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

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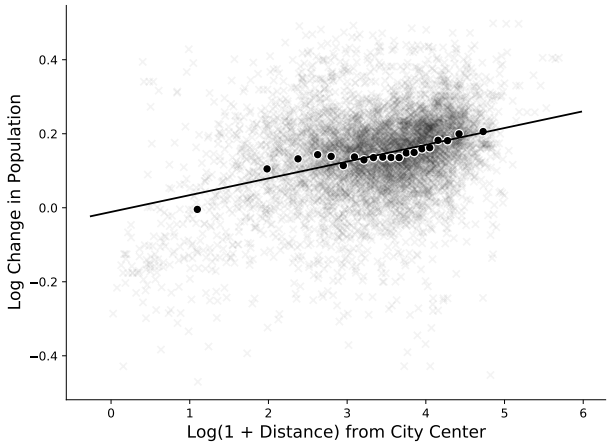
1. Urban Flight

Document Population Moves in the time of Covid

Mobility Gradient Shows Urban Flight

NYC SF vs. Rent vs. Prices Covid gradient

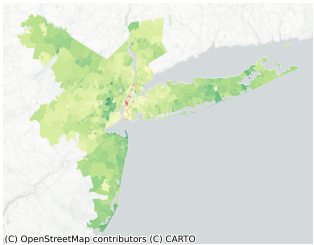
- Covid-19 prompted a large urban flight to suburbs over Feb 2020–Mar 2020
- Venpath cell phone data

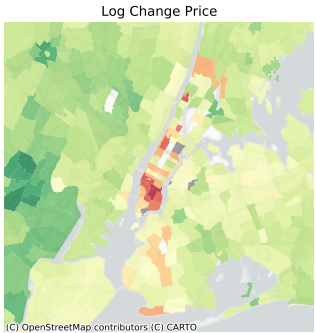


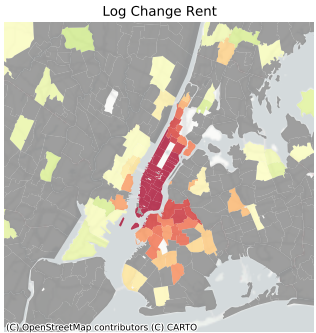
2. Change in Bid-Rent Functions

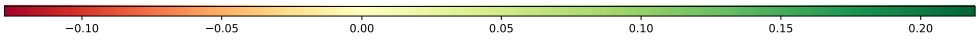
Flattening the Curve

NYC Area SF Chicago





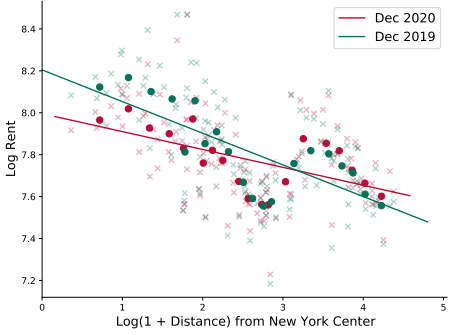




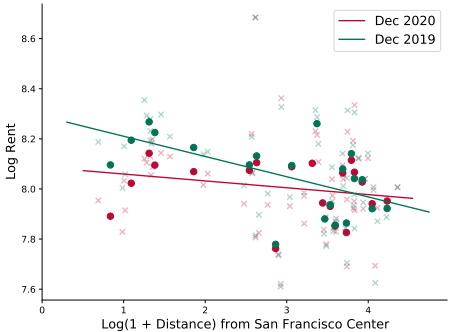
Rent Changes New York

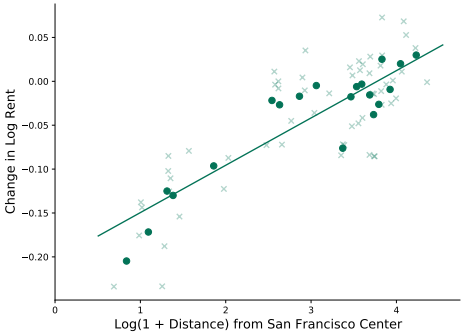
NY Rent Reversal | Pre vs. Post

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



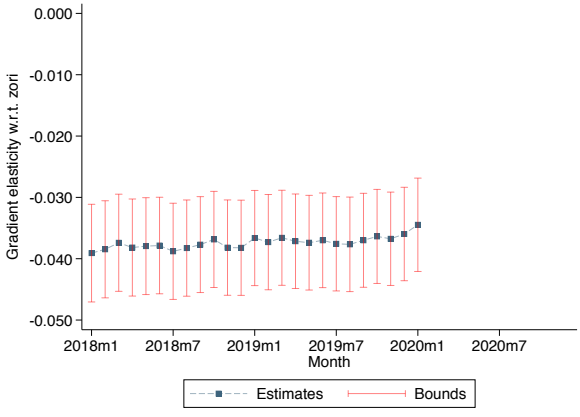
Rent Changes San Francisco





Complete Reversal of Rent Gradient Top 30 MSAs

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



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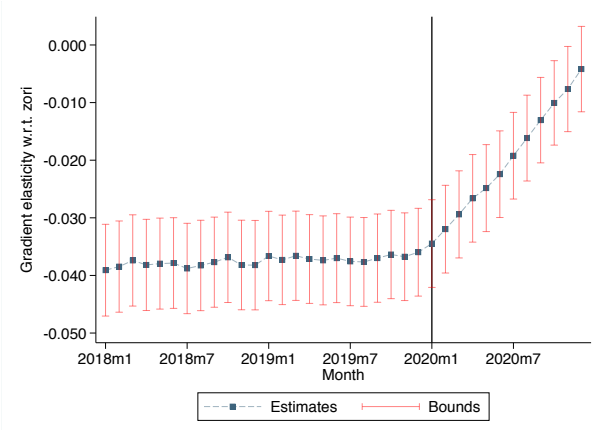
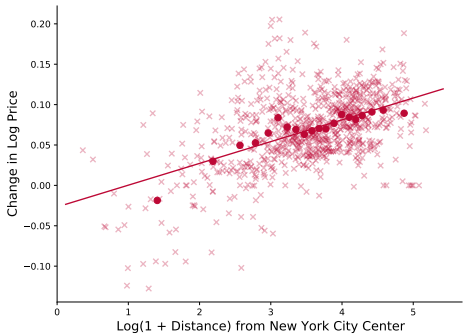
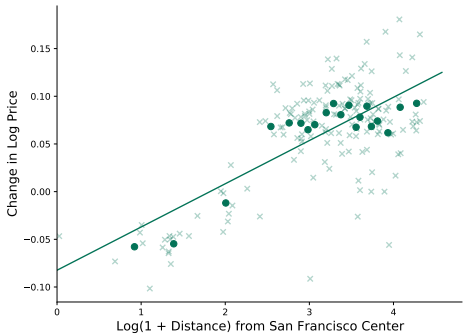


Price Changes New York and San Francisco NY Price Reversal

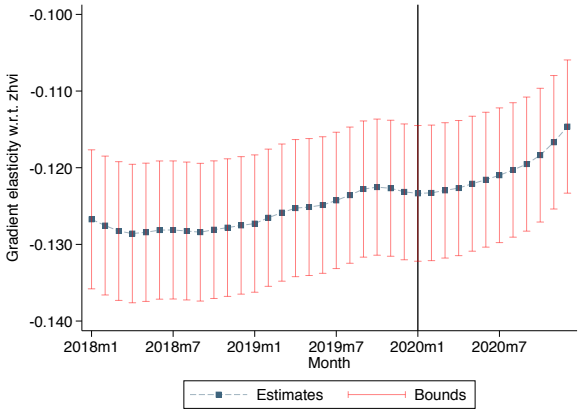
- Prices also saw stronger growth in suburbs as seen in New York (left) and San Francisco (right).





Partial Reversal of Price Gradient Top 30 MSAs

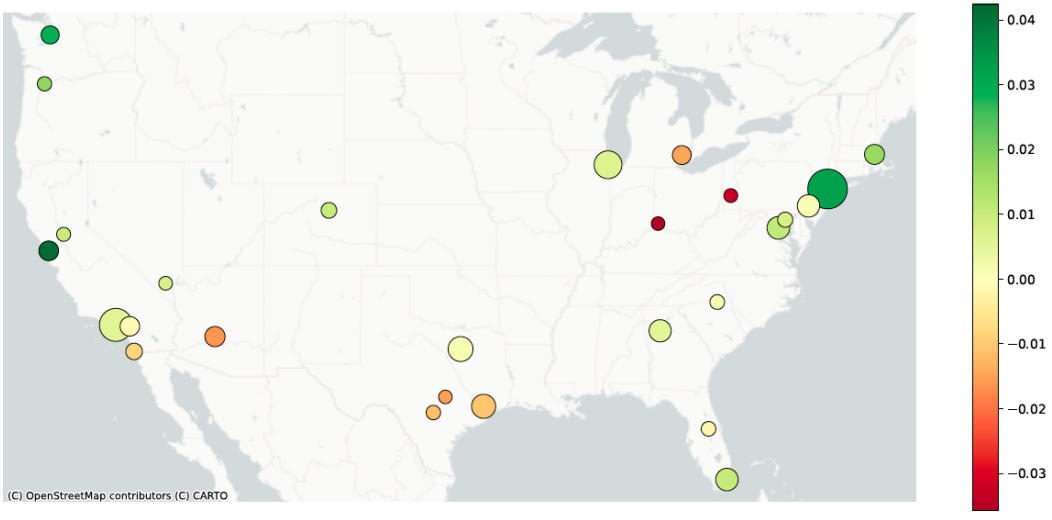
$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



