Did the September 2019 addition of minor regulation impact the Airbnb host landscape in Montréal?

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Overview

Motivation and Intentions

- Earlier iterations clued me into some interesting patterns in the Montréal data. Upon further inspection, September 2019 aligned with an accidental experiment

- I hypothesize that even a small additional burden on Airbnb hosts can drastically change the hosting landscape

- Provide a unique contribution to identifying the actual channels (long-term stays, single unit hosts, superhosts, etc) this small administrative burden affects and to what extent

Data Sources

- InsideAirBnb.com (Multiple Cities of the World)
    - Collects listing level data every month
    - Includes differential calendar level data every month
    - Includes cumulative review data

- Web.Archive.com
    - Collect any missing data files from archives of InsideAirBnb.com

Accidental Experiment

- In September 2019, Montréal implemented a Short-Term Tourist Accomodation Provider Requirement of and to:
  - tourists, for remuneration, for periods less than 31 days, on any media
  - Principle Resident Establishments fee of $50 and one-time admin fee of $75. There are much higher fees for operating "tourist residence" in English we would call this investment property and comes with cost of $256.28 and per accomodation fee of $5.40
  - Possible knock-on effects of registration is increased compliance with law and tax levies

- The fees are relatively minor. However, they are progressive in nature to dissuade (somewhat) "Professionals" from concentrating the host market

- Meanwhile, Vancouver area including Victoria implemented a regulation framework in 2018

Montreal Summary Stats

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
host_listings_count	243,964	15.720	107.846	0.000	1.000	3.000	1,484.000
bedrooms	243,978	1.418	1.031	0.000	1.000	2.000	26.000
beds	243,690	1.858	1.486	0.000	1.000	2.000	50.000
minimum_nights	244,090	8.922	88.247	1	1	3	11,684
maximum_nights	244,090	37,592.740	6,614,968.000	1	40	1,125	1,234,567,890
availability_30	244,090	7.940	10.458	0	0	15	30
availability_60	244,090	18.487	21.935	0	0	38	60
number_of_reviews	244,090	20.917	41.452	0	1	21	667
review_scores_rating	189,940	93.571	8.912	20.000	91.000	100.000	100.000
reviews_per_month	194,360	1.479	1.819	0.010	0.220	2.060	16.670
superhost	244,090	0.190	0.392	0	0	0	1
Group	244,090	1.000	0.000	1	1	1	1

Victoria Summary Stats

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
host_listings_count	44,706	8.126	71.188	0.000	1.000	3.000	1,717.000
bedrooms	44,708	1.518	1.057	0.000	1.000	2.000	9.000
beds	44,693	2.036	1.352	0.000	1.000	3.000	13.000
minimum_nights	44,730	4.936	14.402	1	1	3	365
maximum_nights	44,730	627.538	531.556	1	30	1,125	10,000
availability_30	44,730	10.064	10.575	0	0	19	30
availability_60	44,730	23.481	21.309	0	0	43	60
number_of_reviews	44,730	40.949	61.106	0	3	53	584
review_scores_rating	38,748	96.064	5.982	20.000	95.000	99.000	100.000
reviews_per_month	39,084	2.254	2.261	0.010	0.550	3.210	38.300
superhost	44,730	0.450	0.497	0	0	1	1
Group	44,730	0.000	0.000	0	0	0	0

Comparison of Means Across Cities

Table 1: Summary Means

fle	Group	bedrooms	beds	minimum_nights	maximum_nights	availability_30	availability_60	number_of_reviews	review_scores_rating	host_listings_count	reviews_per_month	superhost
Montreal	1	1.418120	1.858439	8.921976	37592.7437	7.939518	18.48651	20.91737	93.57115	15.719528	1.478566	0.1896800
Victoria	0	1.517626	2.036247	4.935658	627.5383	10.063760	23.48057	40.94909	96.06382	8.125621	2.253778	0.4499888

