



The Effect of COVID-19 on Condominium Prices Near Subway Stations: A Case Study of Toronto



2023 REALPAC/TMU Research Symposium

Meet Shah

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Agenda

- Purpose & motivation of the study
- Relevant Literature
- Research Question
- Data Collection
- Methodology
- Empirical results
- Conclusions

Purpose and Motivation of the study

- To evaluate price appreciation for condominiums near transit hubs
 - Before and During COVID-19
- Prior studies examine the impact of other transit hubs on property values (e.g., Bajic, 1983; Trojanek & Gluszak, 2018)
- The relationship between condominiums in proximity to subway stations during COVID-19

Relevant Literature

Property Values and Transit Hubs:

- Various studies support the notion that improvements to public transit networks capitalize positively in housing prices (e.g., Cervero & Duncan, 2002; Hess & Almeida, 2007; Golub et al., 2012; Trojanek & Gluszak, 2018)

Housing Market and COVID-19

- Price appreciations (e.g., Bhat et al., 2021; Wang, 2021)
- COVID-19 negatively impacted the housing market (e.g., Cheung et al., 2021; Hu et al., 2021)

Research Question

- *Have condominium prices near subway stations appreciated during COVID-19 as much as those located farther away?*

Data Collection

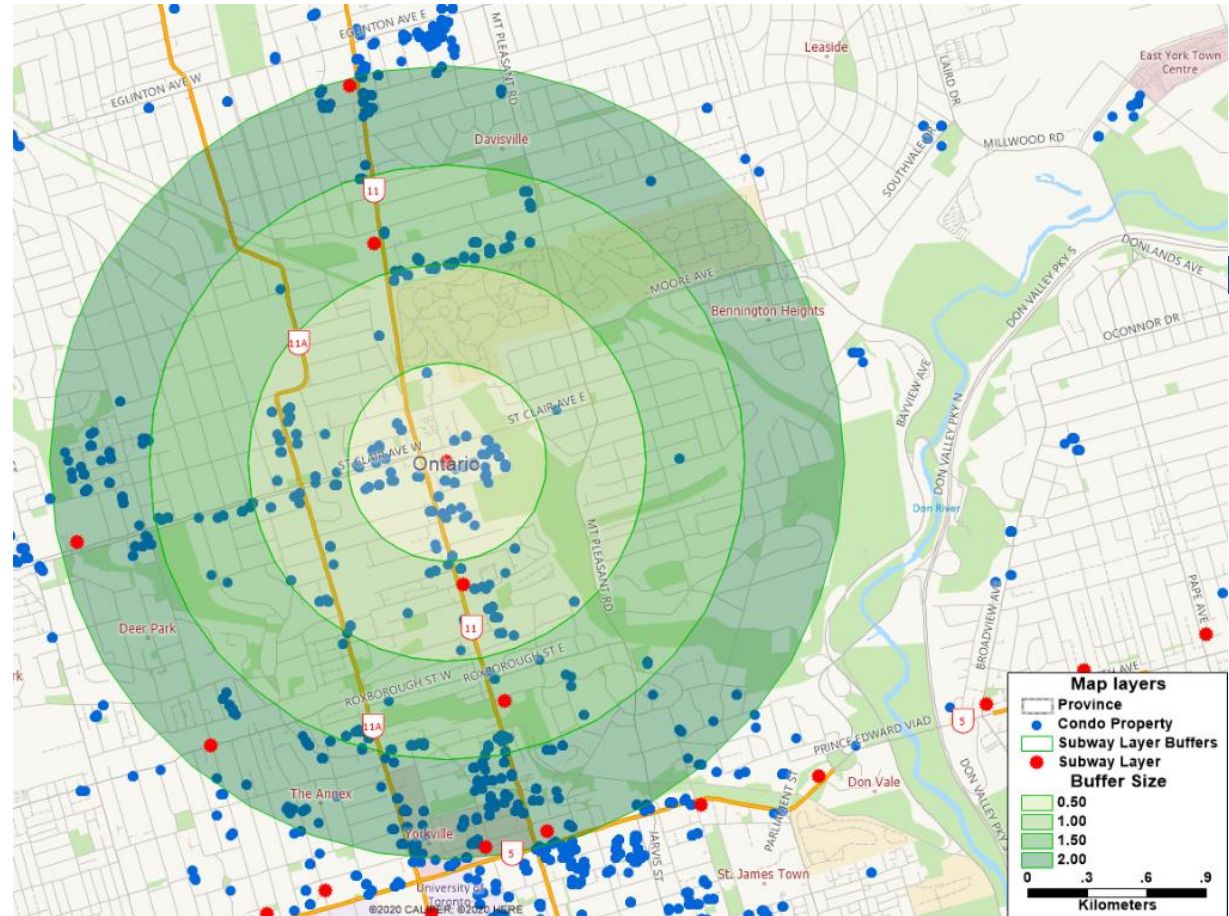
- Individual house price data for the City of Toronto.
 - January 2019 to December 2021
 - Omit all other property types and keep Condominium price data
- Subway spatial locations are obtained from the Open Data portal at the City of Toronto
 - 75 Subway stops for the City of Toronto