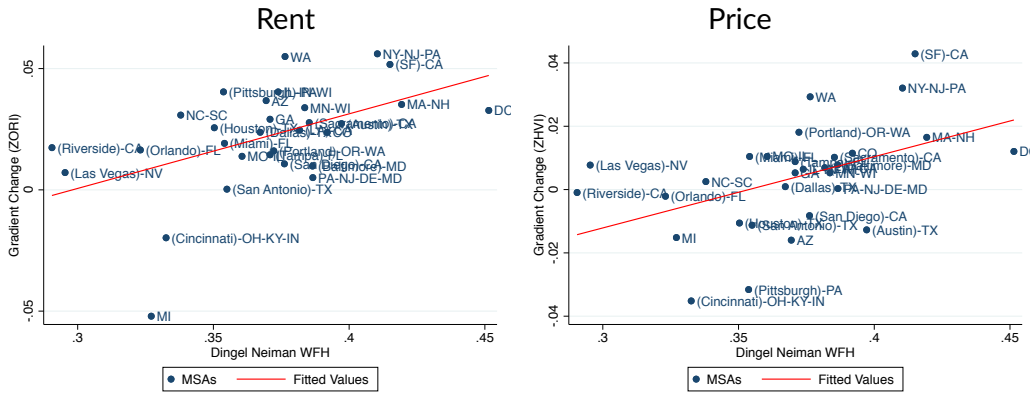
4. Explaining Changes in Real Estate Gradients

Urban Premia Reverses in Presence of Remote Work and Land Scarcity

National Change in Price Gradients



Correlation with Working from Home



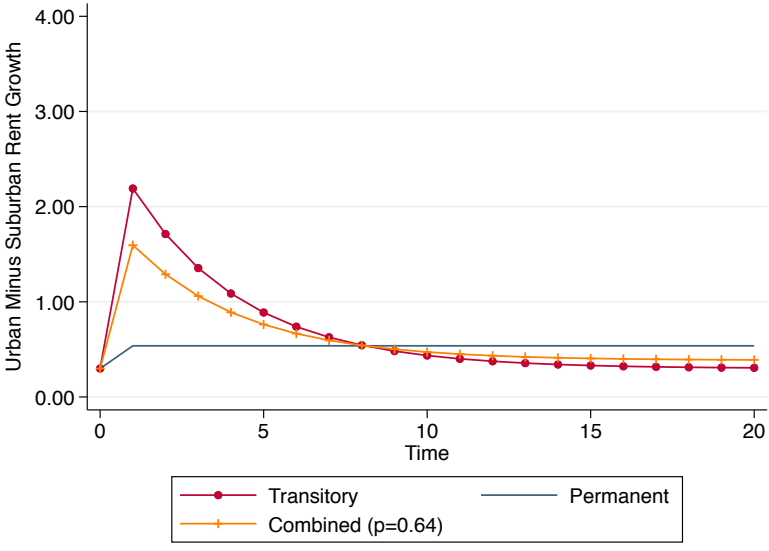
WFH = Dingle and Neiman (2020) measure of ability to work from home, based on detailed job descriptions

Explaining the Variation in Rent Gradient Changes MSA level

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

Work from Home	0.326***			0.267**	0.326***
	(0.101)			(0.112)	(0.102)
Stringency Measure		0.145**		0.0623	
		(0.0651)		(0.0766)	
Supply Inelasticity Index			0.0300*	0.00862	
			(0.0172)	(0.0188)	
Orthogonalized Stringency Index					0.0797
					(0.0664)
Orthogonalized Supply Inelasticity					0.00862
					(0.0188)
Observations	30	30	30	30	30
R^2	0.270	0.151	0.098	0.314	0.314

Backing out Expected Rent Growth, Case 1: $\Delta x^j = 0$ Full Table

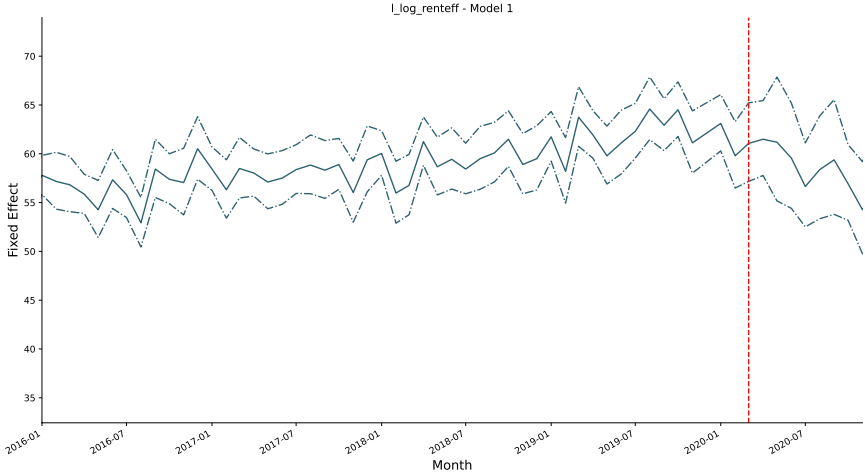


Concluding Thoughts

- 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 predicted and already underway.
- How this plays out will affect housing affordability debate and fiscal health of (superstar) cities.
- Follow-up work: Implications for urban office.

Urban Office Leases: Net Effective Rent

- Study new office leases in New York City using Compstak data
- Net effective rent in $/sf (combines asking rent, free rent, TI)



Are Cities Dead, or is this a Temporary Blip for Urban Growth?

Ed Glaeser: “We’ll eventually figure out how to deal with COVID-19. And the forces that gave rise to superstar cities aren’t going to just go away. Zoom calls remain a lackluster substitute for face-to-face chats, and people will still want all the awesome stuff that density creates.”

Are Cities Dead, or is this a Temporary Blip for Urban Growth?

David Autor: “The COVID crisis appears poised to reshape labor markets along at least four axes: telepresence, urban de-densification, employment concentration in large firms, and general automation... The pandemic will permanently alter the texture of urban life.”

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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1. Document disappearance of rent gradient, partial decline in price gradient
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   - Working from home is the key driver
   - Strong results for rent gradients implying shock is transitory

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   - Use Campbell-Shiller decomposition of prices
   - Use survey expectations data from Pulsenomics to calibrate persistence
   - Price gradient falls less than rent gradient $\rightarrow$ future urban rent growth

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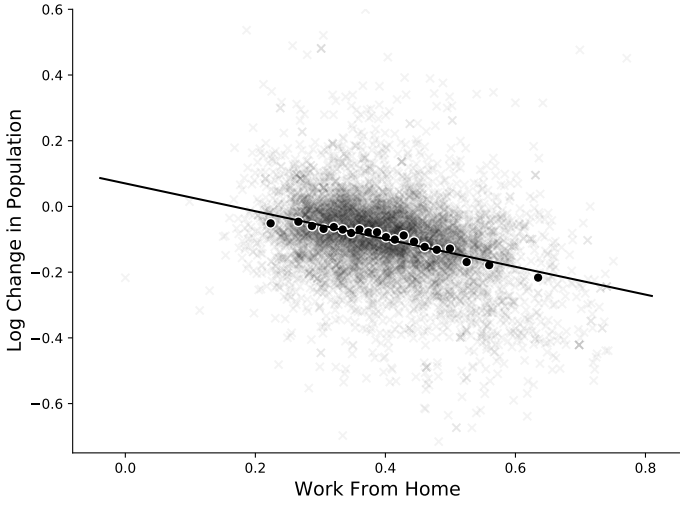
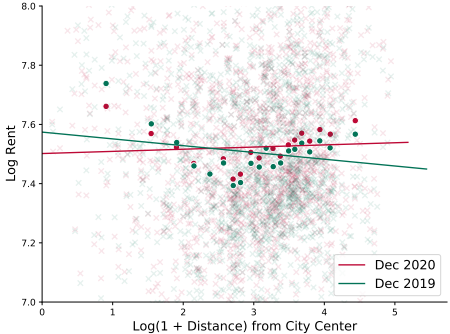
Pandemic was a massive temporary shock, but does not appear to herald the permanent demise of the superstar city

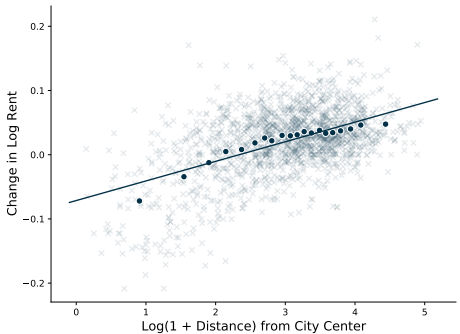
Remote Workers More Likely to Flee



Rent Changes Top 30 MSAs

USA Rent Reversal | Pre vs. Post | LA





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

3. Beliefs About Rent Growth

Predicting Urban Recovery

Present Value Decomposition of Real Estate Valuations

Define the cum-dividend return on a house:

$$R_{t+1} = \frac{P_{t+1} + D_{t+1}}{P_t}$$

Log-linearize:

$$\begin{aligned} r_{t+1} &= k + \Delta d_{t+1} + \rho\, pd_{t+1} - pd_t \\ \rho &= \frac{\exp(\overline{pd})}{1 + \exp(\overline{pd})}, \qquad k = \log(1 + \exp(\overline{pd})) - \rho\overline{pd} \end{aligned}$$

