

Short-term Rentals in Vancouver: Market Overview and Regulatory Impact Analysis

David Wachsmuth, Maxime Bélanger De Blois and Cloé St-Hilaire

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Executive summary

This report analyzes short-term rentals (STRs) in the City of Vancouver, with specific reference to the 2018 City regulations and the 2020 Covid-19 pandemic. It provides a general market overview of STRs in Vancouver. It measures the impact of STRs on Vancouver's housing market, particularly relating to housing affordability and availability, through an assessment of the presence of commercially-operated STRs in Vancouver's areas. It assesses the impact of the City's STR regulations on the size and character of the STR market, and assesses compliance rates among current STR operators. It measures the impact of COVID-19 on the STR market, in terms of active listings, reservations and nightly prices. And it provides an analysis of STR units that have returned to the longer-term rental market, describing their spatial distribution, asking rents, the extent to which they are commercial operations, and whether they are likely to return to the STR market when conditions improve.

SHORT-TERM RENTALS IN VANCOUVER: MARKET OVERVIEW

- There were 3,890 active STR listings in Vancouver housing units in 2019, which collectively earned \$151.4 million.
- A quarter of all listings are in the Downtown area.
- More than two thirds (69.6%) of Vancouver's STR listings are entire homes, and entire homes are responsible for 86.3% of all revenue.
- Revenue is concentrated unevenly among hosts, with the top 10% earning 43.2% of revenue, and the top 1% earning 13.6%, but Vancouver has much less revenue concentration than other large cities in Canada.
- Commercial operators who control multiple STR listings account for 34.7% listings and 30.6% revenue, and those shares have been falling consistently since the introduction of the City's 2018 STR regulations.

SHORT-TERM RENTALS IN VANCOUVER: HOUSING IMPACTS

- Short-term rentals removed 2,570 housing units from Vancouver's long-term market in 2019—an increase of 41.9% from 2018.
- The 2018 regulations returned between 300 and 500 dedicated STRs to the long-term market in the early days of their existence, but those gains have since been partially offset by a rapid growth in dedicated STRs throughout 2019.
- Almost two thirds of all entire-home listings and four in ten private-room listings are dedicated STRs.
- In the Downtown area, 1.9% of all housing has been converted to dedicated STRs, while the figure is 1.5% in Riley Park and 1.4% in Shaughnessy.
- Between 2015 and 2019, STRs have been responsible for a 2.1% increase in average monthly rent, and the average renter household in Vancouver has paid an additional \$1,390 in rent because of the impact of STRs.

SHORT-TERM RENTALS IN VANCOUVER: REGULATORY IMPACTS

- The 2018 implementation of the City of Vancouver's STR licensing system created a one-time negative shock in the number of STR listings in Vancouver, which was disproportionately concentrated among listings which were present on STR platforms but not actively being rented.
- The longer-term impact of the regulations on the number of active STR listings in Vancouver plausibly ranges from between 600 and 1,510 listings removed, or 14.2% to 35.8% of the total number of listings.
- The plausible range for the longer-term impact on commercial listings is between 80 and 980 commercial listings removed, or 3.0% to 35.0% of the total commercial listings.

- Comparisons with other jurisdictions uniformly suggest that the real impact of the City's STR regulations is at the higher end of the trend analysis scenarios.
- Among commercial STR operations, multilistings have been particularly constrained by the City's regulations, while dedicated FREH listings have grown less than they otherwise would have, but at something closer to the rate expected in the absence of regulations.
- We estimate that the City's regulations have returned between 300 and 500 units of housing to the long-term market.

SHORT-TERM RENTALS IN VANCOUVER: REGULATORY COMPLIANCE

- Throughout 2019, the percentage of STR listings operating with valid STR licenses increased consistently, from 30.7% at the beginning of the year to 77.0% at the end.
- Among listings active in mid-October 2020, 29.0% were operating with a valid license, 32.2% with an expired license, and 33.7% with an invalid or fake license, or with no license at all.
- FREH listings had the highest rate of valid licenses (56.9%) among listing categories, although all commercial listings are per se in violation of the City's principal residence requirement.
- 10.6% of active entire-home listings displayed a license number used by at least one other active entire-home listing, suggesting that license numbers are being shared in violation of the regulations.
- Non-conforming listings are concentrated in and around Downtown Vancouver; the West End is the area with the highest percentage of non-conforming listings (79.4%).
- Entire-home listings with license numbers are booked more frequently and earn more revenue than listings without licenses, but there is no substantial difference between listings with valid or non-conforming license numbers, suggesting that STR guests are reluctant to book reservations in listings without a license number.

COVID-19: THE IMPACT OF THE PANDEMIC ON THE STR MARKET

- STR activity in Vancouver has suffered an unprecedented collapse during the COVID-19 pandemic.
- Reservations from March to September 2020 are down 57.6% over 2019.
- Prices for reservations which did occur are down 33.0% from their previous trend.
- In total, the pandemic has reduced STR host revenue in Vancouver by \$130.7 million from March to September.
- The number of frequently-rented entire home listings dropped from 2,680 in January 2020 to just 940 in August 2020.
- 39.2% of FREH listings were permanently deactivated and 22.9% were temporarily blocked.

COVID-19: STRS RETURNING TO THE LONG-TERM MARKET

- *Using image recognition techniques, we identified 1,339 unique Airbnb listings which were posted as long-term rentals (LTRs) on Craigslist or Kijiji between March and September 2020.
- These former STRs have asking rents on average 25.6% higher than other LTR listings, but are correlated with a 13.5% decrease in overall asking rents in Vancouver.
- The evidence suggests that the overwhelming majority of STR listings transferred to LTR platforms are commercial operations.
- We estimate that 30.6% have fully transitioned back to the long-term market, 35.3% have been temporarily blocked on Airbnb and may return to being STRs in the future, and 34.1% failed to be rented on LTR platforms and instead remain active on Airbnb.

Introduction

In October 2020, the Urban Politics and Governance research group (UPGo) at McGill University was commissioned by the City of Vancouver to conduct market research and analysis on the impact of the City's April 2018 regulations on short-term rentals as well as the impact of the COVID-19 pandemic on the short-term rental market in the City of Vancouver. The group also investigated the possibility that short-term rentals are returning to the long-term market because of the pandemic. This report will shed light on the following topics:

- A general market overview of short-term rentals (STRs) in Vancouver, including the volume, revenue, type, size and distribution of units, and the presence of dedicated commercial operations.
- The impact of STRs on Vancouver's housing market, in particular the number of housing units taken off the long-term market as well as their impact on housing supply, rental vacancy rates, and rents.
- The impact of the City of Vancouver's STR registration system on the operation of short-term rentals in the City.
- The impact of COVID-19 on short-term rentals in Vancouver, including the decrease in active listings, reservations and nightly prices.

Information about STRs returning to the LTR market, including the number of listings that have returned; their spatial distribution, size and asking rents; the extent to which they are commercial operations or casual home sharing operations; and whether they are likely to return to the STR market when conditions improve.

Data and methodology are discussed in the Appendix, and all the code used to generate the analysis in the report is available online at <https://github.com/UPGo-McGill/vancouver-analysis>.

1 Short-term rentals in Vancouver: Market overview

There were 3,890 active STR listings in Vancouver housing units in 2019, which collectively earned \$151.4 million. A quarter of all listings are in the Downtown area. More than two thirds (69.6%) of Vancouver's STR listings are entire homes, and entire homes are responsible for 86.3% of all revenue. Revenue is concentrated unevenly among hosts, with the top 10% earning 43.2% of revenue, and the top 1% earning 13.6%, but Vancouver has much less revenue concentration than other large cities in Canada. Commercial operators who control multiple STR listings account for 34.7% listings and 30.6% revenue, and those shares have been falling consistently since the introduction of the City's 2018 STR regulations.

1.1 Active daily listings and annual revenue

Active daily listings are listings which were displayed on Airbnb or VRBO on a given day, and were either reserved or available for a reservation. It is the most reliable means of determining the overall size of the STR market in a location, particularly with respect to change over time. In 2019 there was an average of 3,890 active daily listings (Figure 1) operated by an average of 2,550 hosts. These hosts collectively earned \$151.4 million—an average of \$38,900 per daily active listing or \$59,500 per active host.

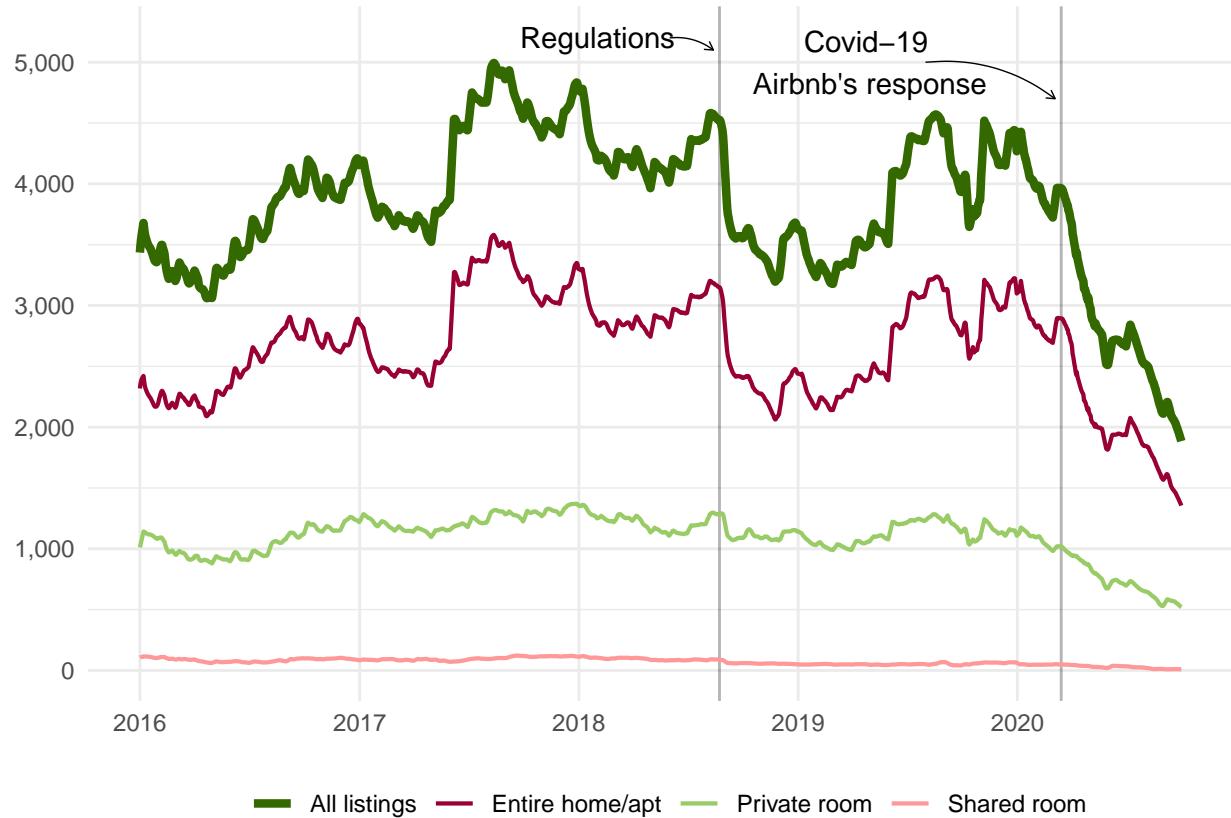


Figure 1: *Active daily STRs in the City of Vancouver (7-day average)*

There was also a daily average of 2,470 listings which were visible on the Airbnb and VRBO websites but were blocked by the host from receiving reservations. The presence of these listings can erroneously suggest that a city's STR market is larger than it is. When these blocked but inactive listings are included, the average listing earned \$16,000 last year, and the average host earned \$28,200. Finally, there was a daily

average of 110 listings that were not located in private housing units (B&Bs, hotels, etc.), which have been excluded from the analysis in this report. All the figures which follow, therefore, pertain to short-term rentals located in Vancouver's traditional residential housing stock.

Active daily listings peaked in August 2017 at 5,070, and have since declined. There were 2.8% fewer listings active on average in 2019 than in 2018. However, host revenue followed the opposite pattern, increasing by 3.1% between 2018 and 2019. The regulations succeeded in reducing the number of active listings, however listings which remained on the platforms are earning a slightly higher revenue than during the previous year.

In general, the number of STR listings available in the City of Vancouver peaks during late summer and winter holidays and falling in between these periods (Figure 1). There are two major exceptions to this pattern: the sharp drop in activity in the second half of 2018 after the City's STR regulations began to be enforced, and the March to September 2020 period, where activity has been sharply below the seasonal trend because of the Covid-19 pandemic.

1.2 STR growth rates

Until mid-2018 the number of active STRs listings steadily increased in the City of Vancouver. Figure 2 shows the change in active listings and revenue relative to one year earlier, which is a convenient way to remove seasonal variation to identify underlying growth trends. The figure indicates that, throughout 2017 and the first half of 2018, there were almost always more listings available than the previous year. This situation reversed itself in late 2018, and for a year between the mid 2018 to mid 2019, the number of active listings has consistently been lower than the previous year. The previous growth trends then returned until March 2020.