Data Collection

- Condominium sale and subway station locations are geocoded using longitude and latitude coordinates using Maptitude.
 - Travel distance and travel times are measured through the routing tool as it assures a more robust level of accuracy than the straight-line method
- Final sample yields 58,804 condominiums and 75 subway stations for the City of Toronto.

Methodology

- Literature has defined “proximity” to subway stations using a radial distance of up to one mile or a threshold of travel distance of under 10-15 minutes.
- This paper defines “proximity to subway station” through a radial distance of up to 1.5 kilometers



Methodology

- Regression framework:

$$P_{x,t} = \beta_0 + \beta_1(Covid_{x,t}) + \beta_2(Subway_{x,t}) + \beta_3(Covid_{x,t} \cdot Subway_{x,t}) + \beta_4(K_{x,t}) + \varepsilon_{x,t}$$

- We use this model to estimate the difference in condominium prices for condominiums near subway stations during COVID-19 while controlling for key covariates.
 - $(Covid_{x,t} \cdot Subway_{x,t})$

Descriptive Statistics

Condominiums near subways (within 1 km) and those more than a km away

Variables		Within 1 km	Greater than 1 km	Total
Sold Price ¹		724,252.8 (280,888.6) [24,232]	650,188.3 (239,636.2) [34,572]	680,708.8 (260,003.63) [58,804]
Bedrooms ¹		1.49 (0.66) [24,232]	1.76 (0.79) [34,572]	1.65 (0.75) [58,804]
Washrooms ¹		1.52 (0.60) [24,232]	1.65 (0.66) [34,572]	1.60 (0.64) [58,804]
Days on Market ¹		11.01 (7.73) [24,232]	10.78 (7.63) [34,572]	10.87 (7.67) [58,804]
Central Air Conditioning ³	Other (Window, Wall, or None)	1,087 (4%)	3,402 (10%)	4,489 (8%)
	Yes	23,145 (96%)	31,170 (90%)	54,315 (92%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>
Gym ³	No	12,781 (53%)	20,777 (60%)	33,558 (57%)
	Yes	11,451 (47%)	13,795 (40%)	25,246 (43%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>
Pool ³	No	13,479 (56%)	19,634 (57%)	33,113 (56%)
	Yes	10,753 (44%)	14,938 (43%)	25,691 (44%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>
GamesRoom ³	No	18,419 (76%)	27,467 (79%)	45,886 (78%)
	Yes	5,813 (24%)	7,105 (21%)	12,918 (22%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>
VisitorParking ³	No	12,444 (51%)	16,621 (48%)	29,065 (49%)
	Yes	11,788 (49%)	17,951 (52%)	29,739 (51%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>
Tennis/Squash Courts ³	No	23,162 (96%)	31,466 (91%)	54,628 (93%)
	Yes	1,070 (4%)	3,106 (9%)	4,176 (7%)
	<i>Total</i>	<i>24,232 (100%)</i>	<i>34,572 (100%)</i>	<i>58,804 (100%)</i>