Iterating forward, applying TVC condition yields Campbell and Shiller (1989):

$$pd_t \equiv log(P_t) - log(D_t) = \frac{k}{1-\rho} + E_t\left[\sum_{j=1}^{+\infty} \rho^{j-1} \Delta d_{t+j}\right] - E_t\left[\sum_{j=1}^{+\infty} \rho^{j-1} r_{t+j}\right]$$

Back out Expected Rent Growth

Subtracting from unconditional average:

$$pd_t - \overline{pd} = E_t\left[\sum_{j=1}^{+\infty} \rho^{j-1}\left(\Delta d_{t+j} - \bar{g}\right)\right] - E_t\left[\sum_{j=1}^{+\infty} \rho^{j-1}\left(r_{t+j} - \bar{x}\right)\right]$$

Price-rent ratios exceed their long-run average when

1. Rent growth expectations are above their long-run average ($\bar{g}$), or
2. Expected returns are below the long-run expected return ($\bar{x}$)

Assume exp. rent growth ($g_t \equiv E_t[\Delta d_{t+1}$) and exp. returns ($x_t \equiv E_t[r_{t+1}]$) follow AR(1) process with persistence ρ_g and ρ_x

$$\underbrace{g_t}_{\substack{\text{current belief}\\ \text{rent growth}}} = \underbrace{\bar{g}}_{\substack{\text{long-run}\\ \text{expected growth}}} + \underbrace{\left(1-\rho\rho_g\right)\left(pd_t - \overline{pd}\right)}_{\substack{\text{deviation price-rent}\\ \text{from LR mean}}} + \underbrace{\frac{1-\rho\rho_g}{1-\rho\rho_x}\left(x_t - \bar{x}\right)}_{\substack{\text{deviation expected return}\\ \text{from LR mean}}}$$

Model 1: Pandemic is Transitory

- Exp. rent growth, exp. returns, and pd ratio revert to pre-pandemic means.
- ZIPs i were at long-run average $(\overline{x}^{ij}, \overline{g}^{ij}, \overline{pd}^{ij})$ in Dec 2019
- Same persistence of expected returns and rent growth across geographies ($\rho_x^{ij} = \rho_x$ and $\rho_g^{ij} = \rho_g$) and $\rho^{ij} = \rho^j$, variation only at MSA j level

Market expectation on expected urban minus suburban rent growth, 1 period:

$$g_t^{uj} - g_t^{sj} = \overline{g}^{uj} - \overline{g}^{sj} + (1 - \rho^j \rho_g)\Delta pd^j + \frac{1 - \rho^j \rho_g}{1 - \rho^j \rho_x}\Delta x^j$$

with

$$\Delta x^j \equiv (x_t^{uj} - \overline{x}^{uj}) - (x_t^{sj} - \overline{x}^{sj})$$

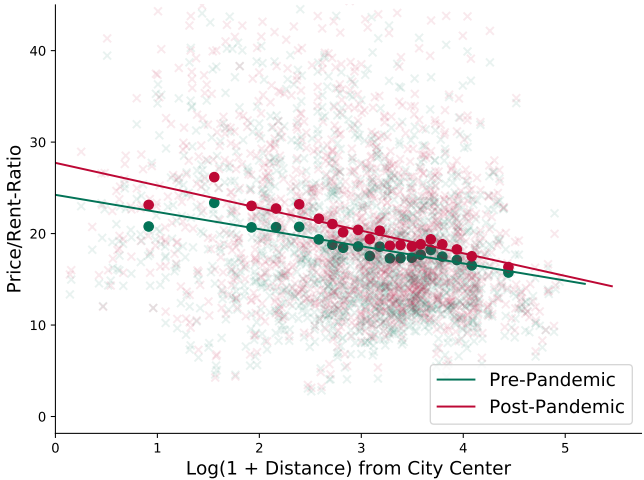
Model 1: Pandemic is Transitory

Consider two cases for Δx^j, the change in expected returns on urban minus suburban real estate during 2020:

1. Expected returns did not change differentially in urban and suburban areas in the same MSA in the pandemic: $\Delta x^j = 0$.

2. (Temporary) increase in urban-minus-suburban risk premia: $\Delta \overline{x}^j = 0.01$: $x^{uj} - x^{sj} = \overline{x}^{uj} - \overline{x}^{sj} + 0.01, \ \forall j$

Price-Rent Ratio against Distance Top 30 MSAs NYC



Model 2: Pandemic is Permanent

Dec 2020 is the new, permanent state Expected urban-minus-suburban rent growth:

$$\widehat{g}^{uj} - \widehat{g}^{sj} = \left(\widehat{pd}^{uj} - \widehat{pd}^{sj}\right) - \left(\log\left(1 + \exp\widehat{pd}^{uj}\right) - \log\left(1 + \exp\widehat{pd}^{sj}\right)\right) + \left(\widehat{x}^{uj} - \widehat{x}^{sj}\right)$$

Again, consider two assumptions on post-pandemic U-S risk premia:

1. Relative premium unchanged: $\Delta\overline{x}^{j} = 0$: $\widehat{x}^{uj} - \widehat{x}^{sj} = \overline{x}^{uj} - \overline{x}^{sj},\ \forall j$
2. Relative premium increased: $\Delta\overline{x}^{j} = 0.01$: $\widehat{x}^{uj} - \widehat{x}^{sj} = \overline{x}^{uj} - \overline{x}^{sj} + 0.01,\ \forall j$

Model 3: Combining Transitory and Permanent

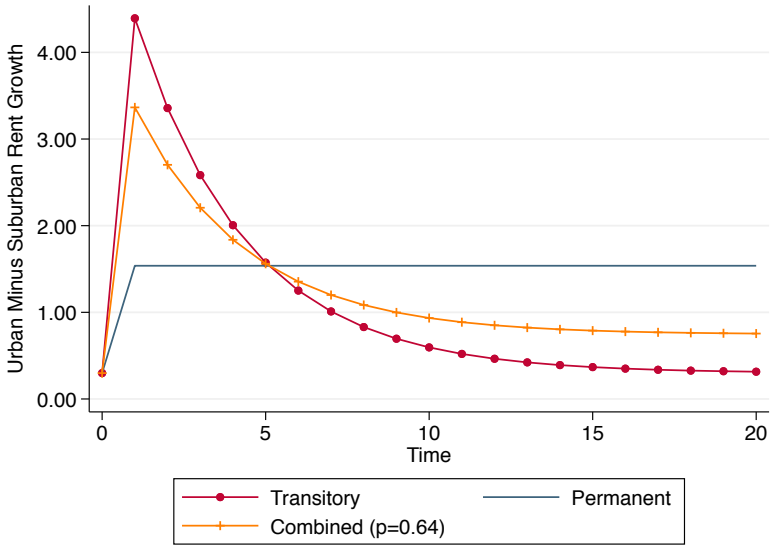
- Use survey data from *Pulsenomics* on professional forecasters' view on whether the covid-induced housing market changes are transitory (64%) or permanent (36%) to combine two cases
- Let p be probability that changes in urban-suburban exp rent growth and exp return are transitory, then combined case:

$$\widetilde{g}_t^{uj} - \widetilde{g}_t^{sj} = p\left(g_t^{uj} - g_t^{sj}\right) + (1-p)\left(\widehat{g}_t^{uj} - \widehat{g}_t^{sj}\right)$$

$$\widetilde{pd}_t^{uj} - \widetilde{pd}_t^{sj} = p\left(pd_t^{uj} - pd_t^{sj}\right) + (1-p)\left(\widehat{pd}_t^{uj} - \widehat{pd}_t^{sj}\right)$$