Comparison of Summary Stats Across Cities

	Montreal		Victoria		Differences	
	mean	sd	mean	sd	Δ	t
bedrooms	1.42	1.03	1.52	1.06	0.10***	(18.36)
beds	1.86	1.49	2.04	1.35	0.18***	(25.16)
minimum_nights	8.92	88.25	4.94	14.40	-3.99***	(-20.85)
maximum_nights	37592.74	6614967.58	627.54	531.56	-36965.21**	(-2.76)
availability_30	7.94	10.46	10.06	10.58	2.12***	(39.12)
availability_60	18.49	21.94	23.48	21.31	4.99***	(45.36)
number_of_reviews	20.92	41.45	40.95	61.11	20.03***	(66.58)
review_scores_rating	93.57	8.91	96.06	5.98	2.49***	(68.05)
host_listings_count	15.72	107.85	8.13	71.19	-7.59***	(-18.92)
reviews_per_month	1.48	1.82	2.25	2.26	0.78***	(63.77)
superhost	0.19	0.39	0.45	0.50	0.26***	(104.86)
Observations	244090		44730		288820	

Comparing City Distribution of Professional vs Non-Professional Hosts (Listings per Host)

Montreal and Victoria Hist
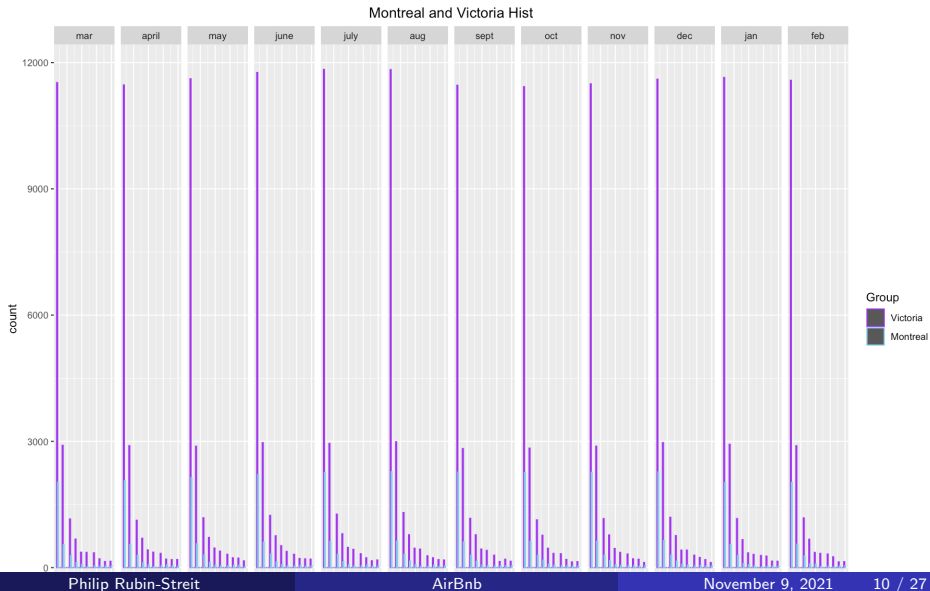
Specification: Difference in Difference Framework for Numerous Dependent Variables

Montréal, QC serves as Treated
Victoria, BC serves as Control
After September 2019 serves as Post

$$Y_{iyt} = \beta_0 + \beta_1 T_{iy} + \gamma t_i + \delta(T_i * t_i) + \alpha_i + \varepsilon_{yt}$$

Where,
$Total\_Listings_i$ = the count of listings per host
β_0 = constant term
β_1 = treatment group effect
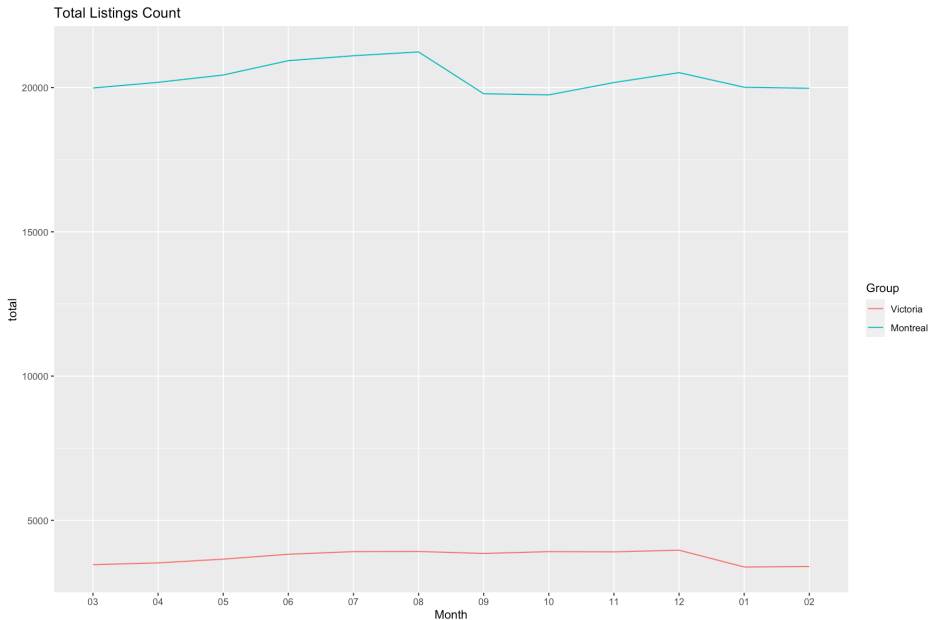T_i = dummy for in treatment group
α_{it} = month and and city dummies
γ = post group effect (Fall 2019 onward)
t_i = dummy for in post group
δ = true effect on number of listings