1: Arithmetic Mean (SD); n (column percentage);

Descriptive Statistics

Pre-and During-COVID-19 Summary Statistics

Variables		Pre-COVID 19	During COVID 19	Total
Sold Price ¹		647,790.3 (264,376.64) [21,683]	699,937.1 (255,463.42) [37,121]	680,708.8 (260,003.63) [58,804]
Bedrooms ¹		1.67 (0.75) [21,683]	1.64 (0.75) [37,121]	1.65 (0.75) [58,804]
Washrooms ¹		1.61 (0.64) [21,683]	1.59 (0.64) [37,121]	1.60 (0.64) [58,804]
Days on Market ¹		11.00 (7.69) [21,683]	10.80 (7.66) [37,121]	10.87 (7.67) [58,804]
Distance (Kilometers) ¹		2.39 (2.35) [21,683]	2.30 (2.31) [37,121]	2.33 (2.32) [58,804]
Central Air Conditioning ³	Other (Window, Wall, or None)	1,730 (8%)	2,759 (7%)	4,489 (8%)
	Yes	19,953 (92%)	34,362 (93%)	54,315 (92%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>
Gym ³	No	12,768 (59%)	20,790 (56%)	33,558 (57%)
	Yes	8,915 (41%)	16,331 (44%)	25,246 (43%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>
Pool ³	No	12,118 (56%)	20,995 (57%)	33,113 (56%)
	Yes	9,565 (44%)	16,126 (43%)	25,691 (44%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>
GamesRoom ³	No	16,823 (78%)	29,063 (78%)	45,886 (78%)
	Yes	4,860 (22%)	8,058 (22%)	12,918 (22%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>
VisitorParking ³	No	10,855 (50%)	18,210 (49%)	29,065 (49%)
	Yes	10,828 (50%)	18,911 (51%)	29,739 (51%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>
Tennis/Squash Courts ³	No	20,072 (93%)	34,556 (93%)	54,628 (93%)
	Yes	1,611 (7%)	2,565 (7%)	4,176 (7%)
	<i>Total</i>	<i>21,683 (100%)</i>	<i>37,121 (100%)</i>	<i>58,804 (100%)</i>

1: Arithmetic Mean (SD); n (column percentage);