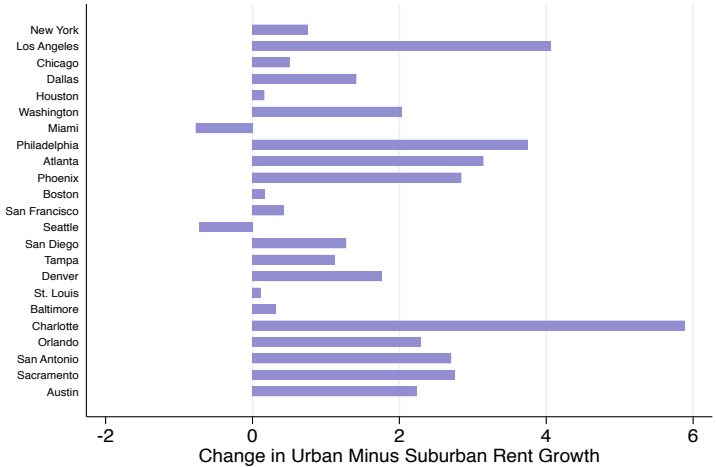
Survey Question | Expectations Data

Backing out Evolution of Rent Growth, Case 2: $\Delta x^j = 0.01$ Full Table

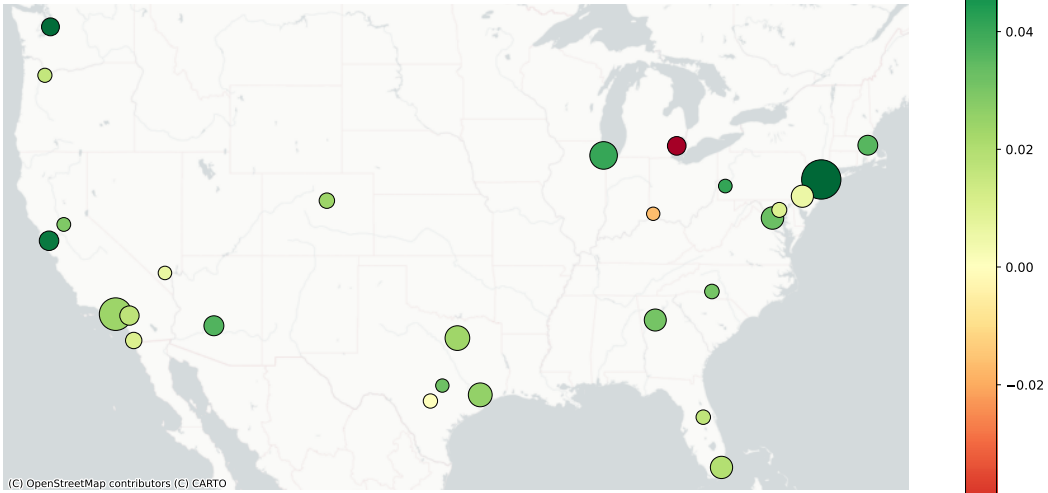


Expected Rent Growth in the Cross-Section

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



National Change in Rent Gradients



Explaining the Variation in Price Gradient Changes MSA level Across MSAs

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

Work from Home	0.215***			0.151*	0.215***
	(0.0747)			(0.0751)	(0.0683)
Stringency Measure		0.107**		0.00776	
		(0.0464)		(0.0513)	
Supply Inelasticity Index			0.0372***	0.0290**	
			(0.0109)	(0.0126)	
Orthogonalized Stringency Index					0.0663
					(0.0445)
Orthogonalized Supply Inelasticity					0.0290**
					(0.0126)
Observations	30	30	30	30	30
R^2	0.228	0.160	0.293	0.400	0.400

Remote Work Lowers Rent Increases ZIP-Level

10 percentage point increase in remote work at ZIP-level $\rightarrow$ 1.8–2.9 percentage point decrease in rents

Log(Distance)	0.0292***		0.0247***	0.0252***	0.0240***	0.0233***
	(5.95)		(5.33)	(6.29)	(5.49)	(6.82)
Work from Home		**-0.274*****	**-0.287*****	**-0.225*****	**-0.182*****	**-0.227*****
		(-9.12)	(-9.22)	(-12.79)	(-6.17)	(-9.68)
Log(2017 Income)					-0.00237	-0.000886
					(-0.43)	(-0.18)
Median Age					0.000136	0.000212
					(0.25)	(0.70)
Percent of Black Households					0.00667	0.0223*
					(0.29)	(2.03)
Share of High Income Households					-0.0663**	0.0264
					(-2.14)	(1.34)
Log(Restaurants & Bars)					-0.0144***	-0.00865***
					(-5.36)	(-4.52)
MSA fixed effects	✓	✓		✓		✓
Observations	1697	1697	1697	1697	1697	1697
R^2	0.566	0.527	0.475	0.671	0.524	0.690

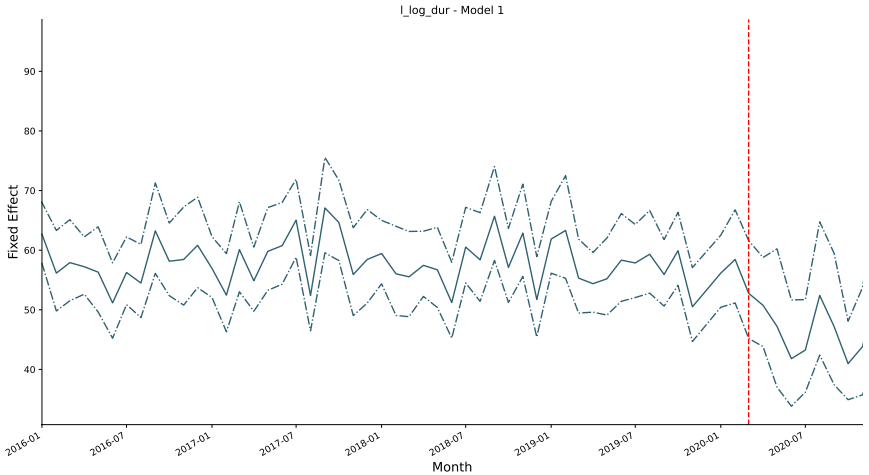
Remote Work Lowers Prices at ZIP-Level

10 percentage point increase in remote work at ZIP-level $\rightarrow$ 0.7–1.4 percentage point decrease in prices

Log(Distance)	0.00283		-0.00130	-0.000480	0.00412	0.00705
	(0.64)		(-0.30)	(-0.10)	(0.94)	(1.57)
Work from Home		-0.136***	-0.120***	-0.138***	-0.0663**	-0.0927***
		(-7.12)	(-5.75)	(-9.19)	(-2.64)	(-4.85)
Log(2017 Income)					0.00144	0.000773
					(0.65)	(0.29)
Median Age					-0.0000367	-0.000253
					(-0.10)	(-1.45)
Percent of Black Households					0.0195*	0.0396***
					(1.83)	(5.78)
Share of High Income Households					-0.0583**	-0.0278
					(-2.72)	(-1.41)
Log(Restaurants & Bars)					0.000626	0.00114
					(0.63)	(0.88)
MSA fixed effects	✓	✓		✓		✓
Observations	6387	6387	6387	6387	5760	5760
R^2	0.180	0.240	0.055	0.240	0.110	0.329

Urban Office Leases: Lease Durations

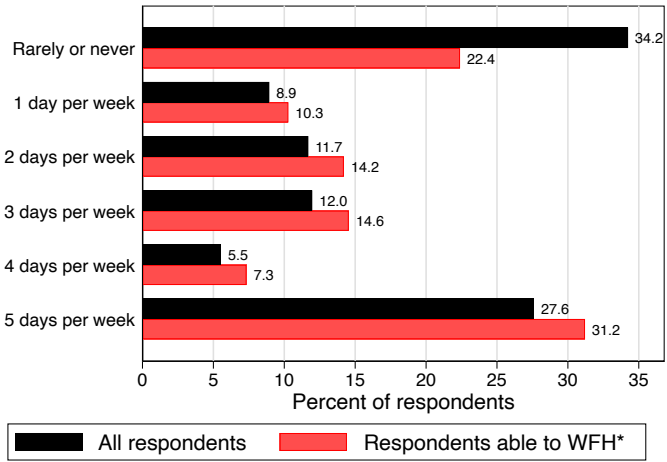
- Lease contract length fallen off substantially



Future of Work From Home

Barrero, Bloom, Davis (2021)

Figure 3: Most workers want to work from home two or more days per week



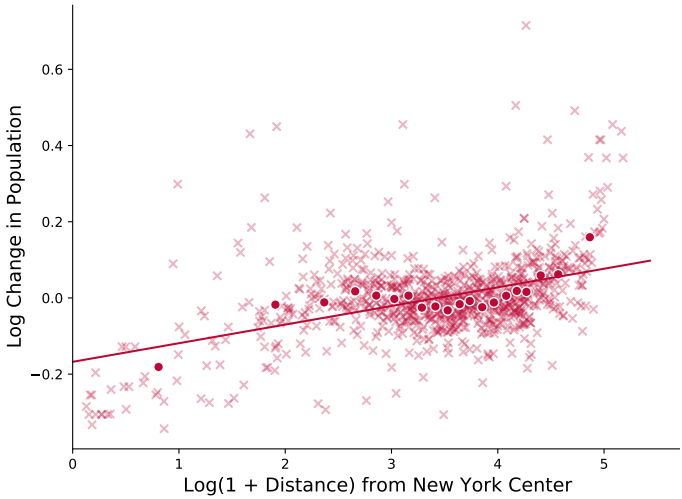
*64% of the full sample meets this criterion

Source: Responses to the question:

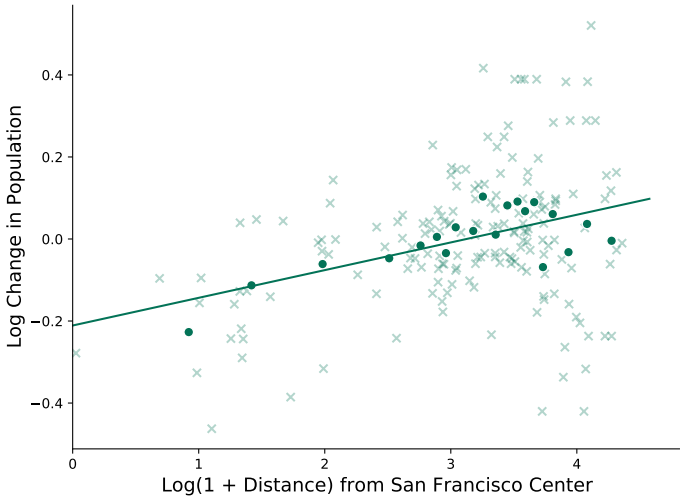
In 2022+ (after COVID) *how often would you like to have paid work days at home?*

Notes: Data are from 33,250 survey responses collected from May 2020 through March 2021 by Inc-Query and QuestionPro. "Respondents able to WFH" are those who say they can work from home at least partially and those who report having mainly worked from home at some point during the COVID-19 pandemic. We re-weight raw responses to match the share of working-age respondents in the 2010-2019 CPS in a given {age x sex x education x earnings} cell.