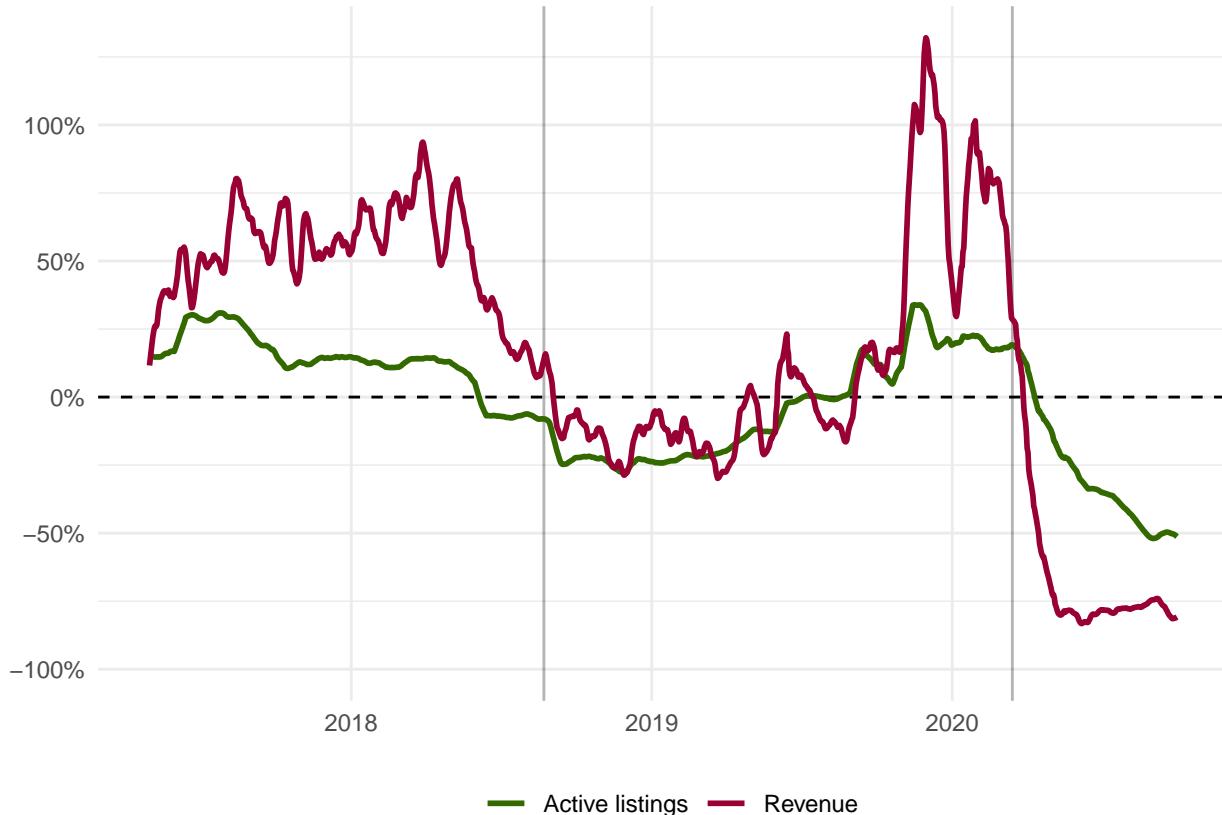


Figure 2: *Change in daily active listings and host revenue compared to one year earlier (14-day average)*

Table 1: 2019 STR activity in the largest ten Canadian municipalities

City	Active listings	Listings per 1000 households	Annual revenue (million)	Revenue per listing
Brampton	430	2.5	\$8.4	\$19,300
Calgary	2,860	5.8	\$50.6	\$17,700
Edmonton	1,400	3.6	\$22.3	\$15,900
Hamilton	560	2.5	\$10.8	\$19,300
Mississauga	1,020	4.1	\$18.2	\$17,900
Montreal	9,310	11.0	\$234.9	\$25,200
Ottawa	2,090	5.3	\$43.3	\$20,800
Toronto	12,210	10.4	\$333.6	\$27,300
Vancouver	3,890	12.6	\$200.8	\$51,600
Winnipeg	790	2.7	\$11.2	\$14,200

Overall, the year-over-year change in average active listings from 2016 to 2017 (12 months) was 17.6%, the year-over-year change from 2017 to 2018 was -6.4%, and the year-over-year change from 2018 to 2019 was -2.8%. In 2020, active listings fell faster thanks to the Covid-19 pandemic. The year-over-year change in active daily listings for 2020 so far (January to September) is -19.9%.

The growth rate of reservations and host revenue tells a different story. Despite there being fewer active listings in 2019 than in 2018, the number of reserved nights increased by 4.9%, from 0.87 million reserved nights to 0.91 million reserved nights, while revenue increased 3.1%. Due to the Covid-19 pandemic, revenue from January to September 2020 is down 39.1% compared to the same time last year.

Until mid-2018, when the City's STR regulations came into effect, the growth rate of active listings was always positive but weaker than revenue growth, which indicates that both total listings and revenue per listing were growing. Both rates fell sharply through the second half of 2018, and in fact became negative, as the City's regulations reduced the size of Vancouver's STR market. STR listing and revenue growth resumed in Fall 2019, and revenue growth in particular reached record highs in late 2019 and early 2020, until the Covid-19 pandemic caused both listing and revenue growth to collapse. Neither has yet recovered.

1.3 Vancouver in comparison with other major Canadian cities

In 2019, Vancouver had the third largest STR market in the country by both active listing numbers (3,890) and host revenue (\$151.4 million), falling in both cases behind Toronto and Montreal (Table 1). However, in relative terms, Vancouver stands considerably ahead of both Montreal and Toronto. Vancouver had the most active listings per 1000 households (12.6 compared to 11 in Montreal) and the most revenue per listing (\$51,600 compared to \$27,300 in Toronto).

1.4 Location of STR listings and revenue

STR activity in Vancouver is highly concentrated in the Downtown (Figure 3). This area accounts for 25.6% of all listings in 2019, and an even higher share of host revenue (33.1%). Downtown is followed by Kitsilano (7.9% of active listings and 9.0% of revenue) and the West End (6.4% of active listings and 7.3% of revenue). When measured in per-capita terms, Downtown and Riley Park have the highest concentrations of STRs, at 25.6% and 5.9% respectively. In all other areas STRs account for between 2.9% and 25.6% of total dwellings.

While current STR activity is more concentrated Downtown, new STR growth is occurring in other areas. In Table 2, entries are orange if the area's value is higher than the City average, and blue if it is lower (TJKTK NOT CURRENTLY IMPLEMENTED). The table reveals an overall inverse relationship between current STR activity and growth trends; while for example Downtown accounts for a plurality of existing listings and revenue, both listing and revenue growth is substantially higher in outlying areas (Marpole and Dunbar-Southlands, for example). This pattern points to an ongoing decentralization of STR activity in Vancouver.

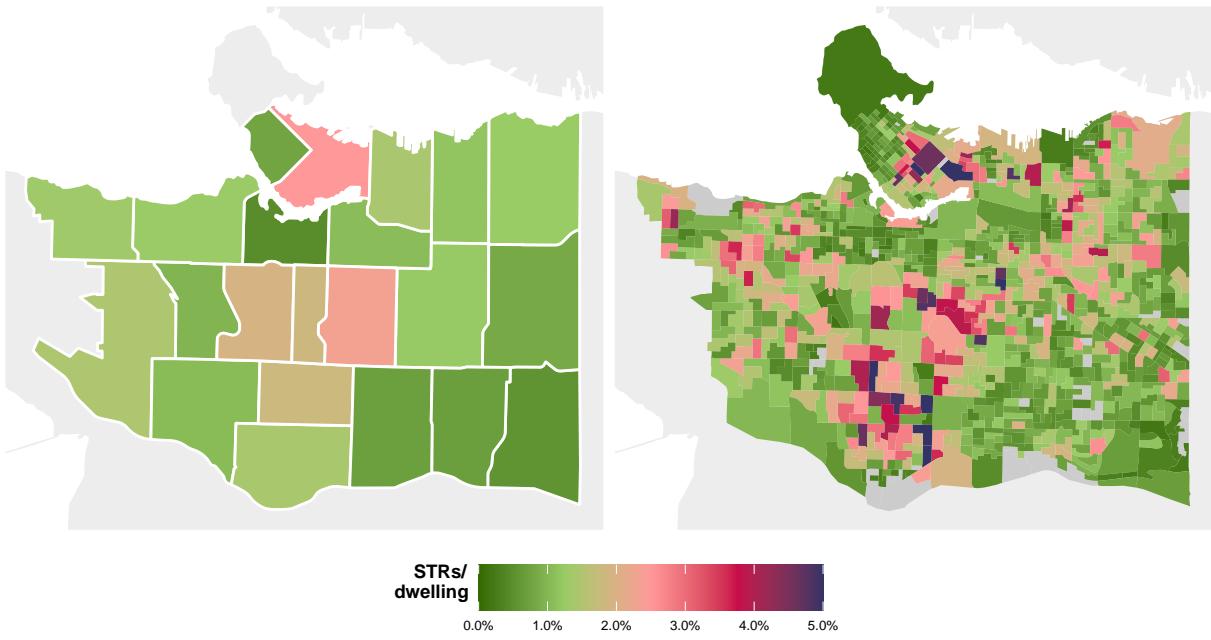


Figure 3: Active STRs as a share of all dwelling units in Vancouver, by local area (L) and dissemination area (R)

Table 2: Local areas with at least 100 daily active listings in 2019

Area	Active listings	Annual listing growth	Active listings as % of dwellings	Annual revenue (million)	Annual revenue growth
City of Vancouver	3,890	-2.8%	1.3%	\$151.4	3.1%
Downtown	1,000	-5.5%	2.5%	\$50.2	-3.4%
Kitsilano	310	-17.7%	1.3%	\$13.6	-7.8%
West End	250	-23.5%	0.8%	\$11.0	-15.8%
Kensington-Cedar Cottage	240	7.3%	1.2%	\$7.0	22.2%
Riley Park	230	15.6%	2.3%	\$7.5	27.7%
Mount Pleasant	210	-26.4%	1.1%	\$8.6	-15.3%
Grandview-Woodland	180	-13.0%	1.2%	\$5.7	-4.9%
Renfrew-Collingwood	180	2.5%	0.8%	\$5.2	23.8%
Hastings-Sunrise	170	10.9%	1.3%	\$4.8	25.8%
Marpole	160	41.0%	1.4%	\$4.9	72.9%
Dunbar-Southlands	110	22.4%	1.5%	\$3.5	9.7%

Table 3: Listing type prevalence in the City of Vancouver

Listing type	Active listings	Annual revenue (million)	Share of all listings	Share of all revenue	Annual listing growth
Entire home/apt	2,710	\$130.7	69.6%	86.3%	-1.1%
Private room	1,130	\$20.3	29.0%	13.4%	-4.4%
Shared room	50	\$0.4	1.4%	0.3%	-34.8%

1.5 Listing types and sizes

STRs listed on Airbnb can be one of four types: entire homes or apartments, private rooms, shared rooms, and hotel rooms. We have excluded the latter from our analysis, since we focus only on STRs located in housing units. Most policy attention has been focused on entire-home listings, both because these listings are most likely to generate harmful negative externalities, including housing loss and neighbourhood nuisance, and because entire-home listings tend to be the most common.

Table 3 provides the distribution of the listings by listing type in 2019. The majority of STRs in Vancouver are entire homes, a category which includes single-family homes, townhouses, apartments and condominiums. 42.2% of these were one-bedroom housing units, and a third (33.3%) were two-bedrooms units. Almost a fifth of these listings (17.8%) were 3 or more bedrooms housing units, and 6.7% were studios. In general, studios and one-bedroom units are overrepresented on STR platforms in comparison with the City’s overall housing stock.

In 2019 entire-home listings accounted for 69.6% of all daily active listings, and 86.3% of total host revenue. (Private rooms accounted for nearly all of the remainder.) Moreover, the dominance of entire-home listings in Vancouver’s STR market is increasing over time; while there were fewer active listings among all listing types in 2019 when compared to 2018, active daily entire-home listings declined by a much smaller proportion than the other listing types.

1.6 Revenue distribution among STR hosts

A crucial concept for understanding the structure of an STR market is the distinction between casual STRs (“home sharing”) and dedicated STRs (“commercial operations”). One way to capture this distinction is to examine the distribution of revenue among STR hosts. Is revenue widely distributed between many part-time hosts of single listings, or concentrated among a small number of commercial operators who control many full-time listings?

While hosts are identified on Airbnb or VRBO with unique accounts, these accounts are not necessarily an accurate guide to the individuals or companies which operate STR listings, since a given person or group of people can create as many host accounts as they wish, and split their listings among these accounts. What may appear superficially as a large number of small STR operators could thus be in reality a much smaller number of operators controlling many accounts each. To address this possibility, we use custom image recognition software to identify identical photographs which are used across multiple listings, and thereby construct groups of host accounts which are either a single operator or a network of operators working in collaboration. If multiple, apparently separate host accounts use the identical photo on the webpages of their STR listings, this is very strong evidence that these accounts are

We identified one network of hosts which has operated 587 listings in Vancouver over the last several years, and which earned approximately \$4.1 million in 2019. An investigation into a sample of the host accounts which make up this network suggests links between numerous property management companies and third party operators. Through time, several individual host accounts seem to have merged into a cluster of larger hosts. The image-matching algorithm also merged hosts that use both Airbnb and VRBO, allowing for more accurate revenue calculations. Without interviewing actors associated with this host network, it is impossible to describe the level of connection and coordination between the various host accounts, but an operation of this scale would not be unprecedented. Reports from Chicago, USA and London, UK have identified similar host networks behind which were property management companies and realty groups (Conti, 2019).

Table 4: Vancouver STR host revenue

Host percentile	Annual revenue
25th percentile	\$5,000
Median	\$16,000
75th percentile	\$35,000
100th percentile	\$4.1 million

Among all the STR hosts who earned revenue in the City of Vancouver last year, the median revenue was \$15,900 (Table 4). Throughout the City of Vancouver, there were 28 hosts that earned more than \$250,000 in 2019. Figure 4 shows the percentage of the total \$151.4 million in STR revenue which accrued to each decile of hosts. The figure shows that revenue is disproportionately concentrated among a small number of hosts; the top 10% earned 43.2%: the top 5% earned 30.5% of revenue, while the top 1% of hosts earned 13.6% of all revenue. As high as these numbers are, however, they are lower than other large cities in Canada. Montreal’s top 10% of STR hosts earned 68.8% of all revenue in 2019, for example. This indicates that Vancouver’s STR market is less dominated by commercial operators than that of its peer cities.