Trends for Total Listings Count

Total Listings Count

Total Listings Count

Table: Difference in Difference

	(1)	(2)	(3)	(4)
		Total Listings Count		
Diff*Post	−644.921***	−644.987***	−649.397***	−658.721***
	(180.573)	(180.568)	(181.925)	(183.771)
Montreal	16,930.250***	16,930.460***	16,932.450***	16,944.570***
	(124.394)	(124.376)	(125.139)	(124.111)
Post	27.154	27.139	25.078	−556.929***
	(126.266)	(126.266)	(126.230)	(153.366)
Bathrooms		−0.261	1.319	0.043
		(0.810)	(0.846)	(0.123)
Bedrooms		1.511*	1.297**	0.066
		(0.785)	(0.526)	(0.281)
Review Score Rating			−0.138	−0.024
			(0.105)	(0.015)
Constant	3,726.525***	3,724.547***	3,738.252***	4,229.190***
	(76.567)	(76.891)	(79.577)	(102.630)
Month Dummy	No	No	No	Yes
Notes:	***Significant at the 1 percent level.			
	**Significant at the 5 percent level.			
	*Significant at the 10 percent level.			

Trends for Total Minimum Nights
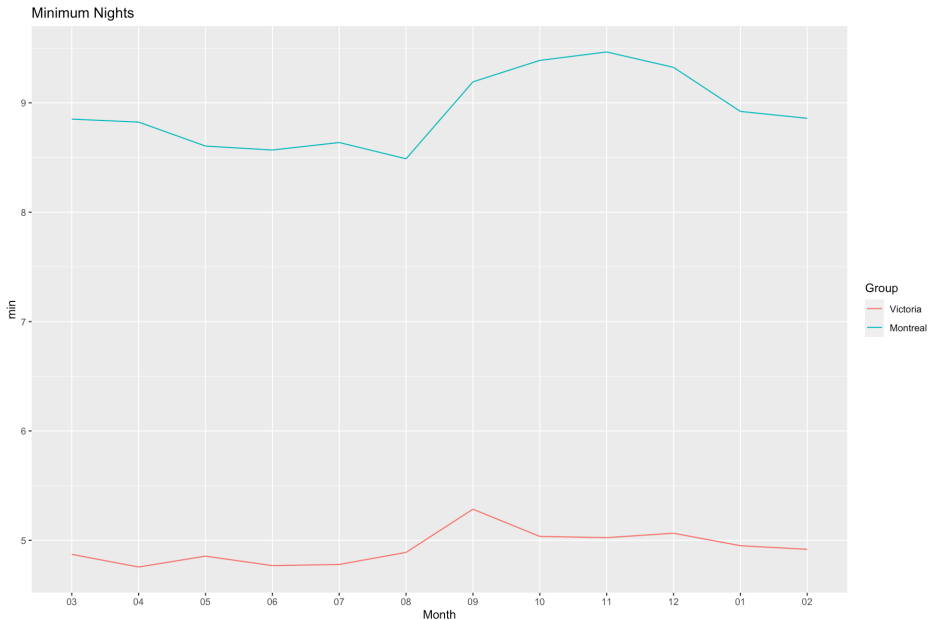
Minimum Nights

