The Impact of the Coronavirus Pandemic on New York City Real Estate: First Evidence

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Background & Motivation

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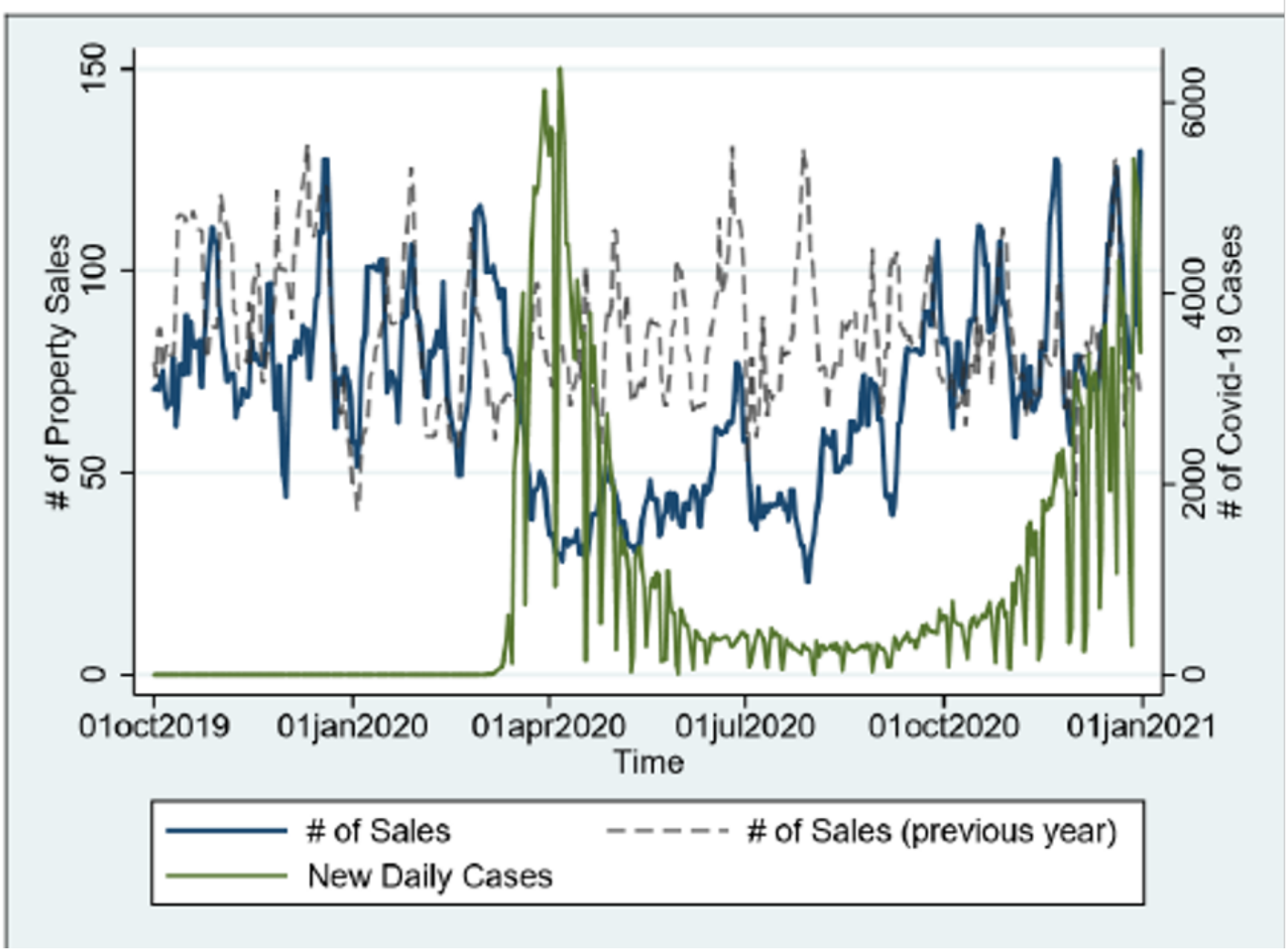
References

New Yorkers 'fleeing to suburbs' (Haag, 2020)?