Regression Estimates by Period

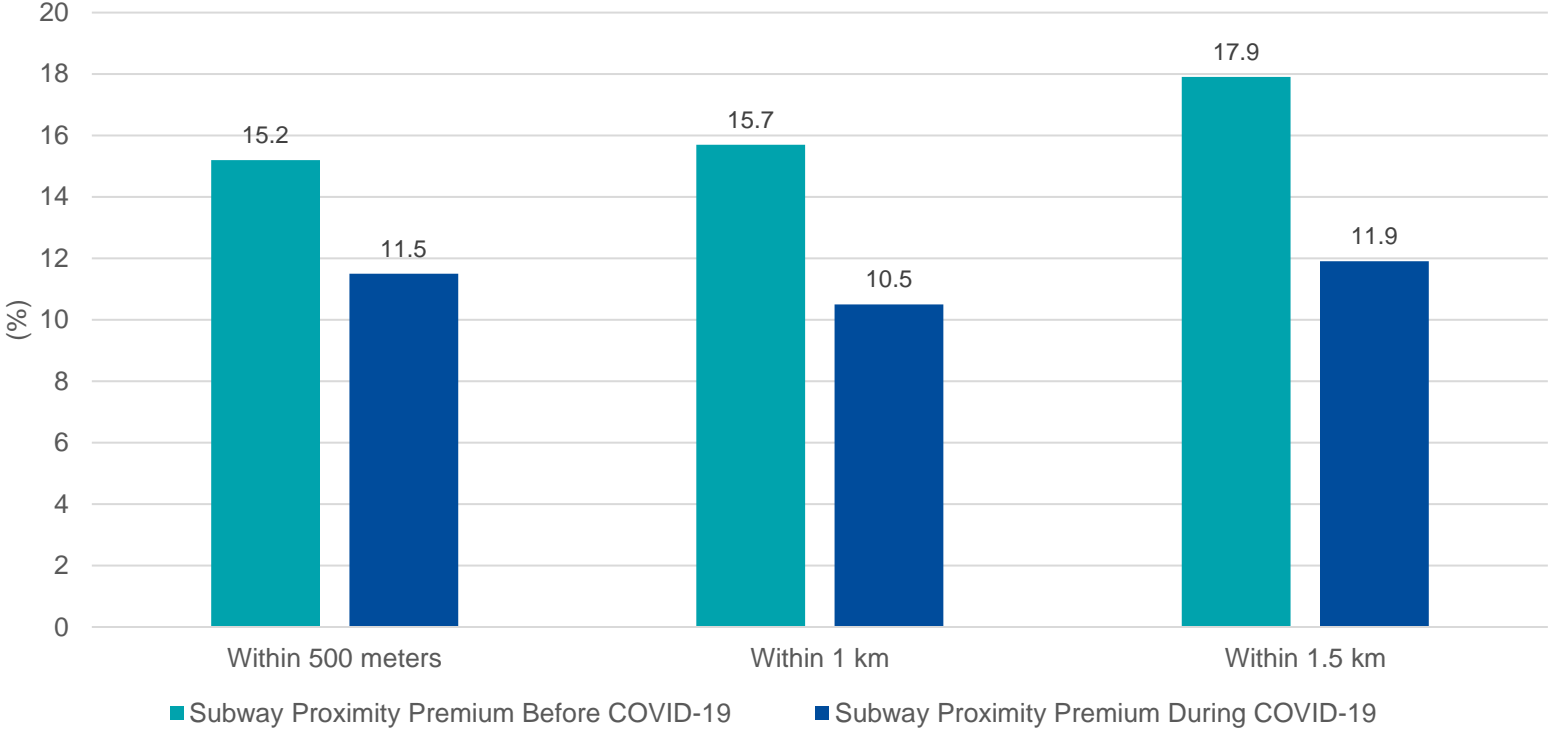
Pre-and During-COVID-19 Condominium Price Results

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Log Sold Price</i>					
Time Period	Pre-COVID-19			During COVID-19		
Bedrooms	-0.00772 (-2.00)	-0.000281 (-0.07)	0.00329 (0.87)	0.0386*** (15.29)	0.0429*** (17.02)	0.0445*** (17.77)
Washrooms	0.263*** (59.70)	0.264*** (60.92)	0.263*** (61.41)	0.226*** (78.72)	0.227*** (79.27)	0.226*** (79.75)
Days on Market	-0.00234*** (-9.50)	-0.00243*** (-10.01)	-0.00231*** (-9.64)	-0.00221*** (-13.56)	-0.00222*** (-13.68)	-0.00217*** (-13.50)
Central Air Conditioning	0.342*** (45.65)	0.342*** (46.35)	0.339*** (46.58)	0.283*** (55.31)	0.285*** (56.21)	0.283*** (56.05)
Gym	0.0612*** (14.74)	0.0593*** (14.50)	0.0583*** (14.45)	0.0409*** (14.99)	0.0389*** (14.33)	0.0393*** (14.57)
Pool	-0.0157*** (-3.77)	-0.0183*** (-4.46)	-0.0125*** (-3.10)	-0.00847*** (-3.09)	-0.0111*** (-4.07)	-0.00833*** (-3.08)
Games Room	-0.0431*** (-9.39)	-0.0455*** (-10.05)	-0.0470*** (-10.51)	-0.0367*** (-11.96)	-0.0380*** (-12.45)	-0.0382*** (-12.59)
Visitor Parking	-0.0123*** (-3.23)	-0.0103*** (-2.73)	-0.0112*** (-3.02)	-0.0126*** (-4.99)	-0.0113*** (-4.48)	-0.0117*** (-4.68)
Tennis/Squash Courts	-0.0736*** (-9.84)	-0.0642*** (-8.71)	-0.0565*** (-7.76)	-0.0562*** (-11.03)	-0.0517*** (-10.19)	-0.0468*** (-9.28)
Distance < 500m	0.152*** (30.97)			0.115*** (35.89)		
Distance < 1km		0.157*** (40.42)			0.105*** (40.94)	
Distance < 1.5km			0.179*** (47.62)			0.119*** (47.15)
Constant	12.59*** (1,324.35)	12.54*** (1,319.88)	12.52*** (1,324.76)	12.73*** (1,949.76)	12.70*** (1,928.10)	12.68*** (1,926.75)
N	21,683	21,683	21,683	37,121	37,121	37,121
Adj R-Sq	36.00%	37.80%	39.50%	38.60%	39.20%	40.00%