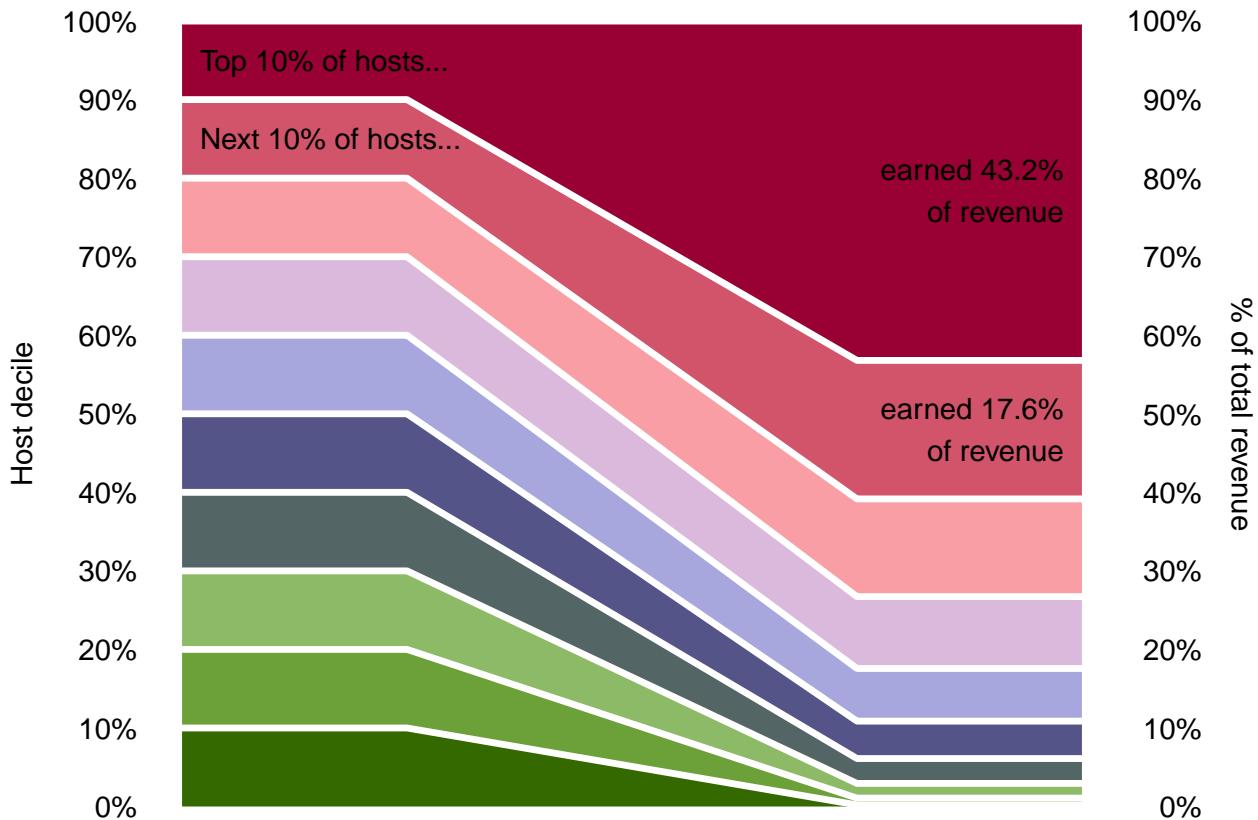


Figure 4: *STR host revenue distribution in the City of Vancouver*

1.7 The commercialization of Vancouver’s STR market

Some hosts operate multiple STR units, which can be an indication of a commercial operator rather than a casual home sharer. To take the simplest case, for example, a host with two or more entire-home listings on the same day cannot be operating both listings out of their principal residence, regardless of the frequency

they are rented throughout the year. This means that these operators are not respecting the by-law, which prevents a person from operating a STR outside their principal residence.

We consider entire-homes to be “multilistings” if they are operated by hosts who are simultaneously operating other entire-home listings. We define private-room multilistings as cases where a host has three or more private-room listings operating on the same day. Since 93.8% of entire-home listings have three or fewer bedrooms, there will be extremely few cases where a host operating three private-room STR listings in a dwelling unit has not converted the entire unit into a dedicated STR. Intuitively, multilistings that are still operating since the City’s STR regulations were enacted in April 2018 are almost certainly non-compliant. In particular, it is impossible for a host holding five listings to be operating them all out of their principal residence, which is one of the regulation’s requirements.

In 2019, 34.7% of active listings in Vancouver were multilistings, earning 30.6% of total host revenue. Multilistings had been growing steadily since 2017, both in terms of listings and revenue percentage, until Airbnb’s mass removal of listings without licence numbers. Since then, the proportion of multilistings and their share of overall revenue has been decreasing. Multilisting revenue as a share of total revenue reached an all-time high right before Airbnb’s August 2018 regulatory enforcement takedown, while multilisting active listings as a share of total active listings peaked several months later (Figure 5). Both indicators have been in relatively steady decline since then, and by the end of 2019 were considerably lower than in any of the other large cities in Canada. Figure 5 also highlights that, amidst generally declining STR activity during the COVID-19 pandemic, multilistings have declined disproportionately quickly, and through the fall of 2020 were earning a bit more than 1 out of every 4 dollars on STR platforms in Vancouver.

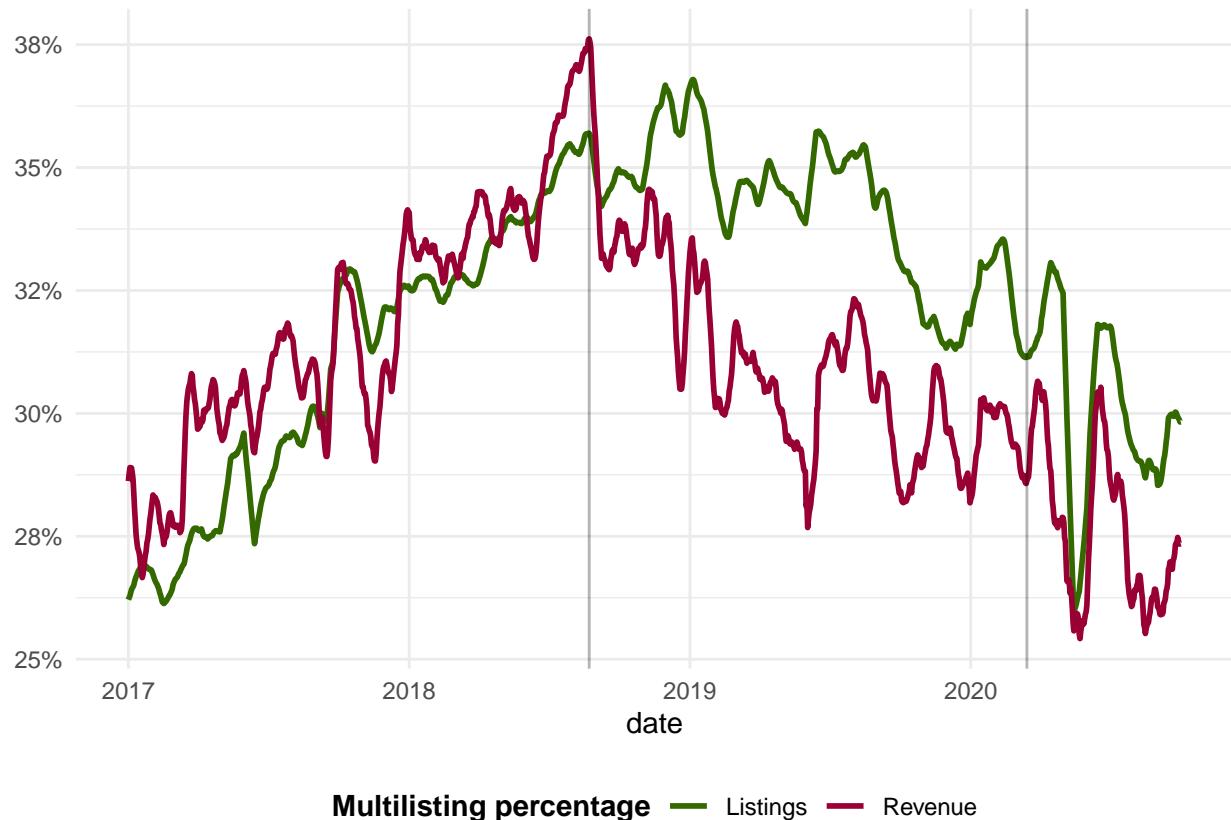


Figure 5: *The percentage of active listings and revenue accounted for by multilistings in Vancouver (14-day average)*

These figures should be taken as highly conservative estimates. Many commercial operators will use different

Airbnb or VRBO accounts to manage their listings. If multiple listings share the same photographs then our image recognition software will be able to connect them together, but it is otherwise difficult to determine whether two accounts belong to the same person. Moreover, many STR commercial operators only operate a single listing, but operate it on a full-time basis. A house owner with a secondary suite, or the owner of an investment condo who operates a STR in it, are clearly commercial operators running listings which are not their principal residences, but they would not be counted by this method.

2 Short-term rentals in Vancouver: Housing impacts

Short-term rentals removed 2,570 housing units from Vancouver’s long-term market in 2019 — an increase of 41.9% from 2018. The 2018 regulations returned between 300 and 500 dedicated STRs to the long-term market in the early days of their existence, but those gains have since been partially offset by a rapid growth in dedicated STRs throughout 2019. Almost two thirds of all entire-home listings and four in ten private-room listings are dedicated STRs. In the Downtown area, 1.9% of all housing has been converted to dedicated STRs, while the figure is 1.5% in Riley Park and 1.4% in Shaughnessy. Between 2015 and 2019, STRs have been responsible for a 2.1% increase in average monthly rent, and the average renter household in Vancouver has paid an additional \$1,390 in rent because of the impact of STRs.

2.1 STR-induced housing loss

Vancouver’s housing market has been under considerable stress in the past years, with housing prices and rents rising, and rental vacancy rates falling. These are symptoms of a market where the supply of housing is insufficient to meet demand. One possible explanation for both the insufficient supply and elevated demand for housing in Vancouver is the growth in short-term rentals. Tourists are now able to compete with residents for housing—adding demand to the local housing market—while landlords are now able to shift their properties out of the conventional housing market to become dedicated STRs—reducing the supply of conventional housing. Research has found that renting a housing unit on the STR market frequently offers landlords greater potential revenue than conventional leases (Wachsmuth & Weisler 2018), especially in transit-accessible neighborhoods (Deboosere et al. 2019). Multiple studies have also found that Airbnb and other STR platforms increase housing costs (Barron, Kung, & Proserpio 2017; Horn & Merante 2017; Garcia-Lopez et al. 2019).

One of the major considerations when gauging the impacts of short-term rentals (STRs) on a city, therefore, is the extent to which STRs are removing long-term housing from the market. This process can occur either directly, where tenants of a unit are evicted or not replaced at the end of a lease and the unit is converted to a STR, or indirectly by absorbing new construction or investment properties which otherwise would have gone onto the long-term market. To obtain the exact number of units that have been occupied as STRs, landlords or units would need to be individually surveyed, which is infeasible because STR hosts are mostly anonymous on major STR platforms such as Airbnb and VRBO. Instead, we use the daily activity of listings, alongside structural characteristics such as listing type and location, to estimate which listings are operating as dedicated STRs and are therefore not available as conventional long-term housing.

Frequently Rented Entire-Home (FREH) listings: The number of frequently-rented units is one way to estimate STR-induced housing loss. If a STR is available for reservations the majority of the year and receives many bookings, it is reasonable to assume that it is not serving as an individual’s principal residence at the same time. Along these lines, we define frequently rented entire-home (FREH) listings as entire-home listings which were available on Airbnb or VRBO the majority of the year (at least 183 nights) and were booked a minimum of 90 nights. We then apply a statistical model (described in the appendix) to the FREH data in order to generate an estimate of FREH activity based on three months of listing activity. This allows us to detect listings which are operating in a full-time manner but have not yet been listed for an entire year, and allows us to account for relatively short-term changes in market conditions.

Ghost hostels: In addition to FREH listings, it is possible that entire housing units have been subdivided into multiple private-room listings, each of which appearing to be a spare bedroom or the like, while actually collectively representing an apartment removed from the long-term housing market. We call these clusters of private-room listings “ghost hostels”, building on the advocacy group Airbnb.ca’s term “ghost hotels”—multiple FREH listings located in a single building, collectively serving as de facto hotels instead of long-term housing (Wieditz 2017). We detect ghost hostels by finding clusters of three or more private-room listings operated by a single host, whose reported locations are close enough to each other that they are likely to have originated in the same actual housing unit. (Airbnb and VRBO obfuscate listing locations by shifting them randomly up to 200 m.)

At the end of 2019, there were 2,320 FREH listings in the City of Vancouver, and 250 more housing units which were operating as ghost hostels. In total, therefore, short-term rentals removed 2,570 housing units from Vancouver's long-term market last year (Figure 6). Notably, while the number of active daily listings declined by 2.8% over 2019, the number of housing units which STRs took off of Vancouver's housing market increased by 41.9% in that same time period, from 1,810 to 2,570. This high growth rate reflects a rebound following a previous substantial decline in dedicated STRs associated with the introduction of the 2018 regulations. On the eve of Airbnb's mass removal of non-compliant listings (August 2018), 2,370 housing units were operating as dedicated STRs, and this number dropped by more than 2,070 the following month, before ultimately bottoming out at 1,750 in January 2019. Taking the seasonality of the underlying pattern into account, this nevertheless implies that between 300 and 450 housing units were (at least temporarily) restored to the long-term rental market by the introduction of the 2018 regulations—something between 12 and 24% of the total.