Table: Difference in Difference

|	Minimum Nights			
	(1)	(2)	(3)	(4)
Diff*Post	0.302***	0.300***	0.388***	0.403***
	(0.114)	(0.113)	(0.147)	(0.145)
Montreal	3.840***	3.860***	3.544***	3.541***
	(0.065)	(0.058)	(0.058)	(0.058)
Post	0.231***	0.235***	0.116*	−0.141
	(0.055)	(0.056)	(0.064)	(0.121)
Bathrooms		1.134***	0.531***	0.528***
		(0.030)	(0.022)	(0.021)
Bedrooms		−0.600***	−0.687***	−0.687***
		(0.044)	(0.025)	(0.025)
Review Score Rating			0.066***	0.066***
			(0.004)	(0.004)
Constant	4.820***	4.257***	−2.164***	−2.236***
	(0.023)	(0.049)	(0.442)	(0.411)
Month Dummy	No	No	No	Yes

Notes: ***Significant at the 1 percent level.
              **Significant at the 5 percent level.
              *Significant at the 10 percent level.

Trends for Unique Hosts Count
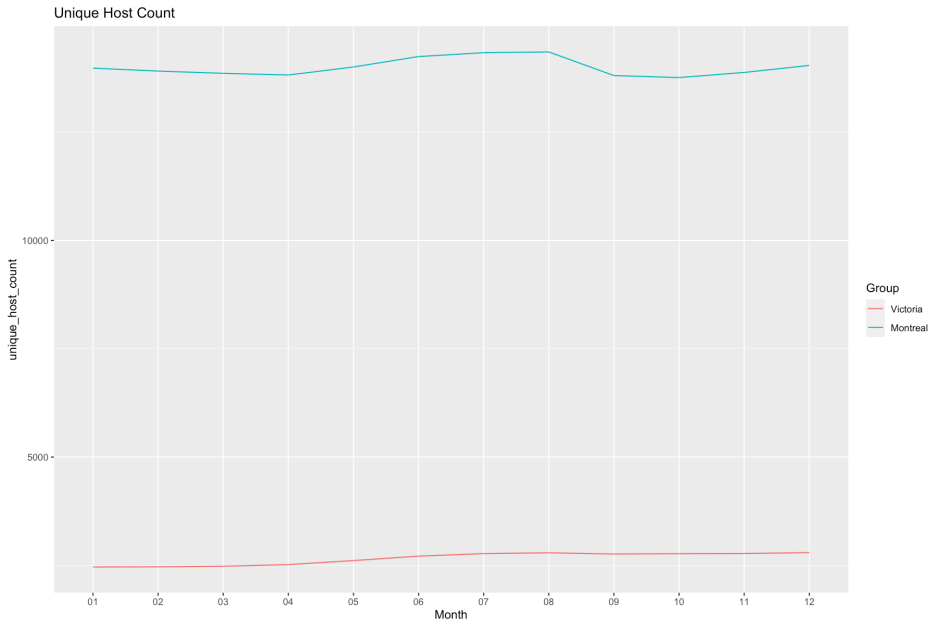
Unique Host Count

Total Unique Host Count

Table: Difference in Difference

	Total Unique Hosts Count			
	(1)	(2)	(3)	(4)
Diff*Post	−238.360***	−238.388***	−240.280***	−246.464***
	(92.066)	(92.067)	(92.282)	(92.507)
Montreal	11,450.550***	11,450.600***	11,451.050***	11,456.850***
	(43.510)	(43.517)	(43.567)	(43.183)
Post	27.841	27.834	26.508	−158.548**
	(78.141)	(78.142)	(78.199)	(77.446)
Bathrooms		−0.575	0.117	−0.029
		(0.372)	(0.338)	(0.057)
Bedrooms		0.845**	0.724***	0.214
		(0.331)	(0.247)	(0.174)
Review Score Rating			−0.059	−0.005
			(0.045)	(0.005)
Constant	2,654.180***	2,653.628***	2,660.094***	2,875.021***
	(50.592)	(50.686)	(51.849)	(35.820)
Month Dummy	No	No	No	Yes
Notes:	***Significant at the 1 percent level.			
	**Significant at the 5 percent level.			
	*Significant at the 10 percent level.			

