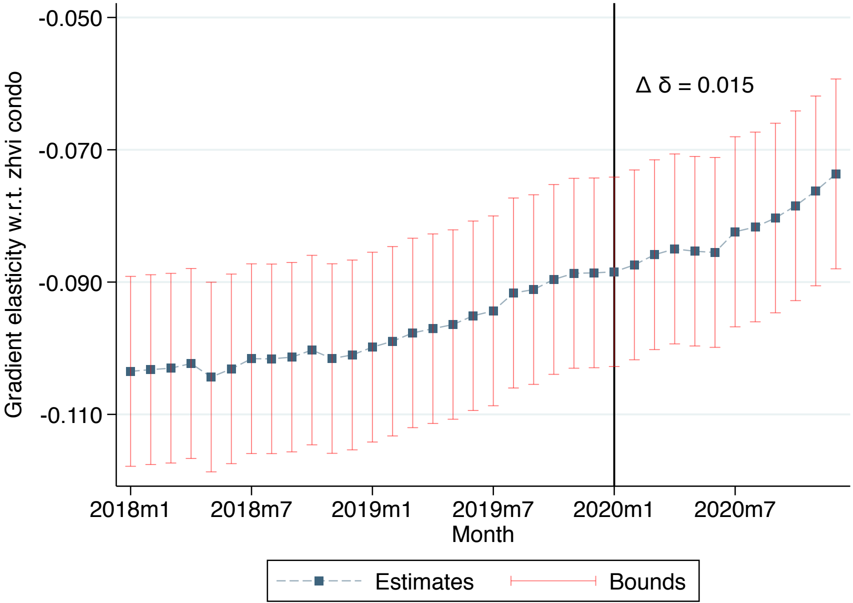


Housing Submarkets — 1 and 2 Bedrooms Top 30 MSAs Back

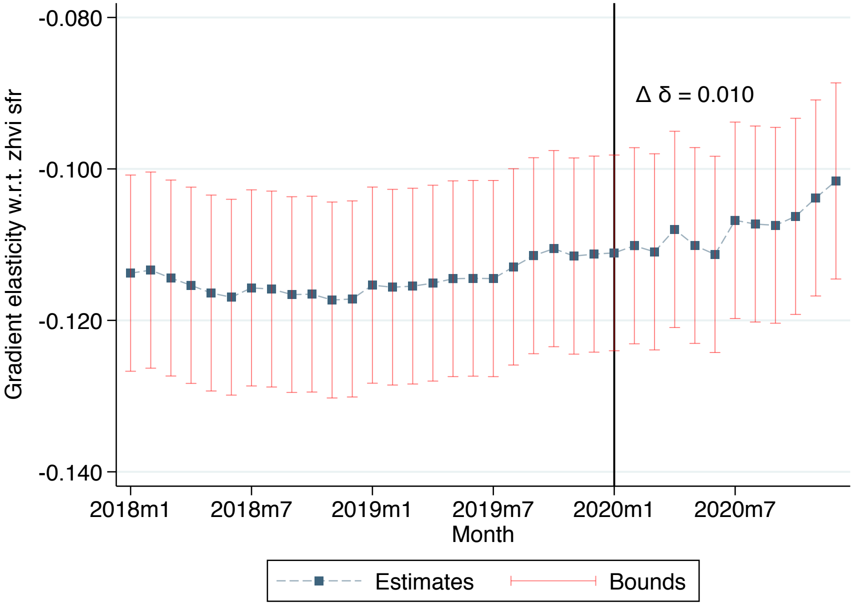




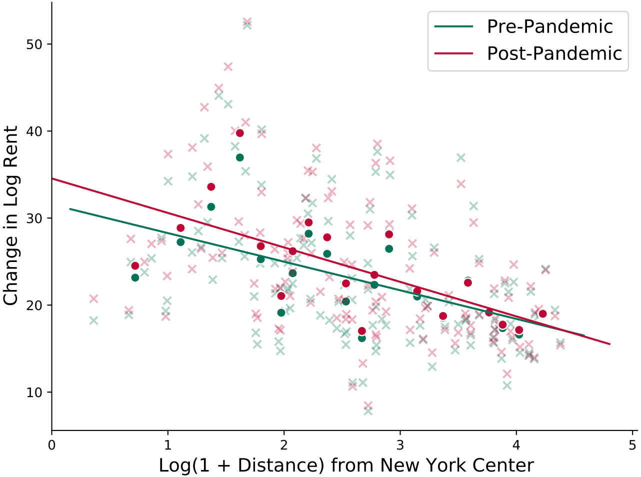
Housing Submarkets – Co-Ops and Condos Top 30 MSAs Back