T statistics in parentheses

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

Subway Proximity Premiums lower during the pandemic



Regression Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Log Sold Price</i>					
<i>Distance Controls</i>	<i>All Sales</i>	<i>All Sales</i>	<i>All Sales</i>	<i>Within 1.0km</i>	<i>Within 2.0km</i>	<i>Within 3.0km</i>
COVID-19	0.1027*** (42.39)	0.1180*** (41.96)	0.1272*** (42.38)	0.06091*** (14.61)	0.06491*** (12.47)	0.09622*** (21.67)
Distance < 500m	0.1615*** (36.07)			0.07139*** (14.50)		
Covid*Distance< 500m	-0.05146*** (-9.22)			-0.006326 (-1.031)		
Distance < 1km		0.1641*** (46.47)			0.02986*** (6.11)	
Covid*Distance < 1km		-0.06285*** (-14.29)			-0.007414 (-1.21)	
Distance < 1.5km			0.1863*** (54.24)			0.08463*** (19.76)
Covid*Distance < 1.5km			-0.07136*** (-16.67)			-0.03888*** (-7.28)
Constant	12.613*** (2,232.71)	12.566*** (2,188.88)	12.539*** (2,175.33)	12.570*** (1,392.37)	12.572*** (1,509.23)	12.564*** (1,684.47)
N	58,804	58,804	58,804	24,232	33,351	42,149
Adj. R-Sq	38.31%	39.47%	40.66%	48.29%	45.39%	42.47%