East Orange, NJ (3 Bedroom, 2 Bath)
Over three days in July 2020: listed for $285,000; received 97 showings and 24 offers, went under contract for 21% over ask. (Haag, 2020)



NYC Daily Case Counts & Number of Housing Sales

- Anecdotal evidence suggests the Coronavirus has been a unique shock event to New York City and surrounding area real estate markets.
- Few detailed studies exist that attempt to quantify COVID's impact on U.S. real estate markets (D'Lima et al., 2020; Zhao, 2020).
- We utilize granular (modified zip code [MODZCTA], Borough-Block-Lot) transaction, unemployment, demographic, and case count data to provide the first known detailed study of **COVID's impact to the New York City specific real-estate market**.

Model

We use two approaches.

The first is the hedonic model (Rosen, 1974) extended for amenities/disamenities (Bishop et al., 2020):

$$P_{it} = f(H_i, AD),$$

where property prices (P_{it}) are assumed to be a function of property characteristics (H_i) and amenities/disamenities (AD).

In our application, we assume the pandemic influences demand for homes through *income* effects and *fear of contagion*.

Hence, our hedonic model takes the form:

$$P_{it} = \beta_0 + \beta_1 CC_{bt} + \gamma \boldsymbol{H}_i + \phi E_{bt} + \omega N_{bt} + \alpha_b + \alpha_t + \varepsilon_{it},$$

where:

- P_{it} is the length N vector of sales prices at time t;
- $\boldsymbol{H}_i$ is a matrix of time-invariant property characteristics (year built, square footage, number of floors, etc.);
- N_{bt} represents neighborhood attributes;
- CC_{bt} represents cumulative local infections;
- E_{bt} represents local unemployment;
- α_b are neighborhood fixed effects (e.g., location to airports);
- α_t are time-of-sale fixed effects (e.g., general appreciation);
- B_0 is an intercept term; ε_{it} is the error term.

The coefficients β_1 and ϕ, therefore, are of primary interest.

In the second approach, we use a repeat-sales sample to reduce the risk of omitted variable bias and inconsistent estimates (Chau and Chin, 2003). That is, assume a second sale occurs at time $t + \tau$:

$$P_{i,t+\tau} = \beta_0 + \beta_1 CC_{b,t+\tau} + \gamma \boldsymbol{H}_i + \phi E_{b,t+\tau} + \omega N_{b,t+\tau} + \alpha_b + \alpha_{t+\tau} + \varepsilon_{i,t+\tau}.$$

Then a first difference $\Delta P_{i(t,t+\tau)} = P_{i,t+\tau} - P_{it}$ yields

$$\begin{aligned}\Delta P_{i(t,t+\tau)} = \beta_1 \Delta CC_{b(t,t+\tau)} + \phi \Delta E_{b(t,t+\tau)} \\ + \omega \Delta N_{b(t,t+\tau)} + \Delta \alpha_{(t,t+\tau)} + \Delta \varepsilon_{(it,t+\tau)},\end{aligned}$$

and so the time-invariant characteristics drop out and the fixed effects $\Delta \alpha_{(t,t+\tau)}$ control for both timing of a sale and the time elapsed between sales.

Hence, we are still interested in the coefficients β_1 and ϕ, but the interpretation changes slightly (i.e., average discount/premium on the change in sale price given a one-unit change in infection rates or unemployment rates near a given property).

Further, we expand our empirical analysis by investigating the top and bottom quartiles of potential home values and specific neighborhood attributes to address possible market segmentation (Adair et al., 1996; Fletcher et al., 2000).

A set of robustness checks may be found in Section 5 of Cohen et al. (2021).