Mobility Gradient Shows Urban Flight New York Back

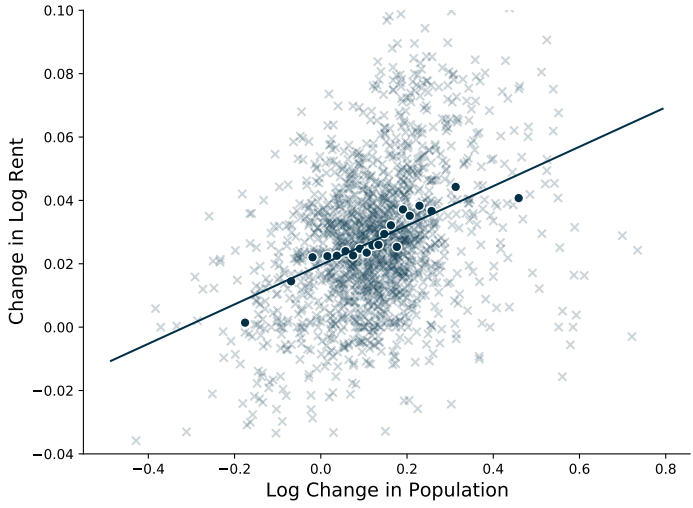


Mobility Gradient Shows Urban Flight San Francisco Back



Mobility Flight Against Rents

Back

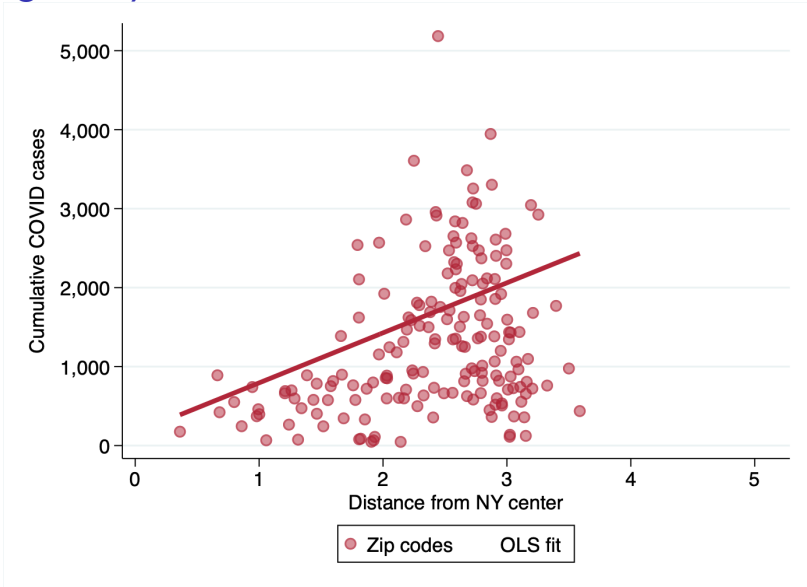


Mobility Flight Against Prices

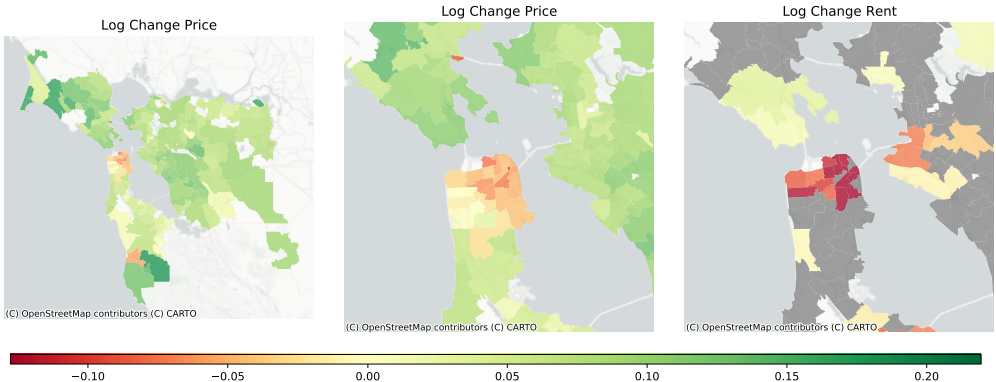
Back

Density Negatively Associated with COVID-19 Cases

Back

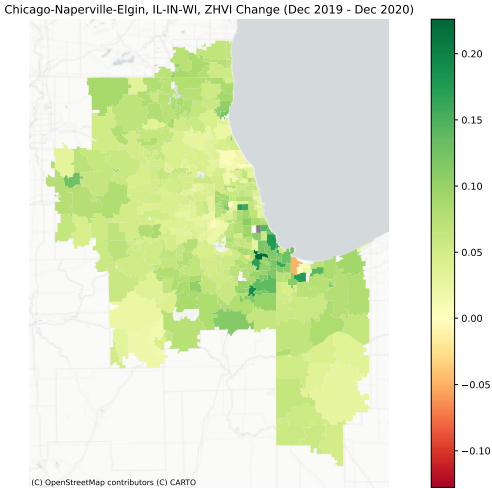


San Francisco Back

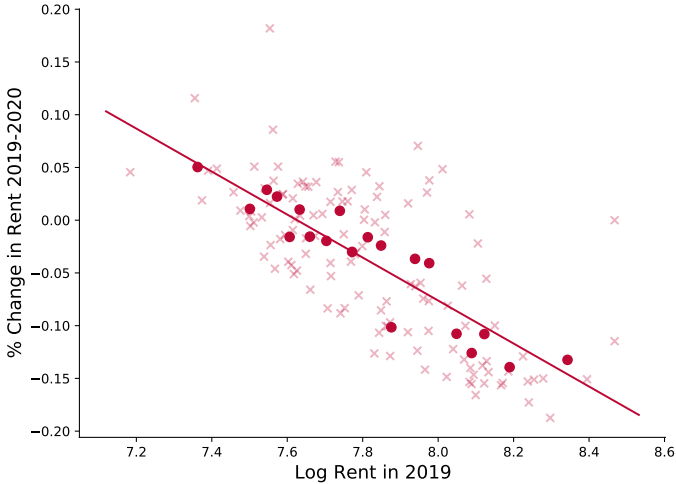


Chicago

Back

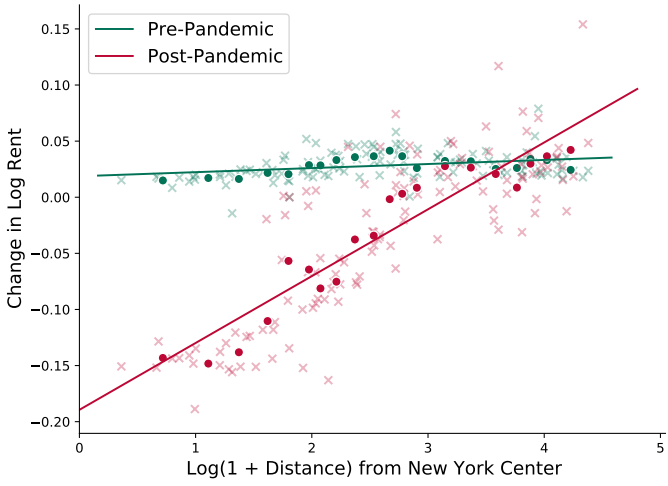


Rents Reverting in Most Expensive Areas New York Back



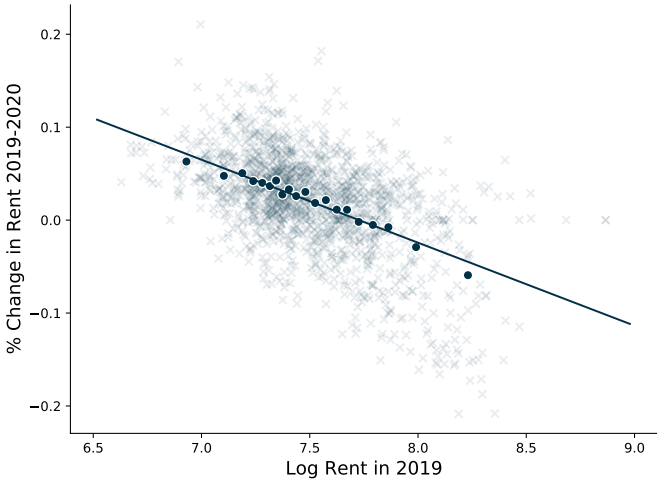
NY: Changes in Rent Growth

Back



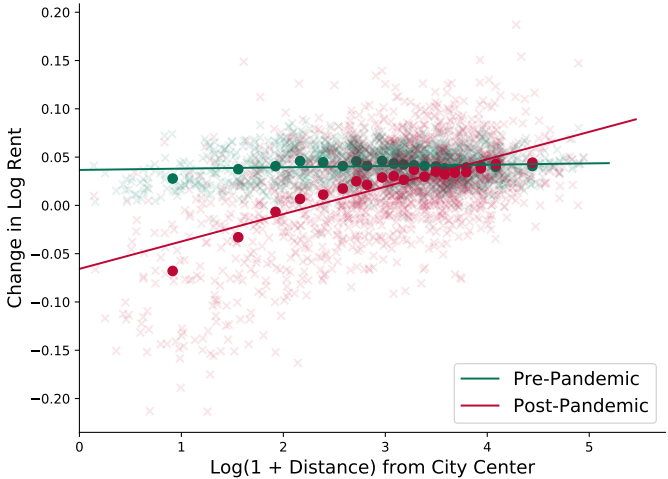
Rents Reverting in Most Expensive Areas Top 30 MSAs