Trends for Single Hosts Share

Single Listing Host Count
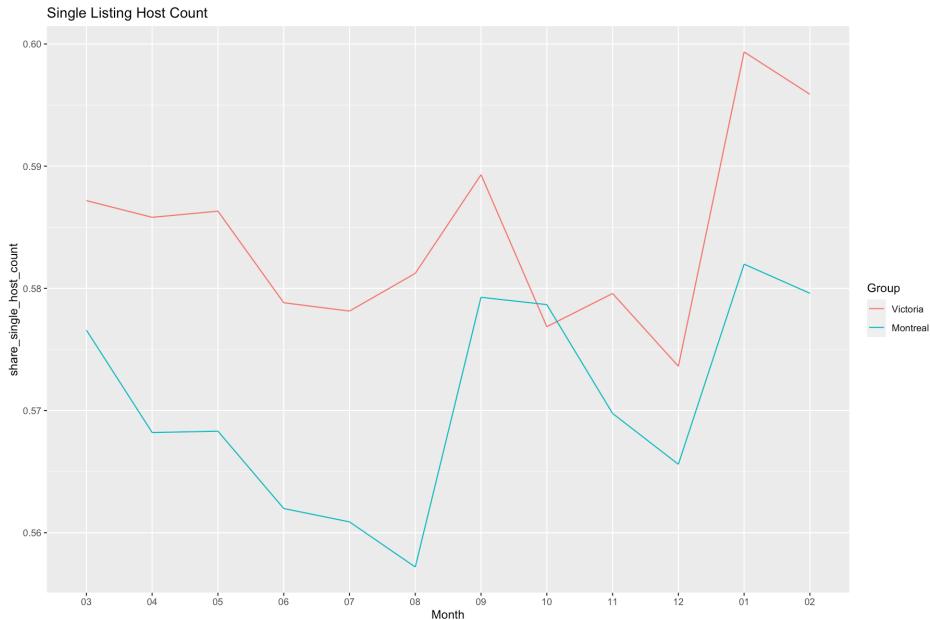
Single Hosts Count

Table: Difference in Difference

	Total Single Property Hosts Count			
	(1)	(2)	(3)	(4)
Diff*Post	0.008***	0.008**	0.011***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)
Montreal	−0.017***	−0.028***	−0.054***	−0.054***
	(0.002)	(0.002)	(0.001)	(0.001)
Post	0.002	0.003	0.000	0.011***
	(0.004)	(0.004)	(0.004)	(0.002)
Bathrooms		−0.071***	−0.077***	−0.077***
		(0.002)	(0.002)	(0.002)
Bedrooms		−0.006***	−0.000	0.000
		(0.002)	(0.002)	(0.002)
Review Score Rating			0.005***	0.005***
			(0.000)	(0.000)
Constant	0.583***	0.683***	0.203***	0.198***
	(0.002)	(0.003)	(0.008)	(0.008)
Month Dummy	No	No	No	Yes

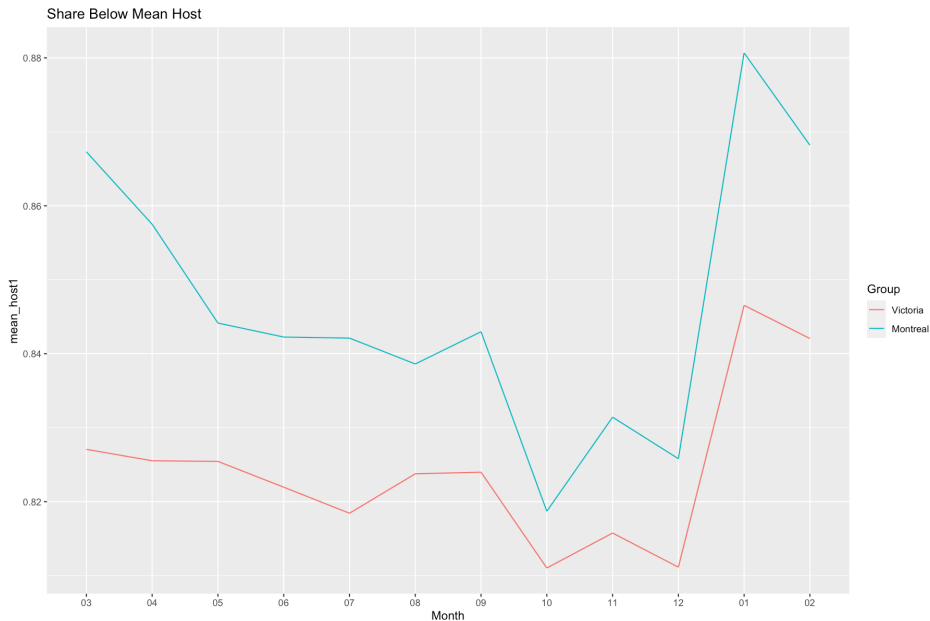Notes:
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Trends for Share Below Mean Host Listings