Housing Data

- (1) Housing characteristics: Primary Land Use Tax Lot Output (PLUTO) via NYC Department of City Planning
- (2) Housing sales: NYC Department of Finance
- Link (1) & (2) via borough-block-lot (BBL)
- Data Spans 2003-2020
- Filter for single-family and two-family homes that are non-investor-owned (plus standard record cleaning: arms-length only, etc.)
- 306,508 transactions (269,478 unique); 9,947 over COVID observation period (Mar-Dec 2020)
- 73,568 (37,196 unique) repeat-sales; 921 over COVID observation period (Mar-Dec 2020)

Unemployment (Income)/Demographic Data

- (1) localized (census tract) UE data: DEEP-MAPS Project (Ghitza and Steitz, 2020) over calendar year 2020
- Use (1) to backcast U.S. Bureau of Labor Statistics borough-level UE data over 2003-2019 (our results are robust to this extrapolation)
- Census tract neighborhood characteristics: 2019 American Community Survey (ACS) published by the U.S. Census Bureau

Pandemic Data

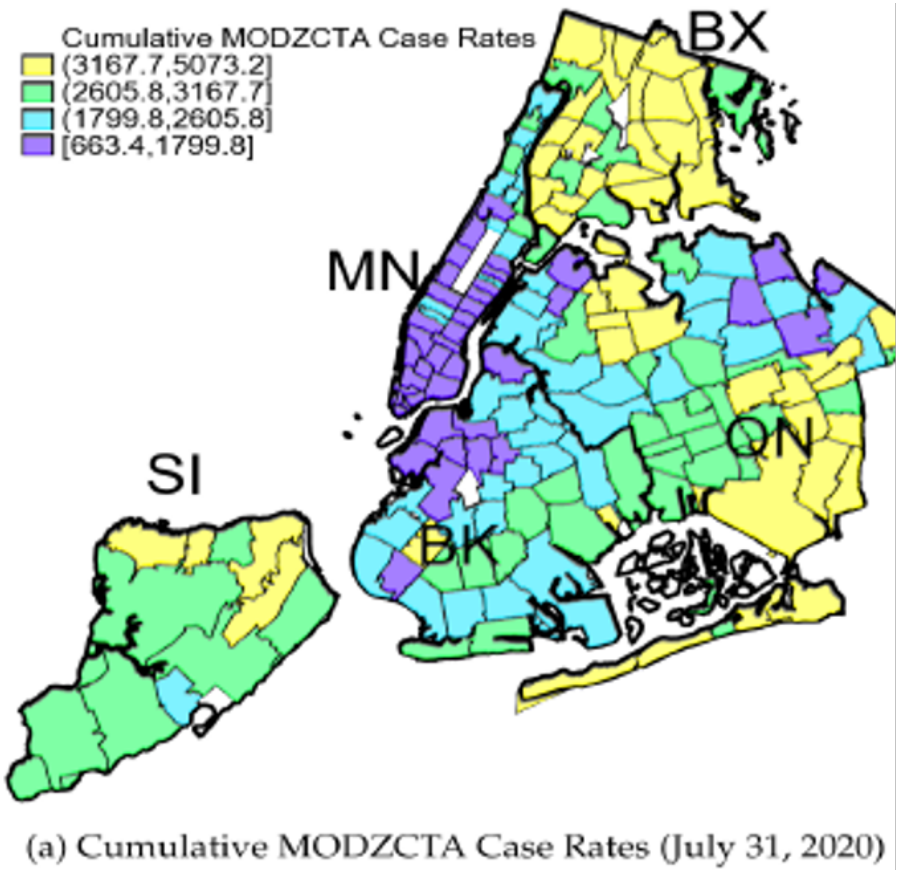
NYC Department of Health publishes daily:

- COVID-19 positive tests
- hospitalized COVID-19 patients
- COVID-19 related deaths / death rates per 100,000

Localization timeline:

- Feb 29, 2020: borough level
- Apr 3, 2020: MODZCTA level
- May 18, 2020: death counts/rates added

We backcast to fill in data at the MODZCTA level over the COVID observation window (our results are robust to this extrapolation).



(a) Cumulative MODZCTA Case Rates (July 31, 2020)

There are 176 MODZCTA's in the five boroughs (Bronx, Brooklyn, Manhattan, Queens, and Staten Island). To aggregate the data with each sold property, we built a a MODZCTA-census tract-BBL concordance.

Results

We differentiate the pandemic effects across the full sample of one- and two-family homes and the more restricted repeat-sales sample.