Back



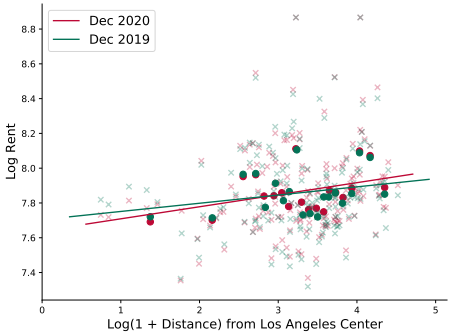
Rent Growth Nationwide

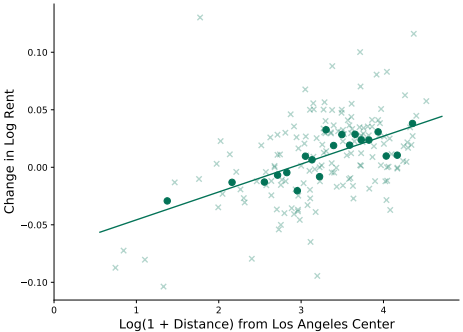
Back



Rent Changes Los Angeles

Back

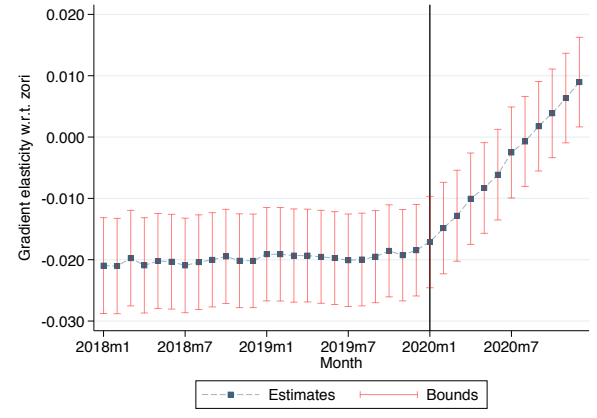




Gradient for Top 49 MSAs

Back

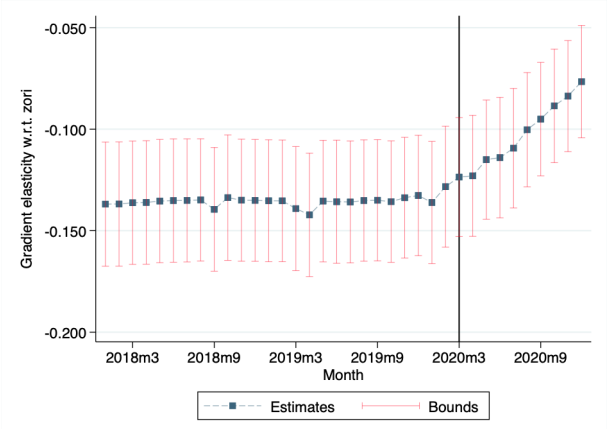
$$\ln \text{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



NYC Gradient

Back

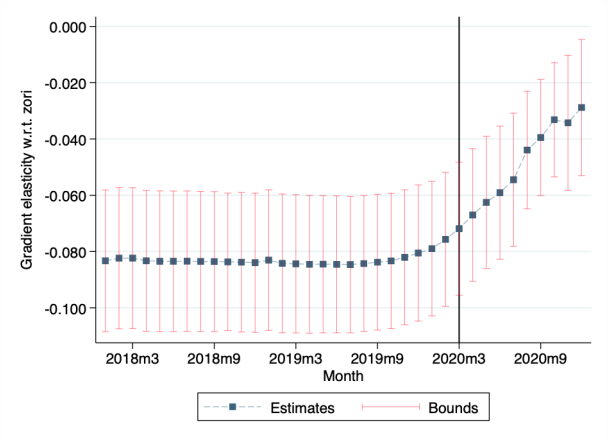
$$\ln \text{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



SF Gradient

Back

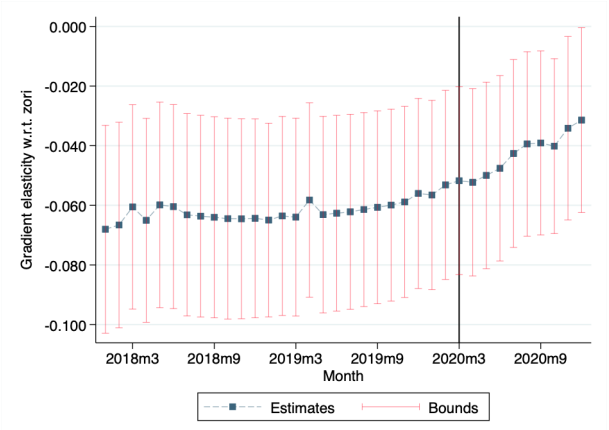
$$\ln \text{Rent}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



LA Gradient

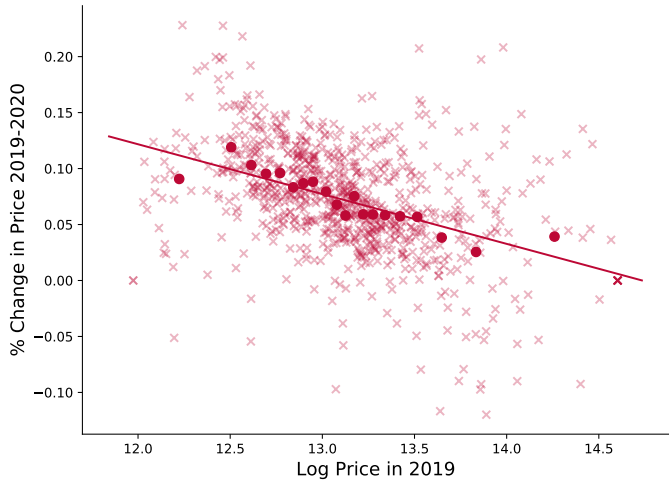
Back

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

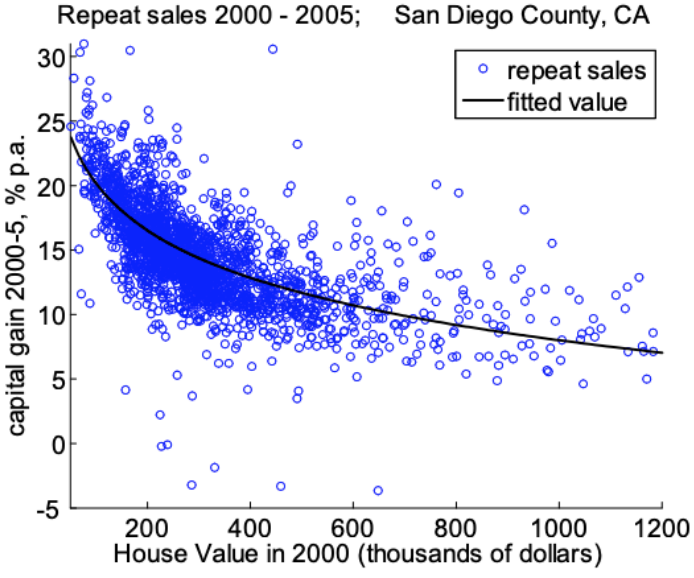


Prices Increasing in Cheapest Areas New York Back

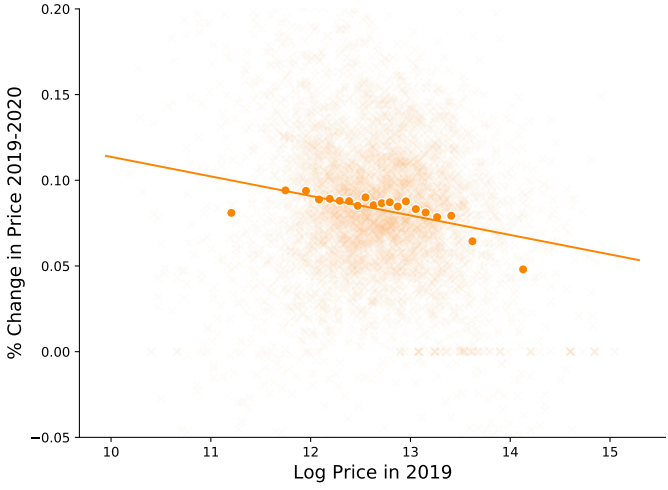
Comparison with Landvoigt Piazzesi Schneider (2015)