Housing Submarkets – Single Family Top 30 MSAs Back



Price-Rent Ratio against Distance for New York City Top 30 MSAs

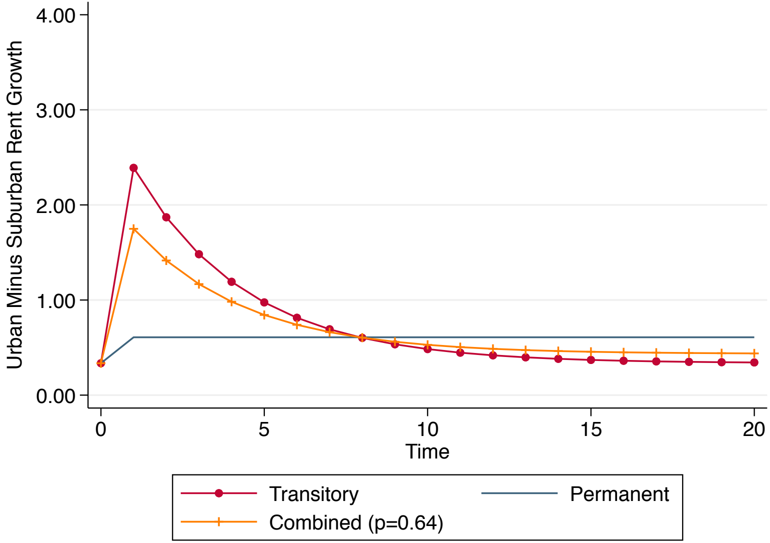


Survey Question Back

Question from 2021.Q1: “The pandemic and rise of remote work have altered housing needs and preferences, though it is uncertain if these changes will prove to be permanent or temporary. For each of the following, would you say that consumer preferences have shifted permanently, temporarily, or not at all?
Full-time work from home in favor of full-time work from company office."

102 survey respondents; real estate experts from banking, consulting, academia

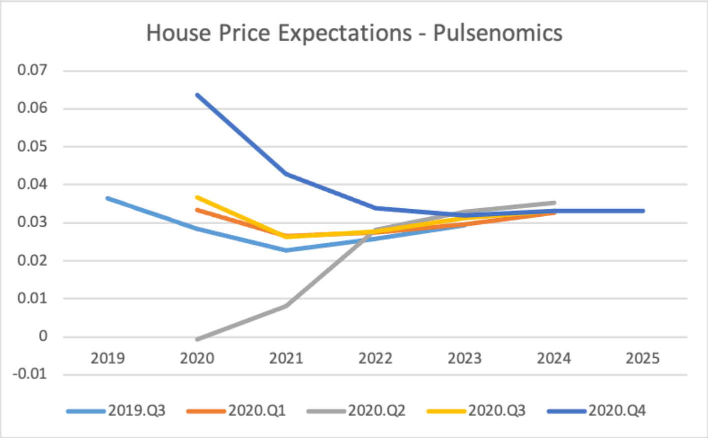
Backing out Evolution of Rent Growth, Case 1: $\Delta x^j = 0$ Back



Expectations from Pulsenomics Back

From periodic survey of 106 real estate economists and experts.

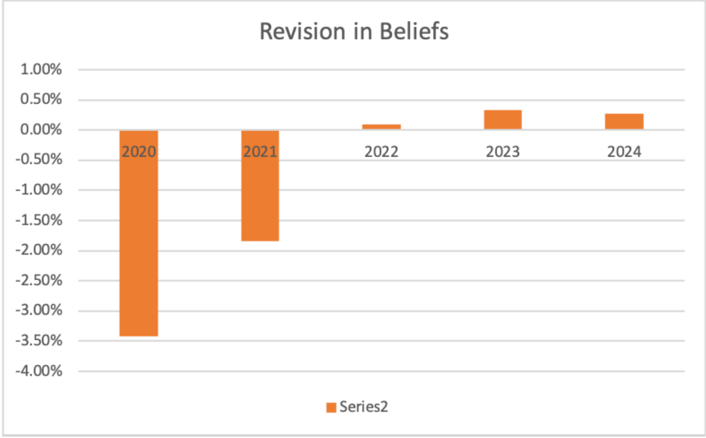
Q: “What do you think the increase in the ZHVI will be in 2021/2022/. . . ”