We also provide estimates of the pandemic effects during the first wave (March 2020 through July 2020) and the second wave (August 2020 through December 2020) by comparing the same months of previous years to control for any seasonal effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	First Wave (03/01-07/31, 2003-2020)				Second Wave (08/01-12/31, 2003-2020)			
	All Sales		Repeat Sales		All Sales		Repeat Sales	
	Cum. Cases	Cum. Cases	Cum. Cases	New Cases	Cum. Cases	Cum. Cases	Cum. Cases	New Cases
Cases per 100,000 ('000)	-0.382**	-0.398**	-0.706*	10.162	-0.611**	-0.618***	-0.633***	-30.759***
	(0.172)	(0.174)	(0.358)	(12.208)	(0.236)	(0.235)	(0.241)	(7.905)
Unemployment Rate (%)		-0.064***	-0.039	-0.039		-0.072***	-0.060**	-0.063***
		(0.012)	(0.024)	(0.024)		(0.013)	(0.024)	(0.024)
Investor Owned (%)	0.004	0.004	-0.009	-0.009	0.002	0.002	-0.011	-0.010
	(0.009)	(0.009)	(0.013)	(0.013)	(0.010)	(0.010)	(0.014)	(0.014)
Altered (yes==1)	1.356***	1.351***	2.432***	2.432***	1.997***	1.989***	3.056***	3.058***
	(0.228)	(0.228)	(0.339)	(0.340)	(0.315)	(0.315)	(0.591)	(0.591)
Year Built	0.002	0.002			0.003	0.003		
	(0.002)	(0.002)			(0.002)	(0.002)		
Home Sqft ('000)	2.174***	2.163***			2.174***	2.159***		
	(0.280)	(0.281)			(0.341)	(0.341)		
Lot Sqft ('00,000)	0.032**	0.032**			0.027*	0.026*		
	(0.014)	(0.013)			(0.015)	(0.015)		
# of Floors	0.051	0.060			0.045	0.067		
	(0.069)	(0.071)			(0.159)	(0.158)		
Basement (yes==1)	0.519***	0.502***			0.530***	0.506***		
	(0.109)	(0.112)			(0.133)	(0.132)		

Hedonic Results, Repeat-Sales

- Cumulative Cases have a significantly negative effect (first and second waves, with/without unemployment);
- Since there are more cases in poorer neighborhoods (Goldstein, 2020), these results suggest homes in lower income neighborhoods lost more value than homes in higher income neighborhoods, all else equal
- Similarly, there are greater case counts in neighborhoods with lower valued homes, all else equal
- Second wave repeat sales tell the same story, though the effect is muted in the first wave

	(1) Base-line Results	(2) Price $< 25^{th}$ Perc.	(3) Price $> 75^{th}$ Perc.	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Interaction w. Neighborhood Attributes						
				BBL Density	Public Transit	Median Income	College Educated	Rental Share	Limited English	Foreign Born
Panel A: First Wave of Infections (03/01-07/31, 2003-2020)										
Cases per 100,000 ('000)	-0.706*	-6.459***	-0.854*	-0.848**	-0.891**	-0.591*	-0.745**	-0.972**	-1.012***	-0.998***
	(0.358)	(1.364)	(0.469)	(0.396)	(0.346)	(0.339)	(0.355)	(0.407)	(0.380)	(0.365)
Cases X Neigh. Attributes				0.867***	0.739***	-0.693***	-0.348	0.999***	0.531**	0.501**
				(0.252)	(0.247)	(0.234)	(0.212)	(0.251)	(0.241)	(0.219)
Unemployment Rate (%)	-0.039	-0.032	0.019	-0.005	-0.020	-0.053**	-0.042*	0.014	-0.038	-0.005
	(0.024)	(0.027)	(0.064)	(0.025)	(0.024)	(0.026)	(0.024)	(0.026)	(0.024)	(0.032)
Unemp. X Neigh. Attributes				-0.080***	-0.064**	0.044*	0.008	-0.086***	-0.015	-0.055**
				(0.025)	(0.028)	(0.023)	(0.027)	(0.023)	(0.025)	(0.025)
N	15,540	2,915	4,360	15,540	15,540	15,540	15,540	15,540	15,540	15,540
adj. R^2	0.146	0.168	0.093	0.147	0.147	0.147	0.146	0.148	0.146	0.146
F	14.2***	7.8***	16.3***	10.8***	11.3***	10.7***	10.6***	11.7***	10.3***	10.9***