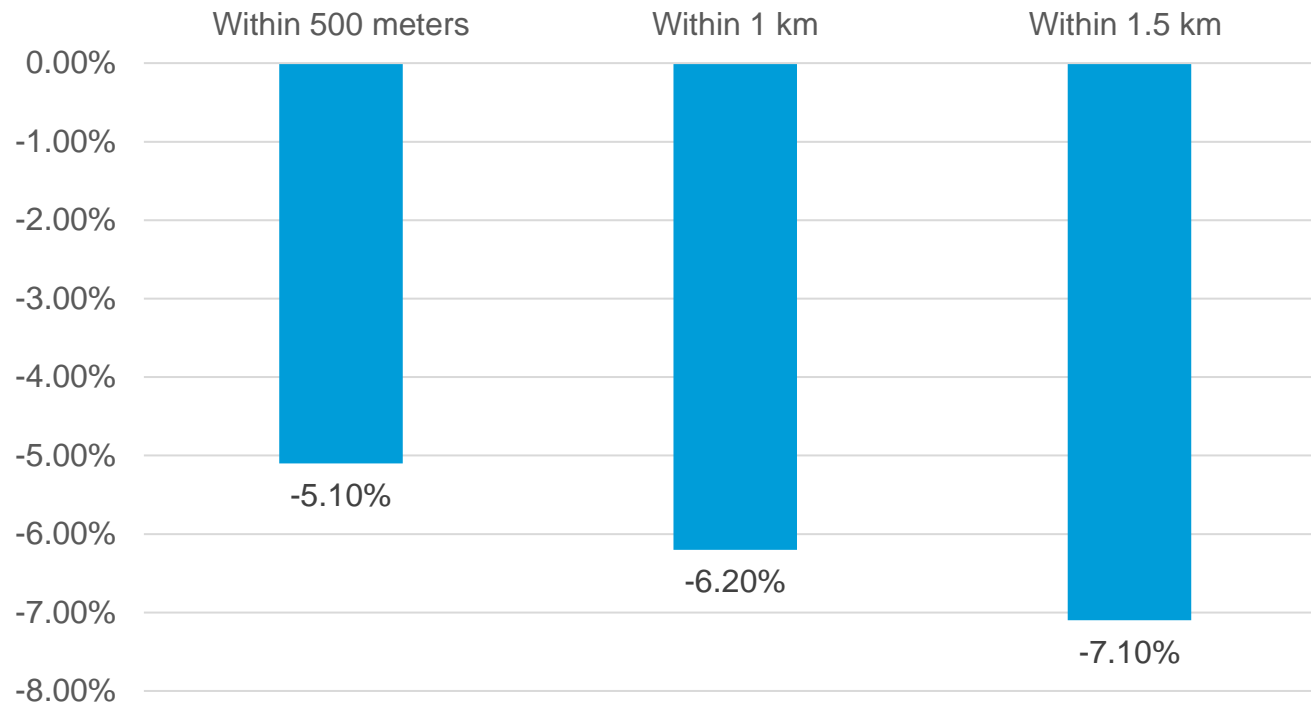
T statistics in parentheses

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

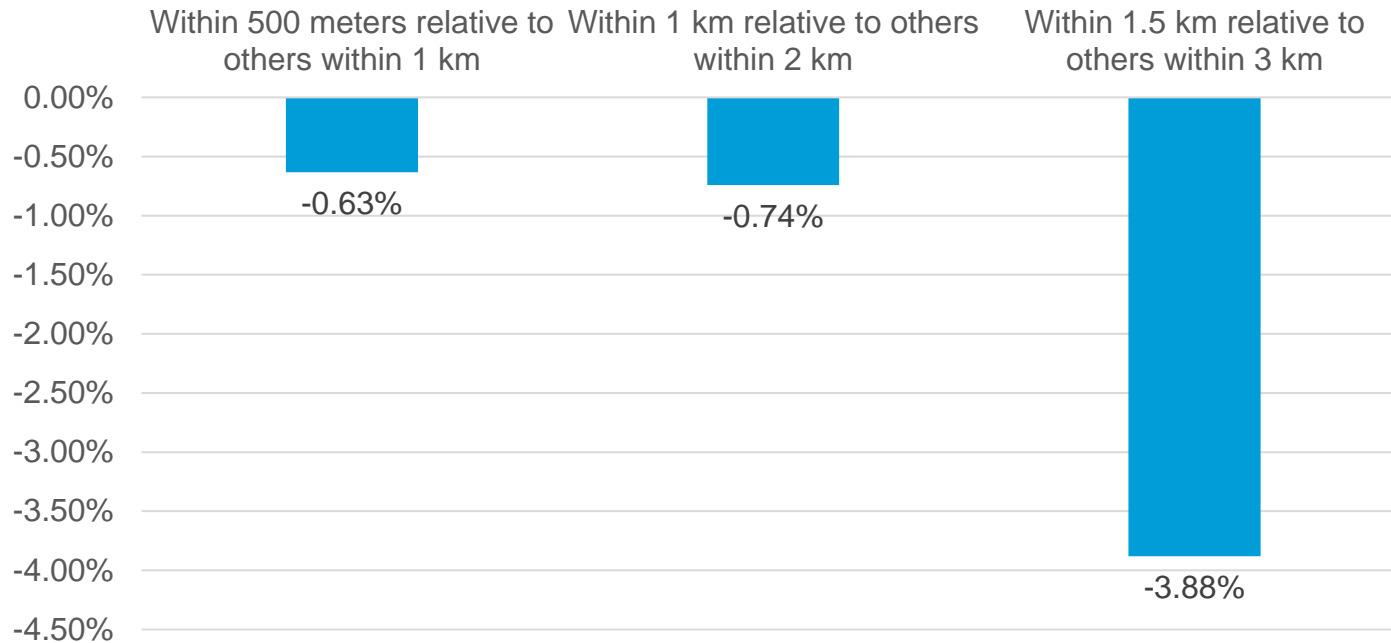
All models control for the following variables: Bedrooms, Washrooms, Days on Market, Central Air Conditioning, Amenities (Gym, Pool, Games Room, Tennis/Squash Court), and Visitor Parking.