Landvoigt Piazzesi Schneider (2015) Back

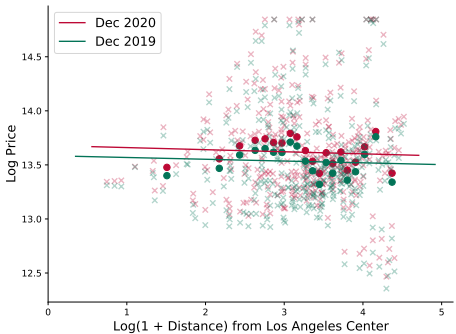


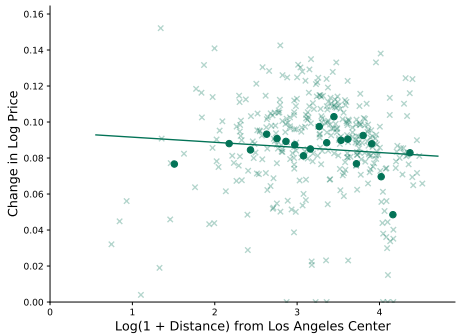
Prices Increasing in Cheapest Areas Top 30 MSAs Back



Price Changes Los Angeles

Back

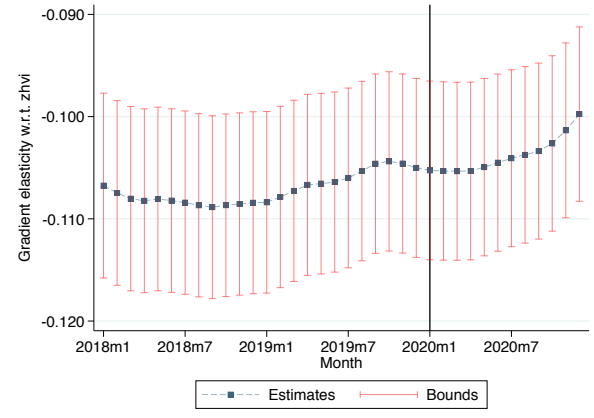




Gradient for Top 49 MSAs

Back

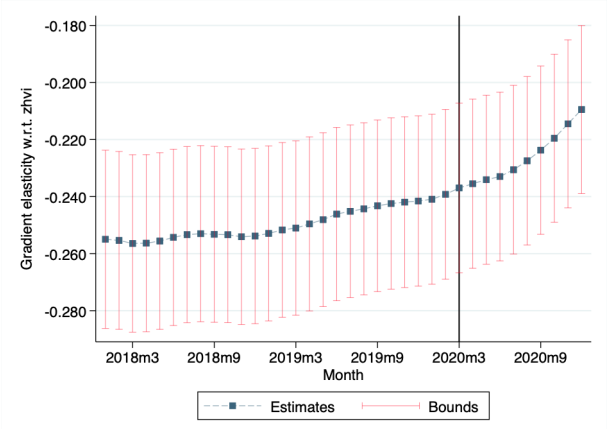
$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



NYC Gradient

Back

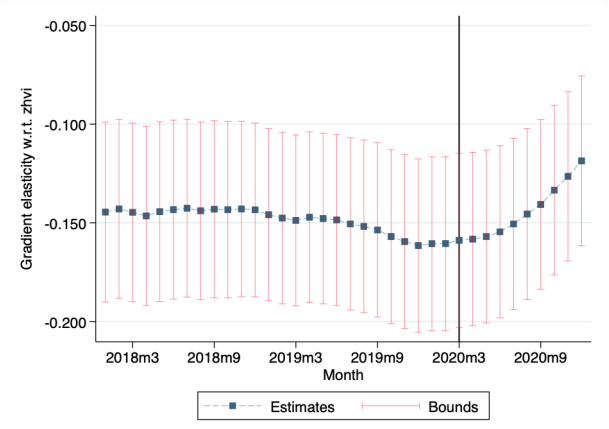
$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



SF Gradient

Back

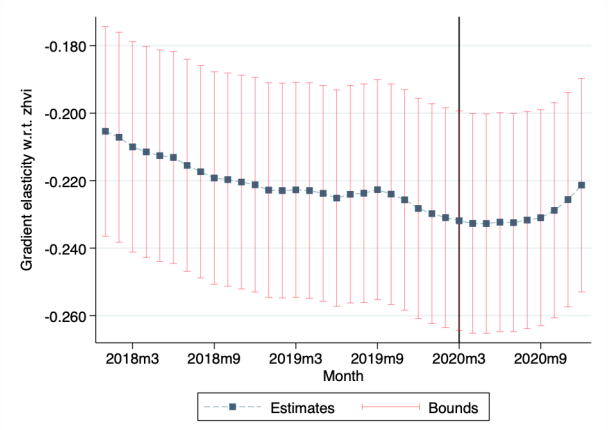
$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



LA Gradient

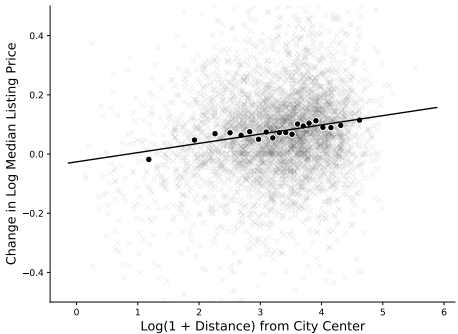
Back

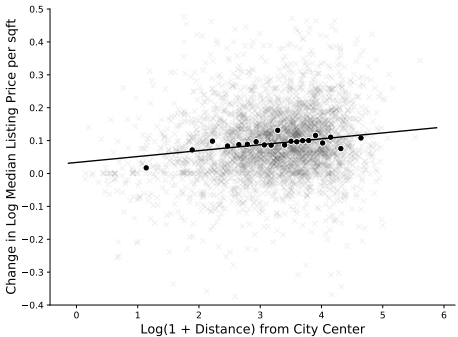
$$\ln \text{Price}_{ijt} = \alpha_{jt} + \delta_{jt}\left[\ln(1 + D(\mathbf{z}_{ij}^{z}, \mathbf{z}_{j}^{m}))\right] + \beta X_{ij} + e_{ijt}$$



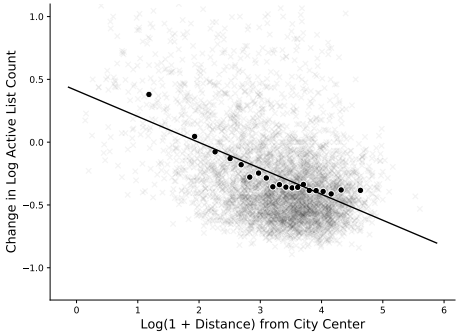
Change in Listing Prices Top 30 MSAs

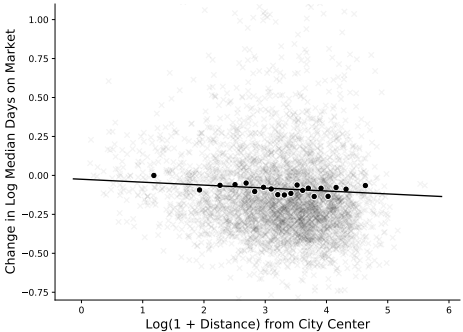
Back





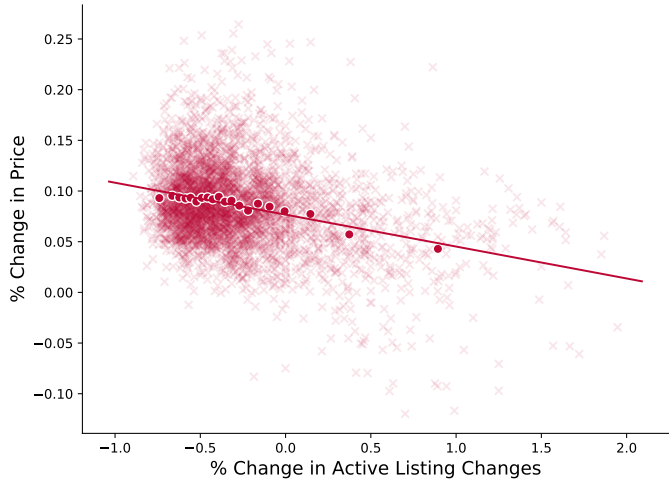
Change in Quantities Top 30 MSAs Back





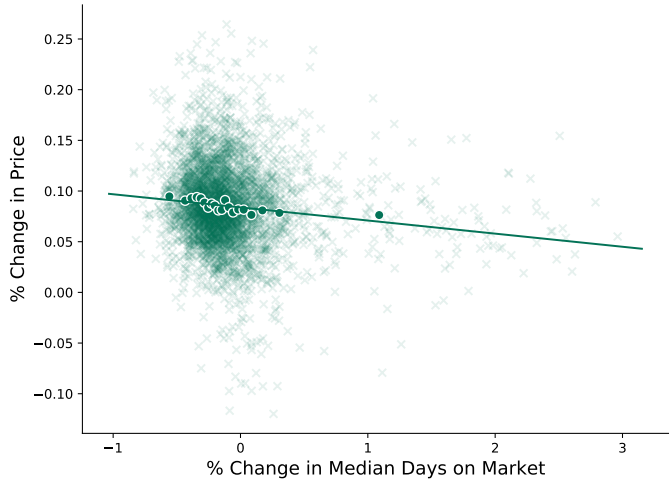
Price change against active listing changes Top 30 MSAs