	(1) Base-line Results	(2) Price $< 25^{th}$ Perc.	(3) Price $> 75^{th}$ Perc.	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Interaction w. Neighborhood Attributes						
				BBL Density	Public Transit	Median Income	College Educated	Rental Share	Limited English	Foreign Born
Panel B: Second Wave of Infections (08/01-12/31, 2003-2020)										
Cases per 100,000 ('000)	-0.633***	0.200	-1.242***	-0.694***	-0.806***	-0.549**	-0.639**	-0.701***	-0.712***	-0.677***
	(0.241)	(0.724)	(0.353)	(0.243)	(0.236)	(0.242)	(0.246)	(0.243)	(0.232)	(0.231)
Cases X Neigh. Attributes				0.550***	0.636***	-0.276***	-0.095	0.482***	0.253**	0.204*
				(0.119)	(0.127)	(0.096)	(0.105)	(0.124)	(0.109)	(0.105)
Unemployment Rate (%)	-0.060**	-0.005	-0.070	0.006	-0.008	-0.074***	-0.060**	0.033	-0.056**	-0.044
	(0.024)	(0.027)	(0.053)	(0.027)	(0.025)	(0.027)	(0.024)	(0.032)	(0.024)	(0.032)
Unemp. X Neigh. Attributes				-0.142***	-0.158***	0.046	-0.011	-0.145***	-0.031	-0.030
				(0.028)	(0.030)	(0.029)	(0.034)	(0.030)	(0.028)	(0.031)
N	15,733	3,208	4,856	15,733	15,733	15,733	15,733	15,733	15,733	15,733
adj. R^2	0.131	0.182	0.070	0.135	0.135	0.132	0.131	0.135	0.131	0.131
F	10.4***	0.2	13.0***	11.1***	11.4***	8.7***	7.8***	9.9***	7.9***	8.2***
Month-of-sale FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Month-of-previous-sale FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Market Segmentation, Repeat-Sales

- Overall, case counts significantly negative in both waves; unemployment significantly negative in second wave only.
- First wave: cases counts were 6 times more severe in bottom quartile home sales than top quartile home sales, all else equal
- Second wave: case count effect vanishes for bottom quartile homes but becomes more severe for top quartile home sales, all else equal
- Homes sold in neighborhoods with (+)population density, (+)public transit, (+)rentals, (−)college educated, and (+)foreign born are more susceptible to changes in *income/employment*, where as homes sold in neighborhoods with (−) population density, (−)public transit, (+)college education, (+)English, (−)rentals, (−)foreign born are more susceptible to changes in *case counts*.

Potential Limitations

- Our housing characteristic data does not include details such as number of bedrooms or bathrooms (repeat-sales analysis helps address this; we also control for major renovations/alterations).
- Our analysis is focused on New York City and may not generalize to other urban centers.
- We focus on one- and two-family homes, and our estimates may not be similar for apartments and condominiums or commercial real estate more generally.

Impact on Property Values

- OLS hedonic results indicate that greater COVID positives are concentrated in neighborhoods with lower-valued properties.
- "Fear of contagion" and "income" effects adversely impacted home sale prices in a repeat-sales analysis.
- Sale prices fell by ~$60,000 (8%) for 1,000 additional infections per 100,000 residents or 10% increase in unemployment in a given MODZCTA.
- COVID-19 may have reduced home values in NYC from 1% to 50%+ (14% on average).
- These price effects were more pronounced during the second wave of infections.

Impact on Inequality

- The *fear of contagion* effect intensified in more affluent but less densely populated NYC neighborhoods, while the *income* effect was more pronounced in more densely populated neighborhoods with more rental properties and greater shares of foreign-born residents.
- This disparity suggests the pandemic has led to further inequality in lower-priced and higher-priced New York City neighborhoods.

Thank you!

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