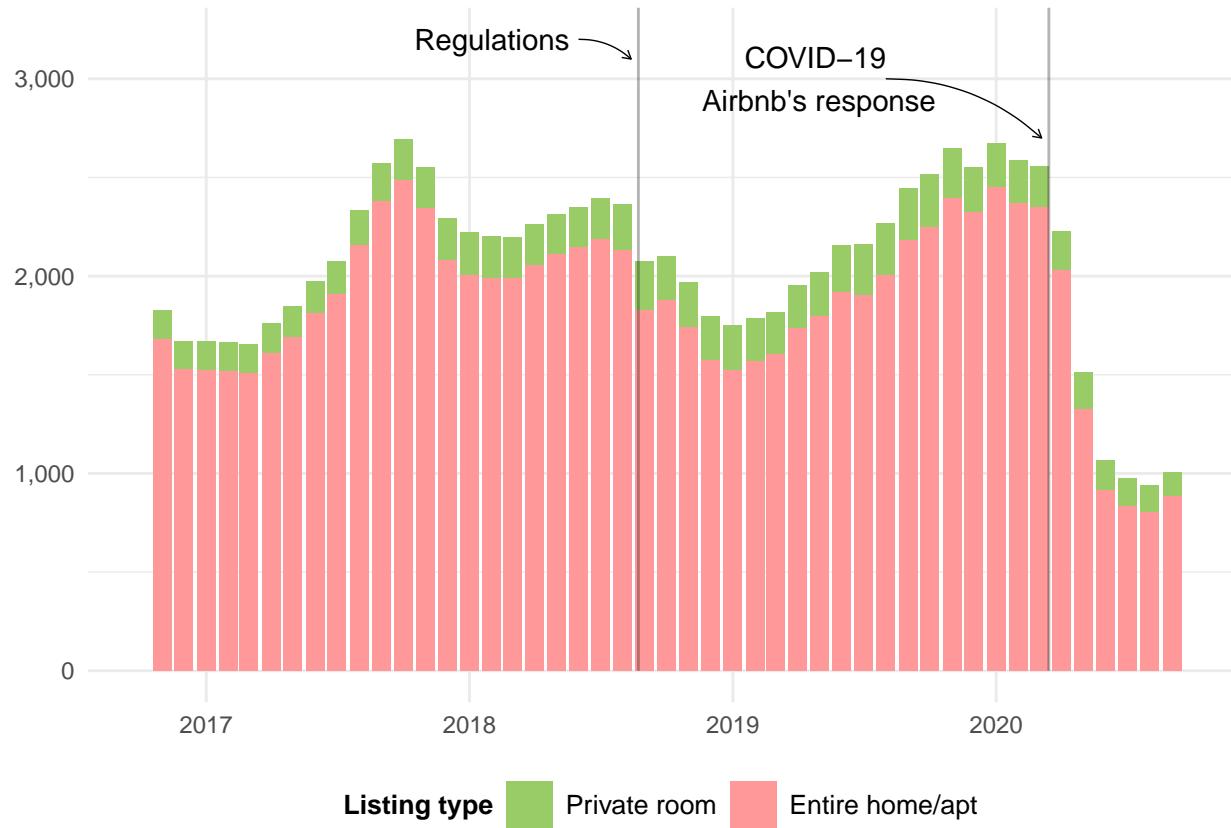


Figure 6: *Housing units converted to dedicated STRs in the City of Vancouver (monthly average)*

However, the result of falling numbers of listings but increasing numbers of listings contributing to housing loss is that the proportion of all active listings which are either FREH or ghost hostels has increased enormously from 2018 to 2019. At the end of 2019 close to two thirds (66.5%) of entire-home listings and more than four in ten (45.2%) private-room listings were taking housing off the market in Vancouver (Figure 7). Three years earlier, the proportions were only 39.5% and 26.4% respectively. It is possible but highly unlikely that FREH listings were operating out of their host's principal residences, since these are cases where the entire home is available for rent most of the year. FREH listings, like multilistings, are thus a probable indicator of non-conformity with the City's regulations.

Table 5 summarizes STR-induced housing loss patterns by neighbourhood. It demonstrates that the City-wide trend of shrinking total numbers of active listings but growing numbers of dedicated STRs also holds in most neighbourhoods. Also, year-over-year growth of housing loss has been evenly distributed between



Figure 7: *The percentage of active STR listings contributing to housing loss each day in Vancouver (14-day average)*

Table 5: STR-induced housing loss by local area in the City of Vancouver (for boroughs with at least 50 housing units lost in 2019)

Area	Housing loss (2018)	Housing loss (2019)	Annual growth (%)	% of housing lost (2019)
City of Vancouver	1810	2570	0.4190	0.0084
Downtown	520	740	0.4291	0.0186
Kitsilano	150	200	0.3791	0.0083
Mount Pleasant	120	170	0.4285	0.0088
Kensington-Cedar Cottage	90	160	0.7663	0.0082
West End	130	150	0.2196	0.0048
Riley Park	90	140	0.6158	0.0147
Grandview-Woodland	80	120	0.4289	0.0076
Hastings-Sunrise	90	120	0.3102	0.0085
Renfrew-Collingwood	80	110	0.4108	0.0051
Marpole	50	70	0.5196	0.0064
Strathcona	60	70	0.0591	0.0095
Sunset	40	60	0.5718	0.0046
Victoria-Fraserview	40	60	0.6751	0.0056
Fairview	40	50	0.3183	0.0027
Kerrisdale	30	50	0.6402	0.0085

virtually all areas, with an average of 45.0% city-wide, returning, in absolute numbers, to 2017 levels already by the end of 2019. This indicates that, although the regulations might have decreased the number of commercial operations in the short run (2018), there seems to be a return to business-as-usual in 2019.

The 2,570 housing units taken off of Vancouver’s housing market in 2019 are 0.8% of the total amount of housing in the city, and this housing loss has been concentrated in small parts of the city. This is more or less the same in relative to the total housing stock: Figure 8 shows the proportion of each area or dissemination area’s housing stock which was operated as a dedicated short-term rental as of the end of 2019. The maps show a tale of two cities: in most of Vancouver, there are relatively few dedicated STRs, while in the center of the city as well as Downtown, they are ubiquitous. In the Downtown area, 1.9% of all housing units have been converted to dedicated STRs. The figure is 1.5% for Riley Park and 1.4% for Shaughnessy. In Downtown, the rental vacancy rate was 1.4% in 2019. This means that there are more dedicated STRs in this neighbourhood than there are vacant apartments for rent.

2.2 The impact of STRs on rental housing supply and vacancy rates

In 2019, the City of Vancouver’s rental vacancy rate stood at only 1.0%—a crisis-level rate, albeit slightly higher than the previous few years. The standard rule of thumb is that a healthy rental market should have a vacancy rate of at least 3%, and all 10 of the CMHC’s zones in Vancouver are substantially below that. Downtown has the highest vacancy rate at only 1.4%, which means that, of the zone’s approximately 11,000 rental apartments, fewer than were available to be rented by prospective tenants in October 2019, when CMHC’s survey was conducted. In general, vacancy rates are even lower for family-sized housing units (defined by CMHC as units with two or more bedrooms). For example, the vacancy rate for units with three or more bedrooms was 0.0% for the Downtown zone.

Given the thousands of housing units which we have documented as having been converted to dedicated STRs in Vancouver, it is highly likely that the STR market is negatively affecting rental housing supply and the vacancy rate. One way to evaluate this possibility is to compare the net change in rental housing units in an area with the effective reductions in rental housing supply caused by the growth in dedicated STRs. Figure 9 makes this comparison, showing the change in primary rental housing units (i.e. apartments and townhouses, but not condominiums being used as rentals) per CMHC zone between 2018 and 2019, and the effective change in housing units once the impact of STRs taking housing off of the market is factored in. We assume that STR conversions happen in the same proportion as existing tenure arrangements in the neighbourhood. For example, in the South Granville/Oak zone, 55.3% of households are renters, so we

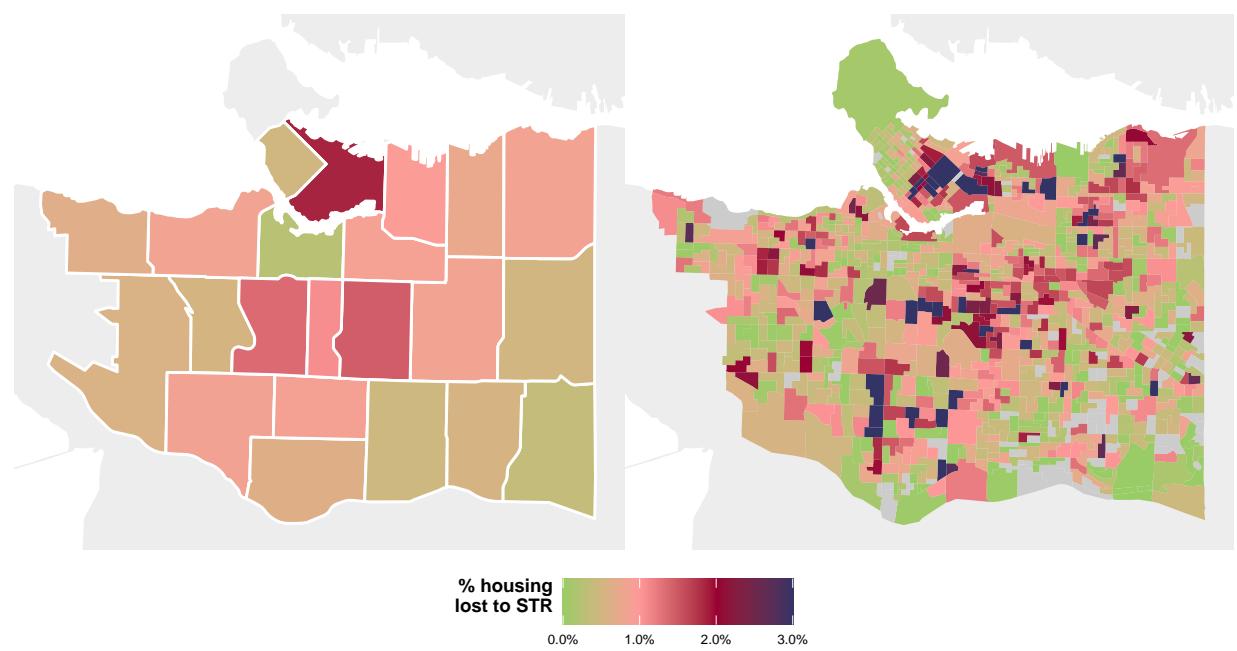


Figure 8: *The percentage of housing units converted to dedicated STRs in the City of Vancouver, by local area (L) and dissemination area (R)*

assume that 55.3% of housing units converted to dedicated STRs would have been rental housing, and the remaining 44.7% would have been ownership housing. (We also assume CMHC has not removed dedicated STRs from their counts of primary rental units. In principle CMHC would not consider dedicated STRs to be rental units, but the difficulty in identifying dedicated STRs implies that the safest approach is to assume that dedicated STRs remain in the CMHC rental count.)

Between 2018 and 2019, the City of Vancouver as a whole saw an 740-unit increase, more than half of which occurred in Southeast Vancouver. In a zone like Downtown, where there is a high concentration of STR operations and a growth in housing loss, the zone's net rental housing change is greatly affected by new STR conversions in 2019. In almost every single of the ten CMHC zones (shown in Figure 9), new STR conversions in 2019 either mostly cancelled out new rental housing production, or substantially decreased the net rental housing supply from 2018 to 2019.