Share Below Mean Host Listings

Table: Difference in Difference

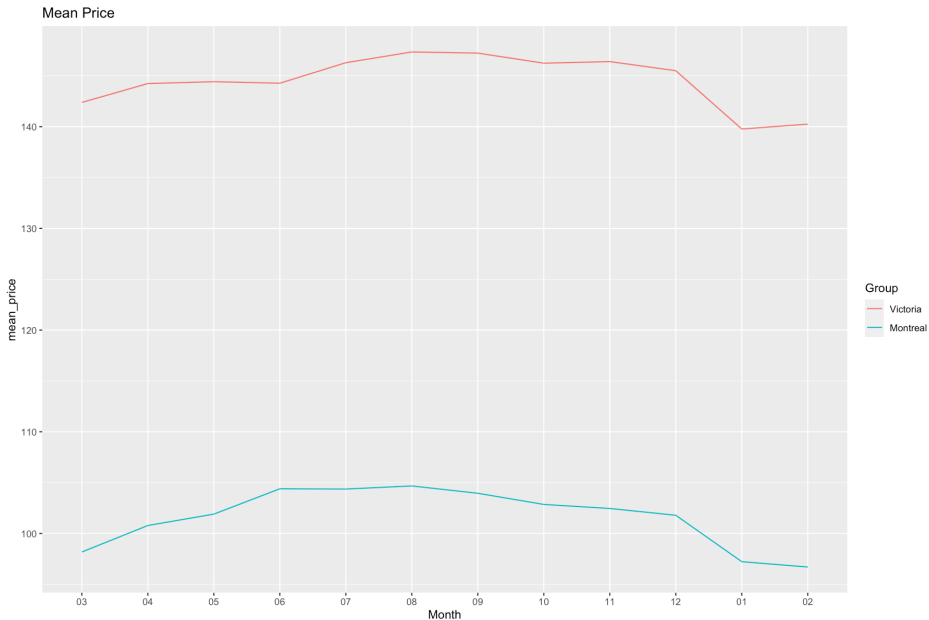|	Below Mean Host			
	(1)	(2)	(3)	(4)
Diff*Post	−0.004	−0.004	−0.005	−0.005
	(0.005)	(0.005)	(0.005)	(0.005)
Montreal	0.025***	0.025***	0.025***	0.025***
	(0.004)	(0.004)	(0.004)	(0.004)
Post	0.001	0.001	0.001	0.043***
	(0.006)	(0.006)	(0.006)	(0.004)
Bathrooms		−0.000*	−0.000**	−0.000
		(0.000)	(0.000)	(0.000)
Bedrooms		−0.000	−0.000***	0.000**
		(0.000)	(0.000)	(0.000)
Review Score Rating			−0.000	0.000
			(0.000)	(0.000)
Constant	0.824***	0.824***	0.824***	0.816***
	(0.001)	(0.001)	(0.001)	(0.003)
Month Dummy	No	No	No	Yes

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Trends for Mean Pricing

Mean Price

Mean Pricing

Table: Difference in Difference

	(1)	(2)	(3)	(4)
		Mean Price		
Diff*Post	−1.138*	−1.138*	−1.094*	−1.010*
	(0.607)	(0.606)	(0.603)	(0.597)
Montreal	−42.464***	−42.462***	−42.470***	−42.412***
	(0.588)	(0.588)	(0.584)	(0.569)
Post	−0.470	−0.470	−0.487	−6.624***
	(1.404)	(1.405)	(1.409)	(0.495)
Bathrooms		0.006	0.024**	−0.000
		(0.007)	(0.011)	(0.000)
Bedrooms		0.009*	0.009***	−0.000
		(0.005)	(0.004)	(0.001)
Review Score Rating			0.000	0.000
			(0.001)	(0.000)
Constant	144.898***	144.877***	144.875***	147.130***
	(0.682)	(0.685)	(0.712)	(0.474)
Month Dummy	No	No	No	Yes
Notes:	***Significant at the 1 percent level.			
	**Significant at the 5 percent level.			
	*Significant at the 10 percent level.			

Next Steps

1. Add helpful complexity in the form of actual dating as opposed to Monthly rounding
2. Endeavor much more rigorous analysis with controls, especially at price levels
3. More thoroughly pin down the regulation change and its administration timing and execution
4. Plow through on the review (demand) side but while avoiding pitfalls of selection bias

References

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Thank you.

Appendix