Slower rate of price appreciation for properties near subway stations

Comparables (all other sales)



Slower rate of price appreciation for properties near subway stations (Restricted Sales)



Do transit proximate condos appreciate slower than the rest?

Distance Buffer Range Results

	(1)	(2)	(3)	(4)
	<i>Log Sold Price</i>			
<i>Distance Controls</i>	<i>Within 1.0km</i>	<i>Between 1.0 km - 2.0km</i>	<i>Between 2.0 km - 4.0km</i>	<i>Between 3.0 km - 6.0km</i>
COVID-19	0.0609*** (14.61)	0.0646*** (12.44)	0.114*** (24.92)	0.132*** (29.23)
<i>Distance < 500m</i>	0.0714*** (14.50)			
Covid*Distance < 500m	-0.00633 (-1.03)			
<i>500m > Distance < 1.0km</i>		-0.00334 (-0.62)		
Covid*Distance (500m > Distance < 1.0km)		-0.00465 (-0.69)		
<i>1.0km > Distance < 2.0km</i>			0.105*** (18.19)	
Covid*Distance (1.0km > Distance < 2.0km)			-0.0500*** (-6.93)	
<i>1.5km > Distance < 3.0km</i>				0.123*** (24.43)
Covid*Distance (1.5km > Distance < 3.0km)				-0.0398*** (-6.30)
<i>Constant</i>	12.57*** (1,392.37)	12.62*** (1,385.71)	12.62*** (1,296.54)	12.58*** (1,474.02)
N	24,232	22,540	25,167	24,232
Adj. R-Sq	48.29%	34.00%	33.40%	48.30%

T statistics in parentheses

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

All models control for the following variables: Bedrooms, Washrooms, Days on Market, Central Air Conditioning, Amenities (Gym, Pool, Games Room, Tennis/Squash Court), and Visitor Parking.

Immediate impact of COVID-19?

Pre-and During-COVID 19 Test

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Log Sold Price</i>					
<i>Time Period</i>	<i>January – June 2019 to July – December 2021</i>					
<i>Distance Control</i>	<i>All Sales</i>	<i>All Sales</i>	<i>All Sales</i>	<i>Within 1.0 km</i>	<i>Within 2.0 km</i>	<i>Within 3.0 km</i>
COVID-19	0.173*** (44.28)	0.193*** (42.24)	0.205*** (42.10)	0.112*** (16.53)	0.128*** (14.95)	0.168*** (23.41)
Distance < 500m	0.169*** (23.98)			0.0717*** (9.13)		
Covid*Distance < 500m	-0.0650*** (-7.25)			-0.00064 (-0.06)		
Distance < 1km		0.172*** (31.05)			0.0323*** (4.18)	
Covid*Distance <1km		-0.0826*** (-11.66)			-0.0166* (-1.66)	
Distance < 1.5km			0.196*** (36.57)			0.0942*** (14.15)
Covid*Distance <1.5km			-0.0944*** (-13.67)			-0.0569*** (-6.59)
Constant	12.55*** (1,358.79)	12.50*** (1,335.23)	12.47*** (1,327.75)	12.54*** (838.56)	12.51*** (920.00)	12.50*** (1,028.01)
N	21,803	21,803	21,803	9,232	12,539	15,774
Adj R-Sq	42.30%	43.30%	44.50%	49.70%	47.60%	45.20%

T statistics in parentheses

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

All models control for the following variables: Bedrooms, Washrooms, Days on Market, Central Air Conditioning, Amenities (Gym, Pool, Games Room, Tennis/Squash Court), and Visitor Parking,

Conclusions

- Impact of COVID-19 on property values near subway stations
 - Appreciated less relative to condominiums farther away
- Main Point:
 - Point we make is that the attraction of downtowns diminished during the COVID episode (e.g., Brueckner et al., 2023)
- Direction for future research:
 - Expand the study group to all municipalities in Ontario
 - Incorporate a present value of time saving approach (*modal choice*).