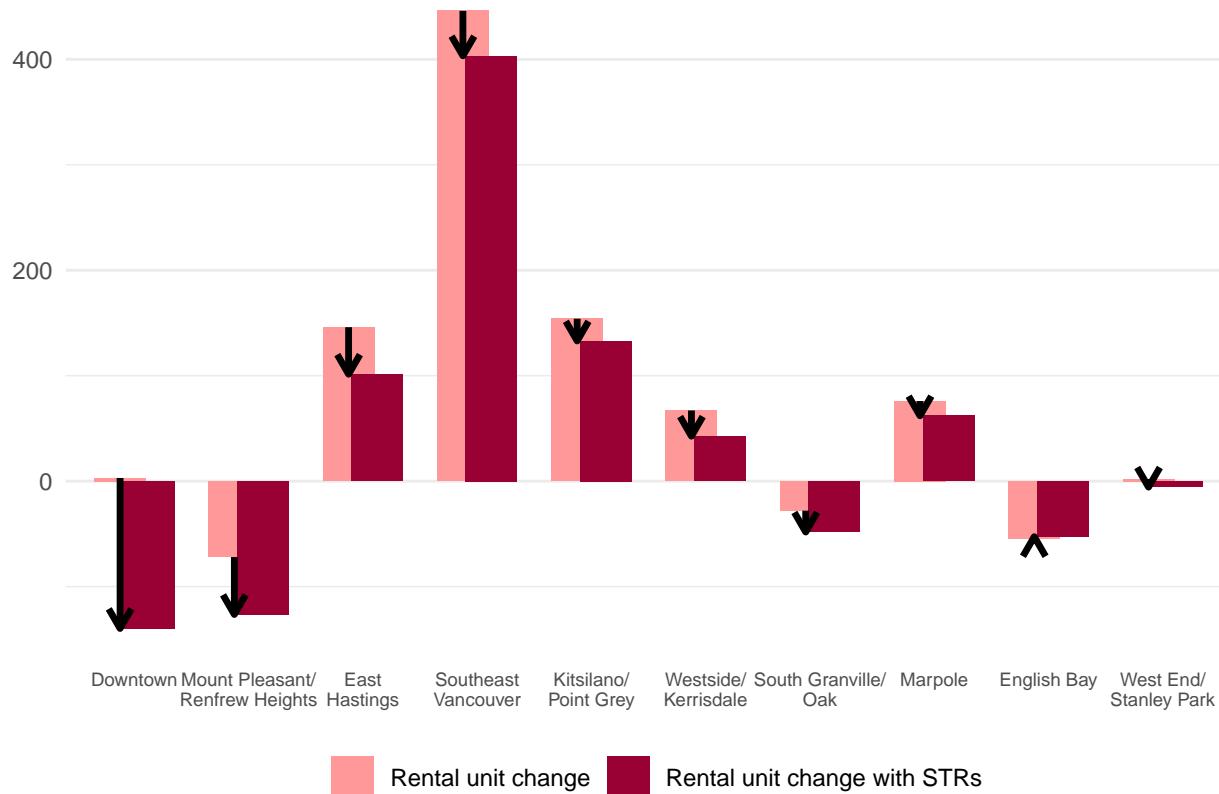


Figure 9: *Nominal and effective changes in rental housing supply, 2018-2019, by CMHC zone*

Another way to contextualize the impact of housing units being converted to dedicated STRs is to examine the relationship between the quantity of dedicated STRs and the rental vacancy rate. The left panel of Figure 10 displays the 2019 rental vacancy rate in the 10 CMHC zones with the largest number of active STR listings. The right panel displays a hypothetical vacancy rate if all dedicated STRs returned to the long-term market in these neighbourhoods. As with the calculations of net housing supply changes above, we assume that these units return to the market in the same proportion as existing tenure arrangements in the neighbourhood. The map shows that, in virtually every zone, the number of dedicated STRs is enough to dramatically increase housing supply if they were to be returned to the housing market. In every zone, the vacancy rate could double.

To be clear, in a scenario where thousands of dedicated STRs returned to the long-term market, these units would not actually remain vacant, but would be absorbed into the rental housing supply. Eventually the

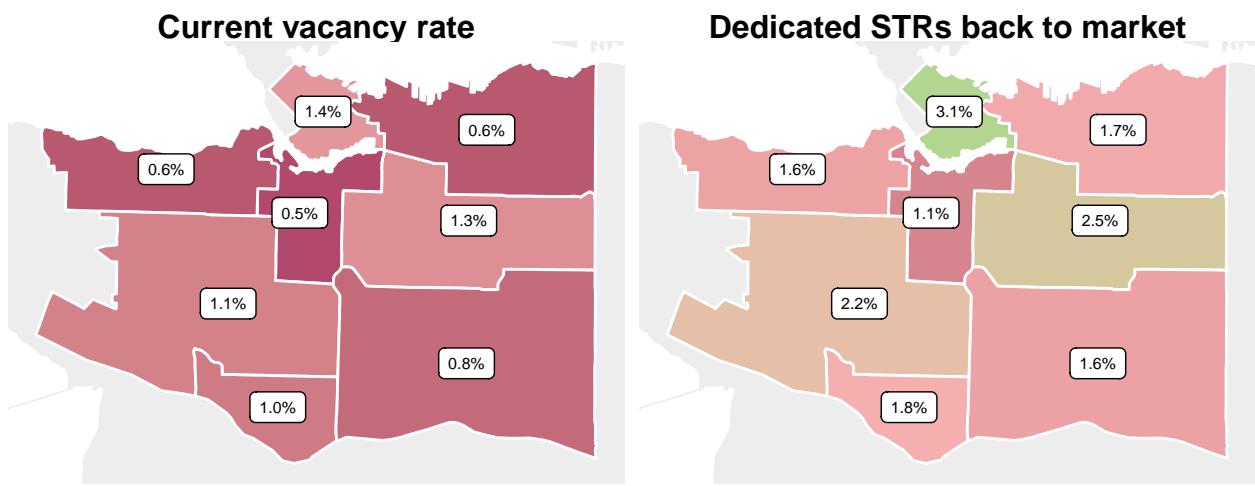


Figure 10: *Current rental vacancy rate in the City of Vancouver (L), and hypothetical vacancy rate if dedicated STRs returned to rental market (R), by CMHC zone*

Table 6: STR impacts on residential rents in the City of Vancouver, by CMHC zone

CMHC Zone	Active listings (2019)	Avg. rent (2015)	Avg. rent (2019)	Rent increase (2015-2019)	STR-induced rent increase (2015-2019)	STR share of rent increase	Avg. extra rent paid due to STRs (2015-2019)
City of Vancouver	3,890	\$1,240	\$1,570	27.0%	2.1%	7.7%	\$1,390
Downtown	1,060	\$1,360	\$1,730	27.3%	2.1%	7.7%	\$1,590
Mount Pleasant/Renfrew Heights	620	\$1,080	\$1,380	28.1%	1.8%	6.5%	\$1,090
East Hastings	560	\$1,000	\$1,320	31.8%	1.8%	5.8%	\$1,030
Southeast Vancouver	490	\$1,120	\$1,520	35.8%	2.6%	7.2%	\$1,550
Kitsilano/Point Grey	390	\$1,280	\$1,660	29.2%	1.9%	6.4%	\$1,350
Westside/Kerrisdale	350	\$1,390	\$1,770	27.0%	3.0%	11.2%	\$2,220
South Granville/Oak	230	\$1,260	\$1,540	21.9%	1.9%	8.7%	\$1,350

result would be a combination of lower rents and a vacancy rate lower than depicted in the map but higher than the current vacancy rate. Nevertheless, Figure 10 demonstrates that the number of housing units which have left Vancouver’s long-term market to be operated as STRs is sufficient to significantly constrain housing availability in the city.

2.3 The impact of STRs on residential rents

Residential rents are rising rapidly in Vancouver. Between 2018 and 2019, CMHC recorded a 6.0% increase in average rents in the City of Vancouver, with even higher numbers for studios and 1-bedrooms—increases which far outstripped inflation or local income growth. Are STRs responsible for any of this growth in rents? STRs could plausibly affect rents in the long-term housing market through two channels. On the one hand, if housing units which otherwise could house residents are converted into tourist accommodations, this will shrink the size of the local rental market, which, in the face of constant demand, will result in higher rents. Second, by offering a new revenue stream to homeowners and potentially some tenants who are willing to become part-time home sharers, STRs can increase the economic value of residential properties. Both phenomena would be expected to increase housing costs and rents, since there is less available housing stock, and since the economic potential of the existing stock is increased.

A US study evaluated the impact of STR growth on housing prices and rents using an analysis of STR listings across the United States from 2012 to 2016 (Barron et al. 2017). The researchers found that 1% growth in the number of STR listings predicts a 0.018% increase in monthly rents and 0.026% increase in house prices. While these numbers may seem small, they were multiplied by STR listing growth rates, which had been quite high over the study period. This model was developed to account for a wide range of locations, so we are able to apply the average values of their model to Vancouver to obtain a rough estimate of the impact which STR growth has had on residential rents. Between 2015 and 2019, we estimate that STRs have been responsible for a -2.1% increase in the average monthly rent. As average rents have risen 33.3% in this time period, this implies that approximately -6% of the total rent increases over the last five years have been caused by the growth of STRs. Put differently, from 2015 to 2019, the average renter household in Vancouver has paid an additional \$1,390 in rent because of the impact of STRs on the housing market. Figure 11 shows the estimated rent increases by CMHC zone, for the zones where enough data is present to make reliable calculations. Table 6 summarizes our rent increase estimates and other related data by CMHC zone. (These results, along with those in the previous paragraph, should be interpreted as rough estimates, as the parameters of the model were developed in the United States.)

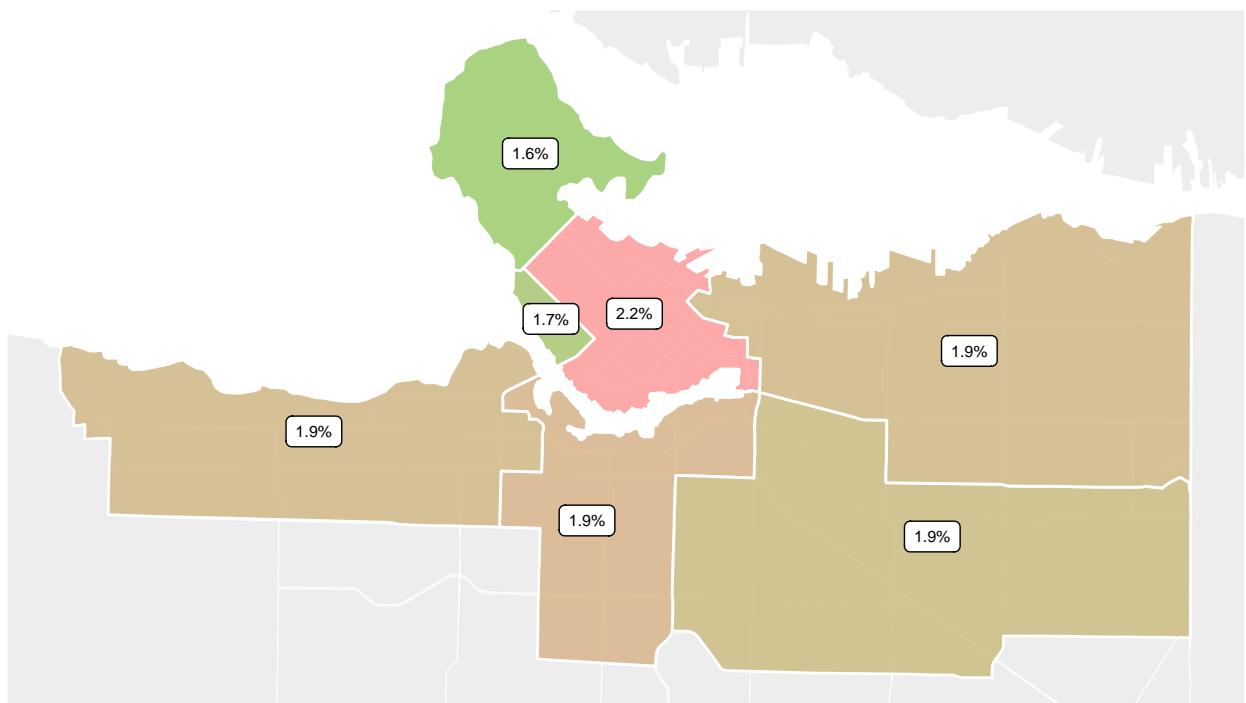


Figure 11: *Estimated cumulative asking rent increases in the City of Vancouver, by CMHC zone*

3 Short-term rentals in Vancouver: Regulatory impacts

The 2018 implementation of the City of Vancouver’s STR licensing system created a one-time negative shock in the number of STR listings in Vancouver, which was disproportionately concentrated among listings which were present on STR platforms but not actively being rented. The longer-term impact of the regulations on the number of active STR listings in Vancouver plausibly ranges from between 600 and 1,510 listings removed, or 14.2% to 35.8% of the total number of listings. The plausible range for the longer-term impact on commercial listings is between 80 and 980 commercial listings removed, or 3.0% to 35.0% of the total commercial listings. Comparisons with other jurisdictions uniformly suggest that the real impact of the City’s STR regulations is at the higher end of the trend analysis scenarios. Among commercial STR operations, multilistings have been particularly constrained by the City’s regulations, while dedicated FREH listings have grown less than they otherwise would have, but at something closer to the rate expected in the absence of regulations. We estimate that the City’s regulations have returned between 300 and 500 units of housing to the long-term market.

3.1 The City of Vancouver’s STR regulations

In April 2018, the City of Vancouver enacted regulations on the operations of short-term rentals in the City, defined as rentals offered for thirty or fewer consecutive days (City of Vancouver, 2020a). Under these regulations, each STR operator is required to obtain a license for their rental unit; these licenses are only issued for STRs operated out of a host’s principal residence, and are valid for a single calendar year. Licensed listings can either be the entire principal residence or individual rooms within the residence. Although the regulations apply to STRs listed on any platform, Airbnb is the only STR platform that agreed to require hosts in Vancouver to fill out a license field in their online listing, to engage in data sharing, and to undertake operator education (City of Vancouver, 2020b). In August 2018, shortly before the City’s announced start date for enforcement of the registration system, Airbnb removed approximately 2,400 listings which had not received licenses.

The regulations put in place by the City significantly constrain the type of STRs which are permitted to be operated in Vancouver. In particular, what we define as “multilistings” (listings operated by hosts who are simultaneously operating other listings) are by definition non-compliant, since multiple different listings cannot be simultaneously operated out of a principal residence. Moreover, frequently rented entire-home (FREH) listings are also highly likely to be non-compliant, since listings which are operated the majority of the year would be unlikely to also be a valid principal residence (excepting rare cases of very frequent travellers, for example).

In what follows we assemble evidence about the of the City’s regulations on the STR market. Given the significant restraints which the regulations impose on the market, their impacts should be highly visible if the regulations have been effective. If, by contrast, few impacts can be discerned, that implies that the regulations have not been effective. We carry out this task by analyzing the trajectory of STR activity in the City of Vancouver over time, and by comparing the City with a set of peer jurisdictions. This analysis collectively demonstrates that the City’s STR regulations have been effective at reducing STR activity and growth in Vancouver, and have accomplished that reduction in part by driving incoming visits to other municipalities within Metro Vancouver. However, the most significant impacts of the regulations were relatively short lived: both total active listings and commercial listings returned to pre-regulation levels within a year of the regulations being implemented.