Expectations from Pulsenomics Back

Price level forecasts reflect permanent shifts from pandemic

Expectations from Pulsenomics Back



Backing Out Expected Rents Back

#	MSA	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
		Pre-pandemic						Pandemic			Transitory Change		Permanent Change	
		$\overline{PD}^{uj}$	$\overline{PD}^{sj}$	$\overline{g}^{uj}$	$\overline{g}^{sj}$	$\overline{x}^{uj}$	$\overline{x}^{sj}$	PD_t^{uj}	PD_t^{sj}	Δpd^j	$(g_t^{uj} - g_t^{sj})/(1-\rho^j \rho_g)$		$\hat{g}^{uj} - \hat{g}^{sj}$	
											$\Delta x^j = 0$	$\Delta x^j = 0.01$	$\Delta \overline{x}^j = 0$	$\Delta \overline{x}^j = 0.01$
1	New York-Newark-Jersey City, NY-NJ-PA	24.73	17.23	2.55	3.01	6.51	8.65	26.88	17.74	5.42	3.80	11.87	-0.31	0.69
2	Los Angeles-Long Beach-Anaheim, CA	29.71	24.13	6.06	4.18	9.37	8.25	35.38	25.12	13.41	20.12	28.69	2.25	3.25
3	Chicago-Naperville-Elgin, IL-IN-WI	17.39	11.24	2.86	2.80	8.45	11.33	18.73	11.88	1.80	2.00	9.04	0.00	1.00
4	Dallas-Fort Worth-Arlington, TX	15.40	12.57	4.30	4.02	10.59	11.67	17.82	13.75	5.62	6.55	13.31	0.48	1.48
5	Houston-The Woodlands-Sugar Land, TX	19.92	14.44	1.06	1.59	5.96	8.29	21.52	14.87	4.87	3.13	9.90	-0.36	0.64
6	Washington-Arlington-Alexandria, DC-VA-MD-WV	23.62	17.85	3.14	2.08	7.28	7.53	26.63	18.89	6.31	9.96	17.83	1.22	2.22
7	Miami-Fort Lauderdale-Pompano Beach, FL	15.83	11.67	2.94	4.14	9.06	12.36	17.70	12.70	2.64	-1.26	5.40	-1.22	-0.22
8	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	10.21	15.00	3.35	2.44	12.69	8.90	12.86	15.83	17.70	20.66	27.42	2.43	3.43
9	Atlanta-Sandy Springs-Alpharetta, GA	15.97	13.84	6.35	4.58	12.42	11.55	18.57	14.55	10.10	15.91	22.74	2.27	3.27
10	Phoenix-Mesa-Chandler, AZ	14.57	15.84	7.36	6.38	14.00	12.50	16.42	16.16	9.99	13.29	20.60	1.59	2.59
11	Boston-Cambridge-Newton, MA-NH	20.63	17.18	4.00	4.88	8.73	10.54	23.72	18.64	5.78	2.74	10.62	-0.71	0.29
12	San Francisco-Oakland-Berkeley, CA	34.13	25.65	4.01	4.90	6.89	8.73	39.64	28.20	5.47	2.25	11.02	-0.84	0.16
15	Seattle-Tacoma-Bellevue, WA	31.78	16.08	5.66	6.63	8.76	12.67	37.69	18.70	1.96	-1.47	6.74	-1.32	-0.32
17	San Diego-Chula Vista-Carlsbad, CA	21.47	21.86	5.88	4.90	10.43	9.37	23.61	23.33	3.00	6.44	14.65	1.11	2.11
18	Tampa-St Petersburg-Clearwater, FL	11.75	9.35	5.00	5.26	13.16	15.43	14.73	11.18	4.64	3.79	10.24	-0.27	0.73
19	Denver-Aurora-Lakewood, CO	21.31	18.55	5.77	5.02	10.36	10.27	24.03	19.67	6.18	8.78	16.52	0.97	1.97
20	St Louis, MO-IL	13.84	12.86	3.20	2.69	10.17	10.18	14.84	13.94	-1.12	0.50	6.80	0.40	1.40
21	Baltimore-Columbia-Towson, MD	8.68	14.93	1.48	1.57	12.38	8.05	9.39	15.74	2.53	2.25	8.81	0.37	1.37
22	Charlotte-Concord-Gastonia, NC-SC	15.00	13.39	6.08	4.07	12.53	11.28	18.28	13.98	15.42	22.04	28.95	2.84	3.84
23	Orlando-Kissimmee-Sanford, FL	12.40	11.82	5.67	4.22	13.42	12.34	14.63	13.00	7.04	11.75	18.47	1.88	2.88
24	San Antonio-New Braunfels, TX	11.28	13.94	4.21	2.46	12.70	9.39	12.87	15.13	5.03	10.67	17.24	2.23	3.23
26	Sacramento-Roseville-Folsom, CA	18.07	22.18	7.08	7.99	12.47	12.40	19.38	19.97	17.48	14.32	22.16	-0.08	0.92
29	Austin-Round Rock-Georgetown, TX	21.10	14.44	4.30	3.10	8.93	9.79	25.61	16.27	7.43	11.51	18.98	1.27	2.27
	MSA Population Weighted Average									6.99	8.13	15.60	0.61	1.61

Explaining Variation in Price Gradient Changes Across Cities

Back

Price Gradient - Rent Gradient Back

	(1)	(2)	(3)	(4)	(5)	(6)
Log(Price/Rent) 2018	-0.00196					
	(0.0118)					
Saiz supply elasticity		-0.00383				
		(0.00374)				
Land unavailable percent			0.0239			
			(0.0300)			
Wharton Regulatory Index				-0.00310		
				(0.00506)		
Dingel Neiman WFH					-0.112	
					(0.0858)	
Stringency Measure						-0.000207
						(0.000573)
Observations	30	30	30	30	30	27
R^2	0.001	0.036	0.022	0.013	0.057	0.005
Adjusted R^2	-0.035	0.002	-0.013	-0.022	0.024	-0.035

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Expected Rent Growth in the Cross-Section

- NY expected to see 4.5% faster urban than suburban rent growth over several years in transitory case
- For 2021, 0.75% in combination case