Back



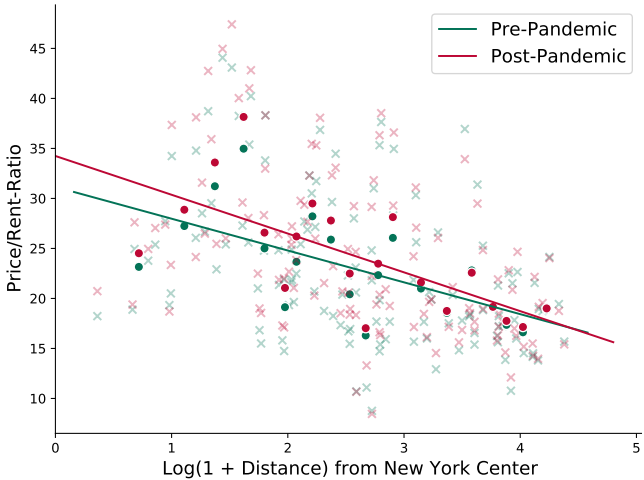
Price Against Change in Days on Market Top 30 MSAs

Back



Price-Rent Ratio against Distance for New York City

Top 30 MSAs



Survey Question Back

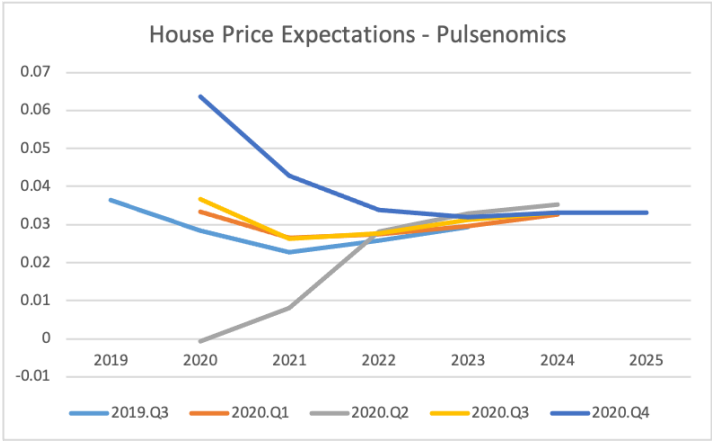
Question from 2021.Q1: “The pandemic and rise of remote work have altered housing needs and preferences, though it is uncertain if these changes will prove to be permanent or temporary. For each of the following, would you say that consumer preferences have shifted permanently, temporarily, or not at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

Expectations from Pulsenomics

Back

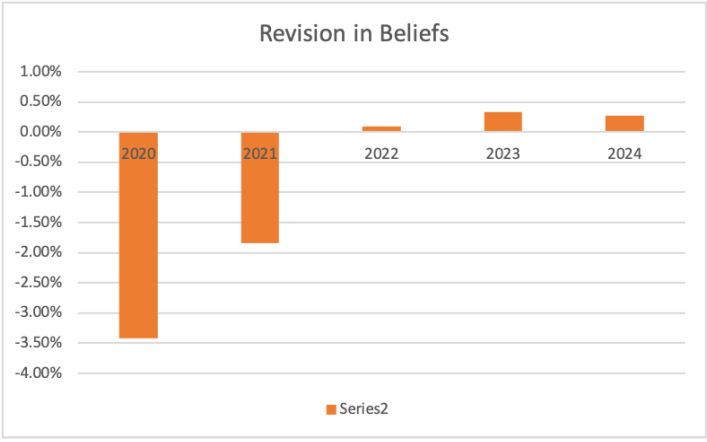
From periodic survey of 106 real estate economists and experts.
Q: “What do you think the increase in the ZHVI will be in 2021/2022/. . .”



Expectations from Pulsenomics Back

Price level forecasts reflect permanent shifts from pandemic

Expectations from Pulsenomics Back



Backing Out Expected Rents

Back

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
		Pre-pandemic						Pandemic			Transitory Change		Permanent Change	
#	MSA	$\overline{PD}^{tj}$	$\overline{PD}^{sj}$	$\overline{g}^{tj}$	$\overline{g}^{sj}$	$\overline{x}^{tj}$	$\overline{x}^{sj}$	PD_t^{tj}	PD_t^{sj}	Δpd^j	$(g_t^{tj} - g_t^{sj})/(1-\rho^j\rho_g)$		$\hat{g}^{tj} - \hat{g}^{sj}$	
											$\Delta x^j = 0$	$\Delta x^j = 0.01$	$\Delta \overline{x}^j = 0$	$\Delta \overline{x}^j = 0.01$
1	New York-Newark-Jersey City, NY-NJ-PA	24.85	17.47	2.50	2.91	6.44	8.47	27.06	17.93	5.99	4.56	12.64	-0.23	0.77
2	Los Angeles-Long Beach-Anaheim, CA	29.55	24.48	5.76	4.12	9.09	8.13	34.95	25.47	12.82	18.65	27.25	1.99	2.99
3	Chicago-Naperville-Elgin, IL-IN-WI	17.40	11.34	2.88	2.79	8.47	11.24	18.73	11.94	2.18	2.48	9.51	0.07	1.07
4	Dallas-Fort Worth-Arlington, TX	15.18	12.62	4.27	4.02	10.65	11.65	17.51	13.76	5.55	6.37	13.12	0.46	1.46
5	Houston-The Woodlands-Sugar Land, TX	20.52	14.05	0.99	1.83	5.74	8.71	22.18	14.46	4.87	2.10	8.89	-0.69	0.31
6	Washington-Arlington-Alexandria, DC-VA-MD-WV	23.91	17.74	2.94	1.99	7.04	7.47	26.71	18.75	5.59	8.88	16.78	1.09	2.09
7	Miami-Fort Lauderdale-Pompano Beach, FL	16.26	11.93	2.79	4.00	8.75	12.05	18.08	12.96	2.29	-1.66	5.04	-1.25	-0.25
8	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	10.60	14.85	3.11	2.43	12.12	8.95	12.88	15.75	13.61	15.82	22.63	1.85	2.85
9	Atlanta-Sandy Springs-Alpharetta, GA	16.26	13.66	6.21	4.58	12.18	11.64	18.40	14.39	7.13	12.49	19.31	1.96	2.96
10	Phoenix-Mesa-Chandler, AZ	14.98	15.84	7.31	6.26	13.78	12.38	16.82	16.34	8.47	12.03	19.37	1.56	2.56
11	Boston-Cambridge-Newton, MA-NH	21.30	17.08	3.88	4.64	8.47	10.33	24.40	18.65	4.83	2.19	10.15	-0.65	0.35
12	San Francisco-Oakland-Berkeley, CA	33.56	26.38	4.02	4.68	6.95	8.40	39.07	28.94	5.92	3.55	12.33	-0.58	0.42
15	Seattle-Tacoma-Bellevue, WA	30.71	16.04	5.59	6.46	8.79	12.51	36.29	18.67	1.50	-1.56	6.60	-1.22	-0.22
17	San Diego-Chula Vista-Carlsbad, CA	21.46	22.13	5.56	4.95	10.11	9.37	23.72	23.66	3.36	5.51	13.73	0.76	1.76
18	Tampa-St Petersburg-Clearwater, FL	11.51	9.46	5.03	4.89	13.36	14.95	14.39	11.26	4.82	5.27	11.71	0.20	1.20
19	Denver-Aurora-Lakewood, CO	21.68	18.58	5.68	5.03	10.18	10.27	24.34	19.72	5.63	7.87	15.65	0.84	1.84
20	St Louis, MO-IL	13.77	12.93	3.11	2.67	10.12	10.12	14.70	14.01	-1.44	-0.02	6.26	0.32	1.32
21	Baltimore-Columbia-Towson, MD	8.84	14.93	1.43	1.57	12.15	8.05	9.47	15.74	1.64	1.21	7.80	0.23	1.23
22	Charlotte-Concord-Gastonia, NC-SC	15.06	13.25	6.07	3.14	12.50	10.42	18.36	14.06	13.91	23.55	30.46	3.65	4.65
23	Orlando-Kissimmee-Sanford, FL	12.99	11.85	5.45	4.31	12.87	12.41	15.01	12.98	5.34	9.08	15.84	1.43	2.43
24	San Antonio-New Braunfels, TX	11.63	13.94	3.99	2.46	12.24	9.39	13.27	15.13	5.09	10.05	16.63	1.99	2.99
26	Sacramento-Roseville-Folsom, CA	17.91	22.18	7.09	7.99	12.53	12.40	19.32	19.97	18.08	14.96	22.80	-0.04	0.96
29	Austin-Round Rock-Georgetown, TX	21.07	14.47	4.16	3.11	8.80	9.80	25.30	16.32	6.26	9.82	17.28	1.07	2.07
	MSA Population Weighted Average									6.45	7.47	14.96	0.54	1.54

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

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