3.2 The trajectory of post-regulation STR activity in Vancouver

The impact of the City’s regulations can be directly measured in two ways: changes in the total number of listings on STR platforms in Vancouver, and changes in commercial listings which are highly likely to

be non-compliant. Because all Vancouver STR listings are required to be licensed whether or not they are active, in Figure 12 we show the total number of listings displayed each day alongside our standard metric of active daily listings. Displayed listings comprise active listings (i.e. listings which are either reserved or available for reservation) and inactive (blocked) listings which are visible on Airbnb or VRBO. Both indicators show a sharp drop following Airbnb's mass removal of non-licensed listings in August 2018, but the decline is proportionally twice as large for displayed listings, which decreased 30.8% from August 20 to September 7, as it is for active listings, which decreased 17.8% over the same date range. Furthermore, displayed listings have never come close to regaining their pre-regulation numbers in Vancouver, while active listings had mostly recovered by the summer of 2019, a year after Airbnb's mass removal. Put differently, a disproportionate share of the large decline in STRs which followed Airbnb's mass removal was listings which were not actually in use on the platform anymore.

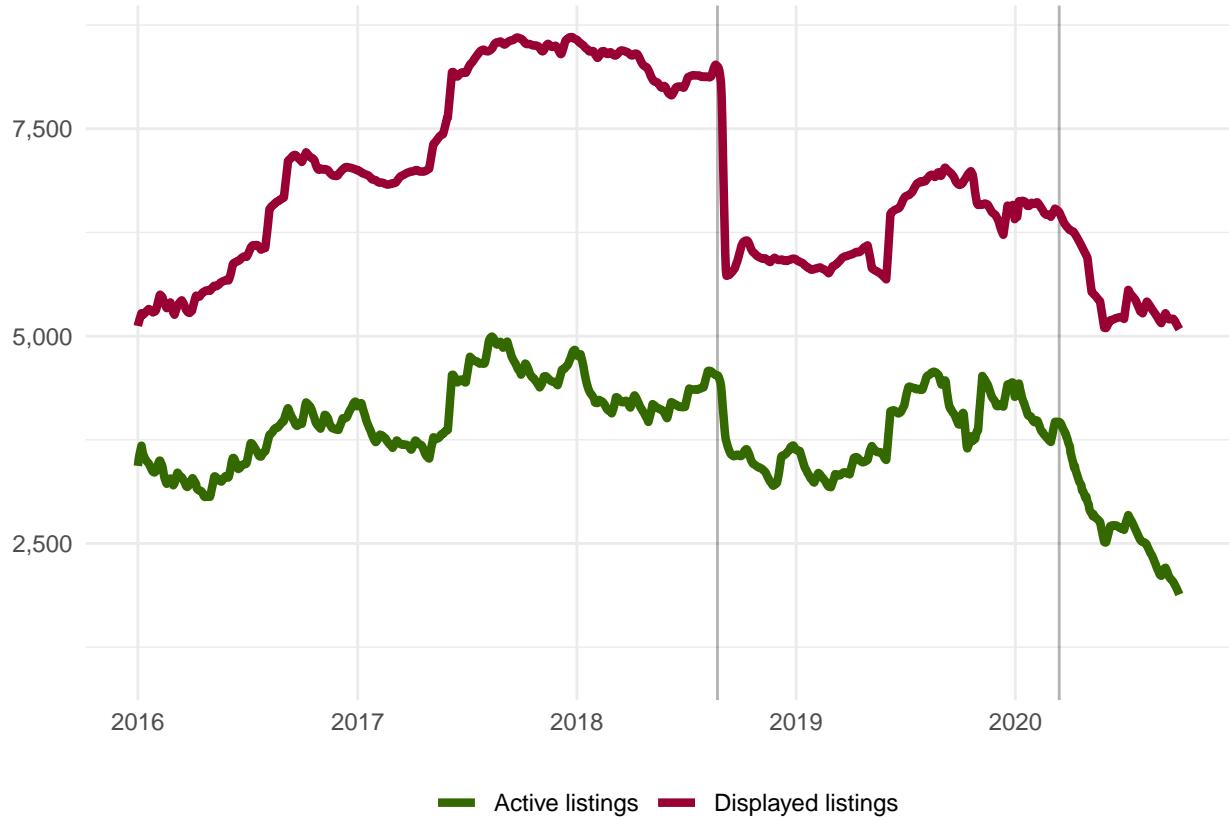


Figure 12: *Displayed and active listings in the City of Vancouver (7-day average)*

Trend analysis allows for a more precise estimate of the impact of regulation on active listings. Figure 13 compares the actual number of active listings with two scenarios for the listings which would have been expected based on pre-August-2018 trends. The higher, red line is a scenario where the growth rate of active listings from the previous two years continued into 2019. The lower, blue line is a scenario where aggregate growth in active listings stops, although seasonal variation continues. These two scenarios represent the plausible upper and lower bounds for what “natural” STR listing growth in Vancouver might have looked like in the absence of regulations. (As the subsequent section discusses, the continued-growth scenario is similar to Toronto’s actual STR market trajectory, while the no-growth scenario is similar to Montreal’s STR market trajectory.)

What Figure 13 demonstrates is that, under either scenario, the City’s regulations have had two different impacts on the number of active listings in Vancouver. The first is a one-time negative shock corresponding to Airbnb’s mass listing removal, which has proven to be temporary. As of mid-2019, active listings had

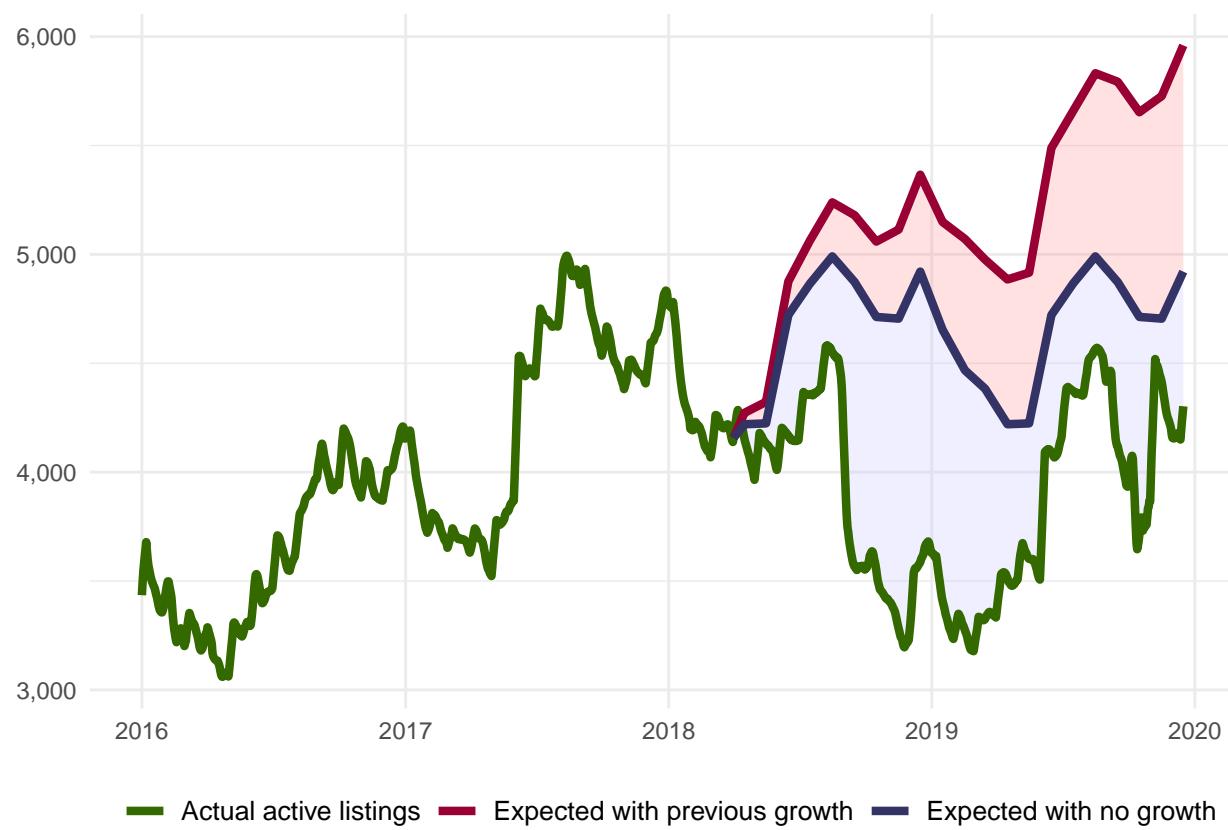


Figure 13: *Actual and expected active listings after implementation of regulations*

recovered to something close to their post-shock level. The second impact is a more durable shift downward in the STR listing growth curve. In the second half of 2019, the average difference between actual active listings and the two no-regulation counterfactuals was 1,510 under the continued-growth scenario, and 600 under the no-growth scenario. Our conclusion is therefore that the City's STR regulations have, in the long-term, resulted in between 600 and 1,510 fewer active listings in Vancouver's STR market each day. These numbers represent between 14.2% and 35.8% of the total number of active STRs in the city.

Since the 2018 regulations do not prohibit short-term rentals but merely limit them to hosts' principal residences, the fact that active listings in Vancouver have been significantly reduced by the regulations is not on its own decisive evidence of the effectiveness of the regulations. A harder to measure—but arguably more important—metric is the number of commercial STRs operating in Vancouver, given that they are necessarily non-compliant with the City's regulations. Figure 14 decomposes the trajectory of active listings shown above (in Figure 12) into commercial and non-commercial listings. The former are all listings which are either frequently rented entire-home (FREH) listings or multilistings. The graph shows that non-commercial listings experienced a noticeable drop when Airbnb carried out its August 2018 mass listing removal, but that the number of these listings was already in decline. The quantity of commercial listings, meanwhile, experienced a much sharper drop in August 2018 (21.6% of all commercial listings were removed by Airbnb) and continued to decline for the rest of 2018. Commercial operations recovered throughout 2019, however, and reached a new all-time high (3,090) by the end of 2019.

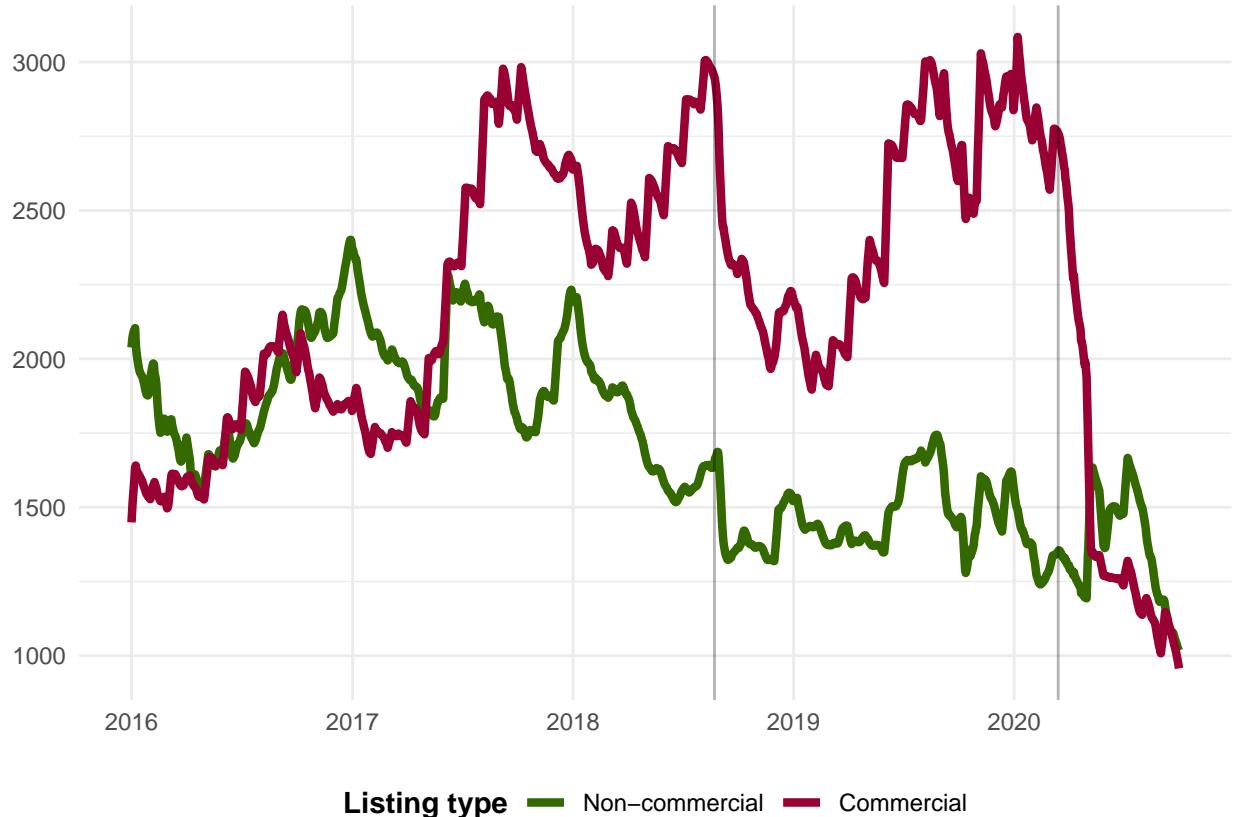


Figure 14: *Non-commercial and commercial active daily listings in Vancouver (7-day average)*

Figure 15 offers a closer look at how the actual number of commercial listings compares with two scenarios where the mid-2018 regulations are not enacted: a growth-as-usual scenario where the growth trend from the previous two years continues, and a no-growth scenario where commercial growth had stopped by the time that the City's regulations were enacted. Unlike the trend analysis of all active listings, above, where under both scenarios the regulations are likely to have substantially reduced the number of daily active listings,

the effect of the City's regulations on commercial listings is highly sensitive to the scenario chosen. In the second half of 2019, the average difference between actual commercial listings and the two no-regulation counterfactuals was 980 under the continued-growth scenario, and 80 under the no-growth scenario. This is an enormous, twelve-fold difference. Under the assumption that commercial listing growth would have continued on its pre-regulation trend, we estimate that regulations have reduced the number of commercial operators by 35.0%. But under the assumption that commercial listing growth had leveled off when the regulations were introduced, we estimate that the City's regulations have only reduced the number of commercial operators by 3.0%. Applying the same modelling to the narrower question of FREH listings implicated in housing loss, we estimate that the City's regulations have reduced the number of housing units converted to dedicated STRs by between 60 in the no-growth scenario and 560 in the continued-growth scenario. This is between 3.6% and 32.7% of the total amount of housing units we estimate have been converted to dedicated STRs.

To be clear, however, the correct value for the "actual commercial listings" line in Figure 15 should be zero, given that all non-principal-residence STRs are forbidden under Vancouver's regulations. Even allowing for some error in the measurement of commercial operators, at the end of 2019 there were almost certainly 2,500 or more listings operating in violation of the City's principal residence rules.

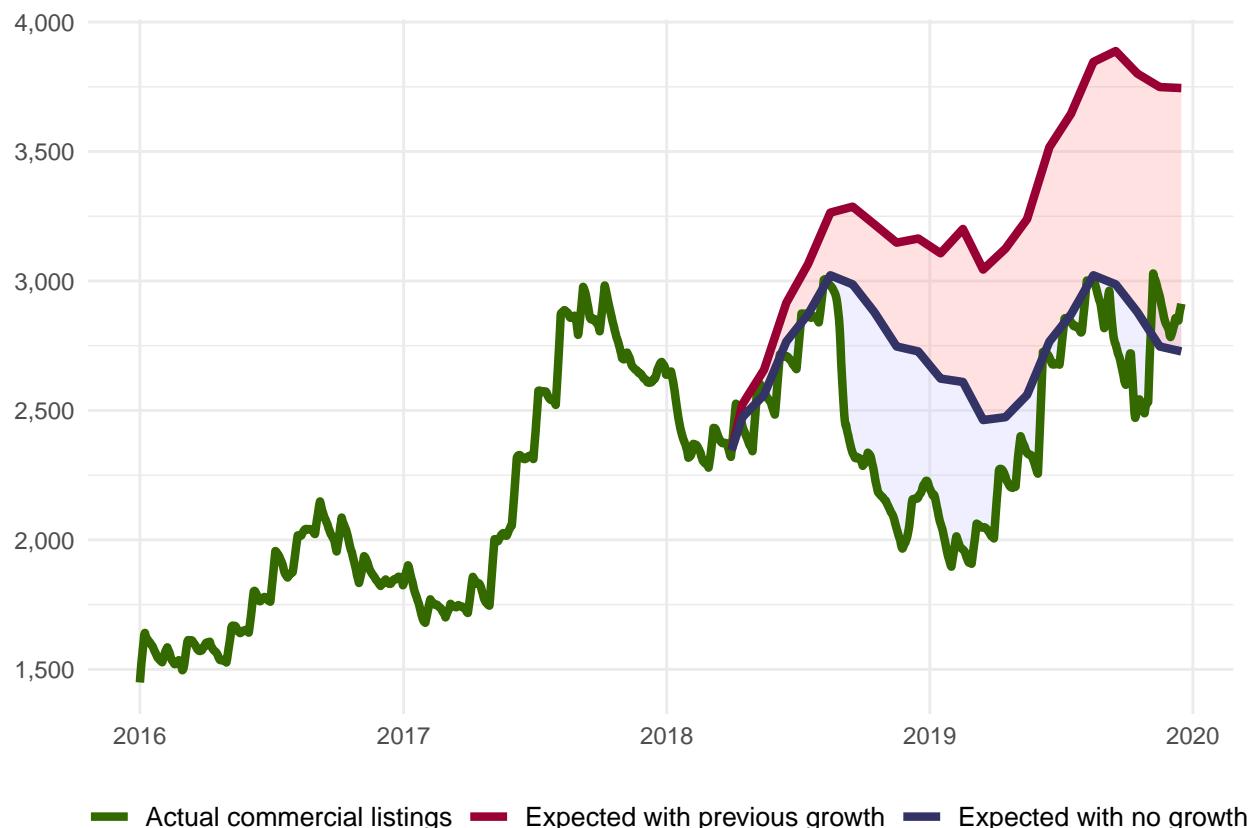


Figure 15: *Actual and expected commercial listings after implementation of regulations*

3.3 The City of Vancouver in comparison with Montreal and Toronto

The preceding analysis varies significantly with the underlying assumptions being made about the growth of Vancouver's STR market prior to the introduction of the City's regulations. If we assume that growth would have continued along its previous trajectory, then the regulations have had a major impact on the number of active listings, and in particular on the number of commercial operations. If growth were already

leveling off prior to the introduction of the regulations, by contrast, then it is likely that the regulations have somewhat reduced the number of active listings, but have been ineffective at targeting the commercial operations which are not permitted under the rules.

There is no way to determine with certainty which of these scenarios would have occurred, but a promising strategy is to compare Vancouver with a set of similar jurisdictions which did not regulate their STR markets in mid-2018. In what follows we do this at multiple spatial scales, beginning with the other two largest STR markets in the country: Toronto and Montreal. The City of Toronto has recently implemented mandatory host registration and a principal-residence requirement which are very similar to Vancouver's rules, but these were not active during the study period. The City of Montreal has rules which vary across the city, but in the key central-city boroughs commercial short-term rentals are largely forbidden. However, with no registration system in place during the study period, it has been widely understood that Montreal's enforcement mechanisms have not been sufficiently strong to significantly affect the operation of commercial STRs. Toronto and Montreal thus represent zero- or low-regulation cases with which to compare Vancouver.

Figure 16 compares the active listing (left), FREH listing (middle), and multilisting (right) trajectories in Montreal, Toronto and Vancouver. (Commercial listings are disaggregated into FREH listings and multilistings in order to clarify the key patterns.) The figure lends significant weight to the conclusion that Vancouver's STR regulations have significantly reduced the commercial portion of the STR market. The left panel demonstrates that the growth trajectory of active listings in Vancouver was on a very similar trajectory to Montreal and Toronto prior to 2018. In 2018 the three cities diverged, with listings in Vancouver plummeting in response to the new registration system, listings in Toronto continuing to grow quickly, and listings in Montreal beginning a long period of stagnation and decline. By the end of 2019 Vancouver's active listings had caught up to Montreal's in relative terms (in both cases with total numbers similar to the beginning of 2017), but were far behind Toronto's, which grew by more than 50% from 2017 through 2019. Montreal was the first Canadian city to have a large STR market, driven by a combination of strong tourism and cheap housing (which incentivized conversions to STRs), and it has followed a trajectory comparable to other large tourist destinations—early growth then stagnation. Toronto and Vancouver began their periods of growth somewhat later, probably due in large to much higher housing prices. Toronto thus represents the most likely counterfactual for how Vancouver's STR market would have evolved in the absence of regulations. Over the second half of 2019, Toronto had on average 38.9% more active listings than Vancouver, relative to each city's market size on January 1, 2017. In 2017, by contrast, the difference was only 1.0%. This tends to support the higher end of our 14.2-35.8% estimate for the impact of the City of Vancouver's regulations on the number of active STR listings.

The divergence between Vancouver and Montreal and Toronto is even more significant with respect to commercial listings, which were prohibited by Vancouver's regulations but were either de jure (Toronto) or de facto (Montreal) permitted in the other cases. The center and right panels of Figure 16 show, respectively, the trajectory of FREH listings and multilistings in the three cities. In both cases the three cities were on highly similar growth trajectories through 2017. Montreal's FREH listings were growing at a 11.9% higher rate than Vancouver, while Toronto's FREH growth rate was identical to Vancouver's. Montreal's multilistings were growing at a 6.9% higher rate than Vancouver, while Toronto's were growing 1.6% faster. In the second half of 2019, by which point the temporary impacts of Airbnb's mass listing removal in Vancouver would have subsided, the commercial side of Vancouver's market looked dramatically different from either Montreal or Toronto. Montreal's FREH listings had grown 29.5% faster than Vancouver's, while Toronto's had grown an incredible 51.4% faster. The numbers are similar for multilistings: Montreal outpaced Vancouver by 18.4%, and Toronto outpaced Vancouver by 40.9%.

These differences are summarized in Table 7. They strongly support the conclusion that the City of Vancouver's regulations have durably reduced the commercial part of Vancouver's STR market. Our "growth-as-usual" counterfactual had suggested that the regulations might have reduced commercial operators by 35.0%. Comparison with Montreal and Toronto adds additional evidence suggesting that this estimate is plausible.

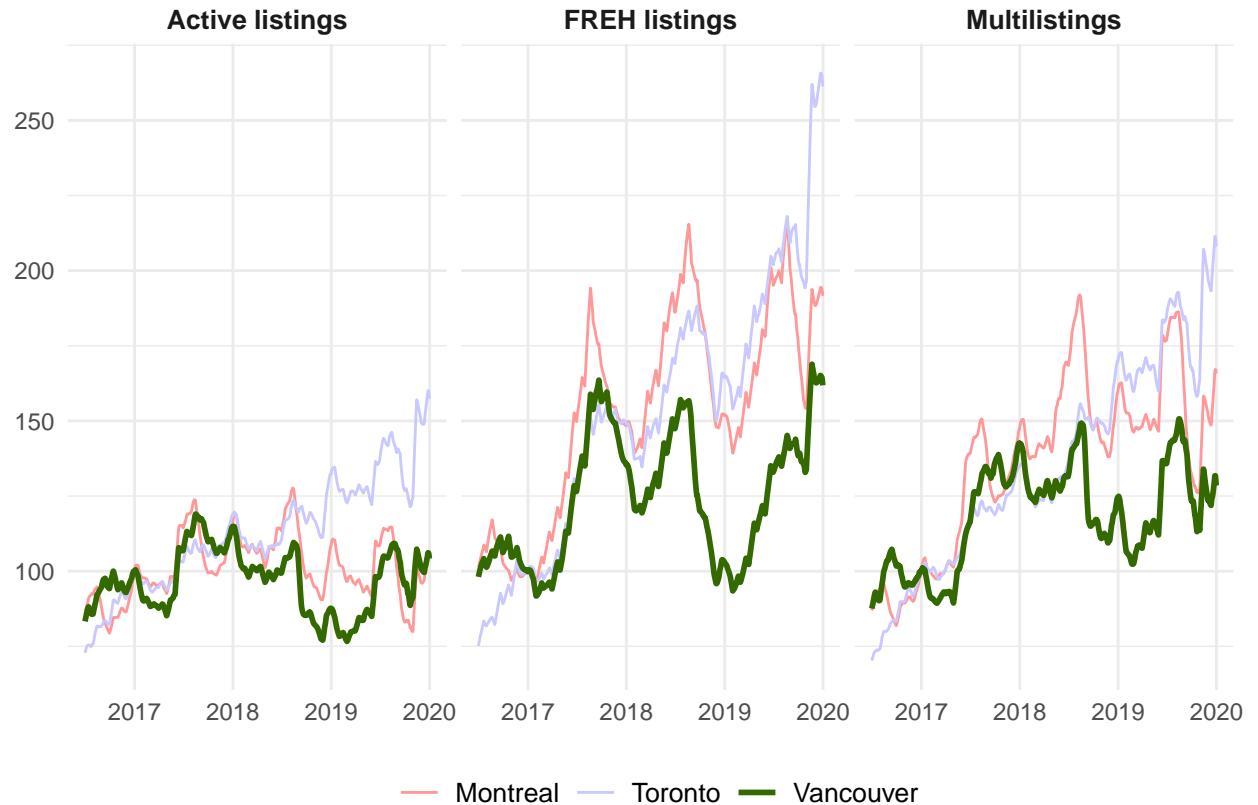


Figure 16: *Active listings* (L), *FREH listings* (C), and *multilistings* (R) in Montreal, Toronto and Vancouver (2017-01-01 = 100)

Table 7: Montreal and Toronto listing trajectories in comparison with Vancouver (values are the growth rates since 1 January 2017 relative to Vancouver's growth rates in the same time period)

City	Time period	Active listings	FREH listings	Multilistings
Montreal	2017	2.3%	11.9%	6.9%
	2019 (2H)	-3.0%	29.5%	18.4%
Toronto	2017	1.0%	0.0%	1.6%
	2019 (2H)	38.9%	51.4%	40.9%

3.4 The City of Vancouver in comparison with the rest of the Vancouver region

Another point of comparison for assessing the impact of the City's STR regulations is the rest of Metro Vancouver. While many visitors to Vancouver will be determined to stay within the City itself regardless of price or availability, others will be more flexible. So if the City's regulations have reduced the prevalence of commercial STRs, we should expect to see some redistribution of STR activity to neighbouring municipalities. We test this possibility by comparing the City of Vancouver with the remainder of the Vancouver Census Metropolitan Area (CMA), which is roughly coterminous with Metro Vancouver (Figure 17).

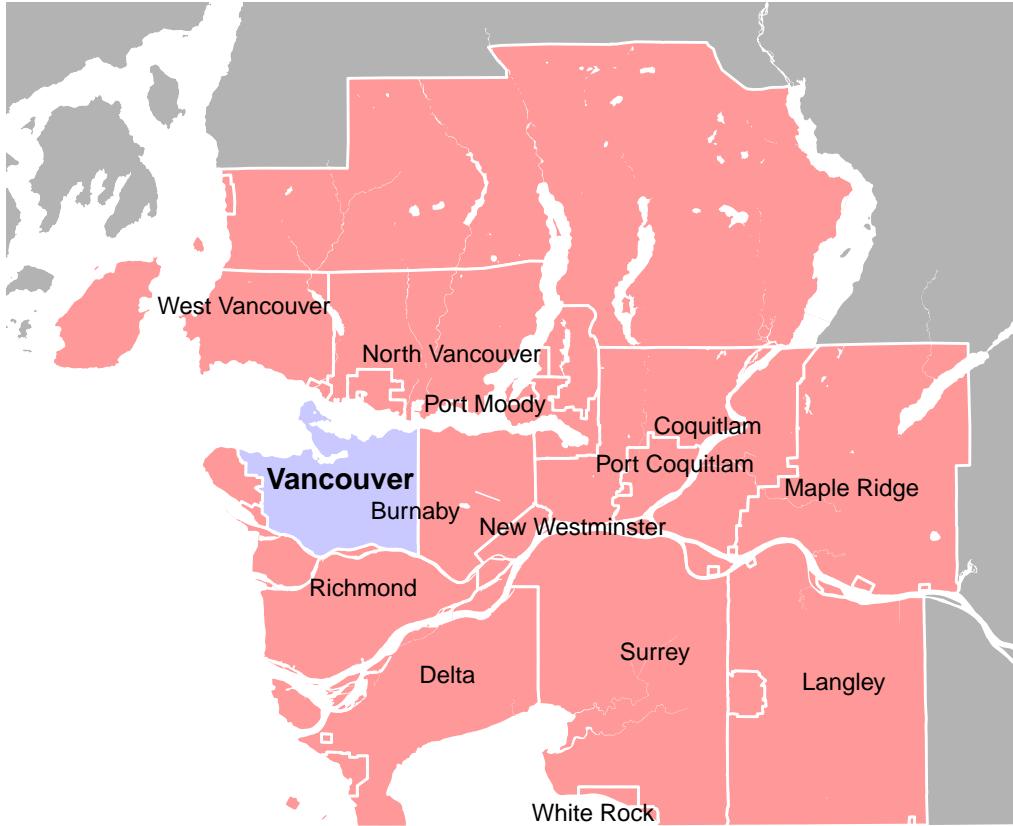


Figure 17: *The Vancouver Census Metropolitan Area (CMA)*

STR activity in the outlying municipalities of the Vancouver CMA is mostly concentrated in the cities of Richmond, Burnaby and Surrey, and there are substantial differences between the STR markets of the City of Vancouver and the these outlying municipalities. For example, the median listing in the City of Vancouver earned \$7,200 in 2019, while the median listing in the rest of the CMA earned \$5,800. However, examining the relative trajectories of listing growth since 2017, as was done above with Toronto and Montreal, provides additional context for the drop in active and commercial listings experienced in the City of Vancouver since mid-2018.

Figure 18 shows the relative trajectories of active listings, FREH listings, and multilistings for the City of Vancouver and the rest of the Vancouver CMA since 2017. It demonstrates dramatic and widening divergences between the two geographies. While throughout 2017 active listings were already growing 7.7% faster in the rest of the CMA than in Vancouver, by the second half of 2019 the difference was 77.2%. FREH listings and multilistings reveal even larger divergences, from 12.6% to 113.2% for FREH listings and from -1.6% to 63.1% for multilistings.

How much of this divergence can be explained by Vancouver's STR regulations? At least some of the

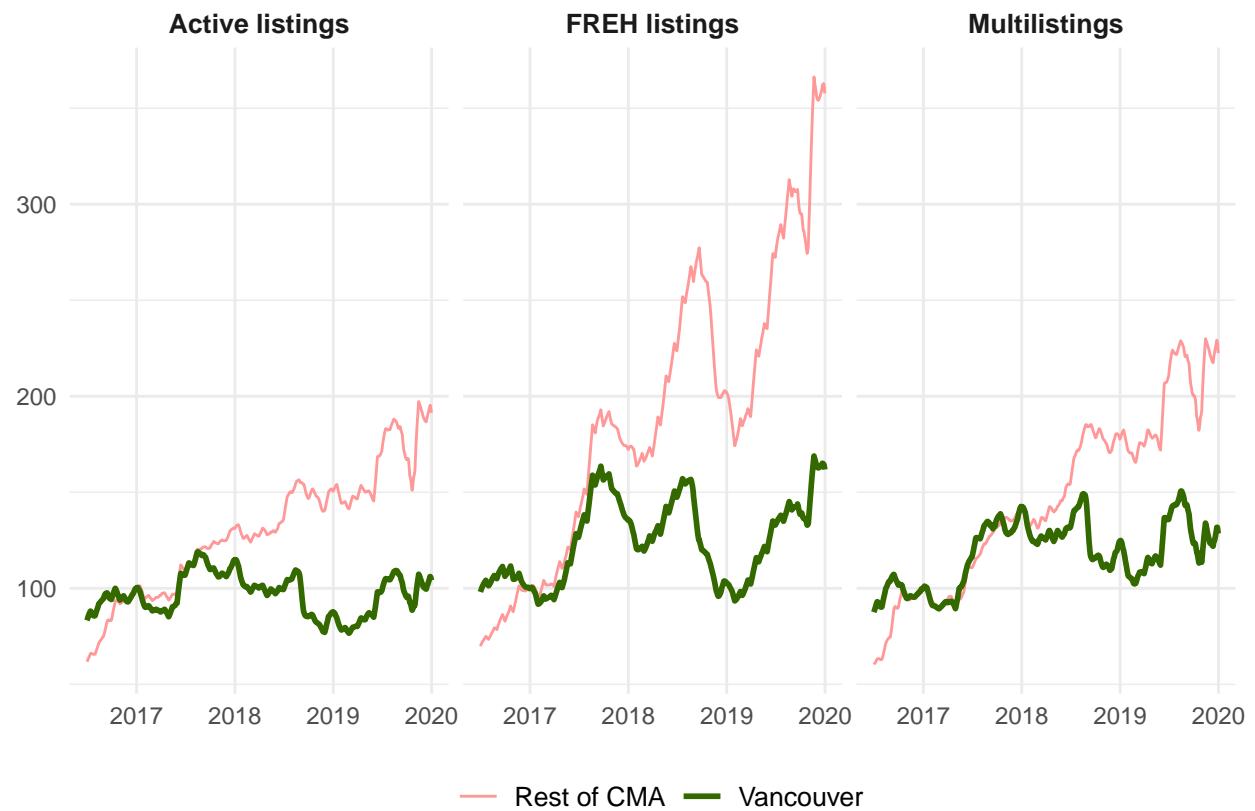


Figure 18: Active listings (L), FREH listings (C), and multilistings (R) in the City of Vancouver and the rest of the Vancouver CMA (2017-01-01 = 100)

Table 8: Vancouver CMA listing trajectories in comparison with the City of Vancouver (values are the growth rates since 1 January 2017 relative to the City of Vancouver’s growth rates in the same time period)

Time period	Active listings	FREH listings	Multilistings
2017	7.7%	12.6%	-1.6%
2018 before listing takedown	31.0%	45.5%	11.5%
2018 after listing takedown	73.7%	107.0%	52.5%
2019 (2H)	77.2%	113.2%	63.1%

divergence was already underway by the time the City implemented its new rules, and in particular by the time that Airbnb undertook its mass removal of listings in August 2018. However, the divergence between Vancouver and the rest of the region widened significantly after August 2018—from 31.0% to 73.7% for active listings, from 45.5% to 107.0% for FREH listings, and from 11.5% to 52.5% for multilistings (Table 8). This suggests that the regulations were an important (although not exclusive) force shifting STR activity from the City of Vancouver to outlying municipalities.

Another way to examine the relationship between the City of Vancouver and the rest of the CMA is to compare the proportion of total regional active listings, FREH listings and multilistings located in the central city with the same proportion in the Montreal and Toronto regions. Figure 19 shows this comparison, and makes clear that Vancouver’s STR market has long had an atypical relationship with that of its surrounding municipalities. In Montreal and Vancouver, the central city dominates the regional STR market in terms of total active listings, and on top of that has disproportionately high shares of FREH listings and multilistings. While in both cases outlying municipalities are slowly increasing their share of the regional market, as of the end of 2019 the central cities still had between 75% and 90% of the regional share of the various listing types. Vancouver had both a substantially lower share of its regional STR market in 2016 (where the graph begins) and a much sharper decrease in regional share across all listing categories. The fact that more STR activity would be located in outer municipalities of the Vancouver region than in Montreal or Toronto is not surprising, given that the City of Vancouver makes up a much smaller part of its CMA than the other two cities. But the fact is that Vancouver’s declining share of regional STR activity began well before the City’s regulations were put into place. At the same time, the City’s share of regional STR activity drops noticeably in 2018, and the drop has proven to be durable. These facts suggest that the City’s 2018 regulations accelerated a shift of STR activity from Vancouver to the neighbouring municipalities that was already underway. It is also notable that Vancouver now has a much smaller share of the region’s multilistings than it does of active listings as a whole, but that it has a *higher* share of FREH listings than it does of active listings as a whole. This pattern indicates that Vancouver’s registration system has discouraged hosts from operating multiple listings simultaneously—a *prima facie* violation of the principal residence requirement—but that the system has not proven as effective at deterring full-time operation of a single listing, which is equally prohibited under the rules but arguably harder to detect.

3.5 The eastern edge of the City of Vancouver in comparison with the western edge of the City of Burnaby

We conducted a final comparison at a smaller scale designed to directly assess the impact of the City’s regulations on STR growth trajectories, by examining listings lying within one kilometre of the Vancouver-Burnaby border, in both Vancouver and Burnaby. Listings located in the study zone on either side of the Vancouver-Burnaby will be highly comparable from a visitor’s perspective. The only significant difference between these listings is that some are located in the City of Vancouver, and are subject to its regulations, while some are located in the City of Burnaby, and are not. (We conducted an additional analysis of listings within walking distance of SkyTrain stations on both sides of the Vancouver border to reduce non-regulatory variations between listings even more, but the results were very similar to this analysis, so we have not presented them.) If listings in the study zone on the Vancouver side of the border display growth trajectories similar to their counterparts on the Burnaby side, this implies that the City’s regulations are not meaningfully

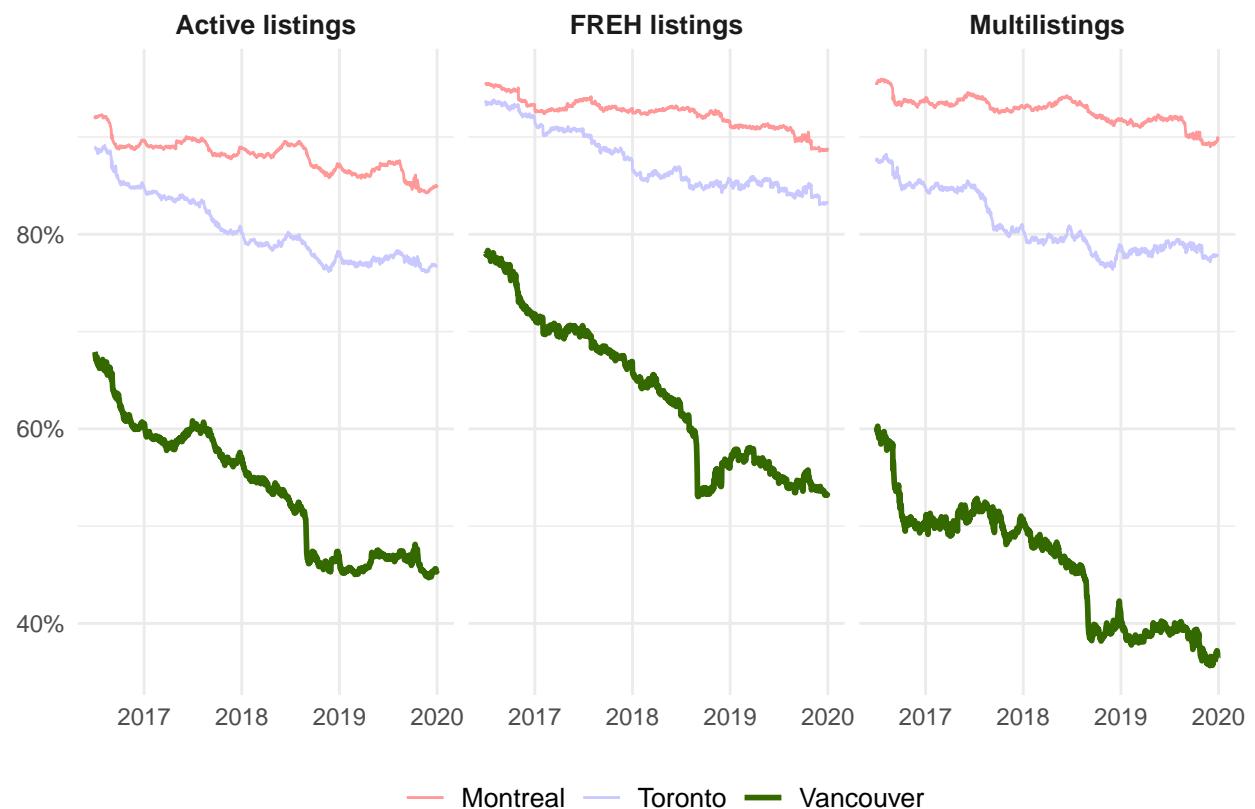


Figure 19: *The share of active listings, FREH listings and multilistings in the central city of the Montreal, Toronto and Vancouver CMAs*

constraining STR operators in Vancouver. By contrast, if listings in the study zone on the Vancouver side of the border display growth trajectories dissimilar to their counterparts on the Burnaby side but similar to the rest of the City of Vancouver, this implies that the City's regulations are have a significant impact.

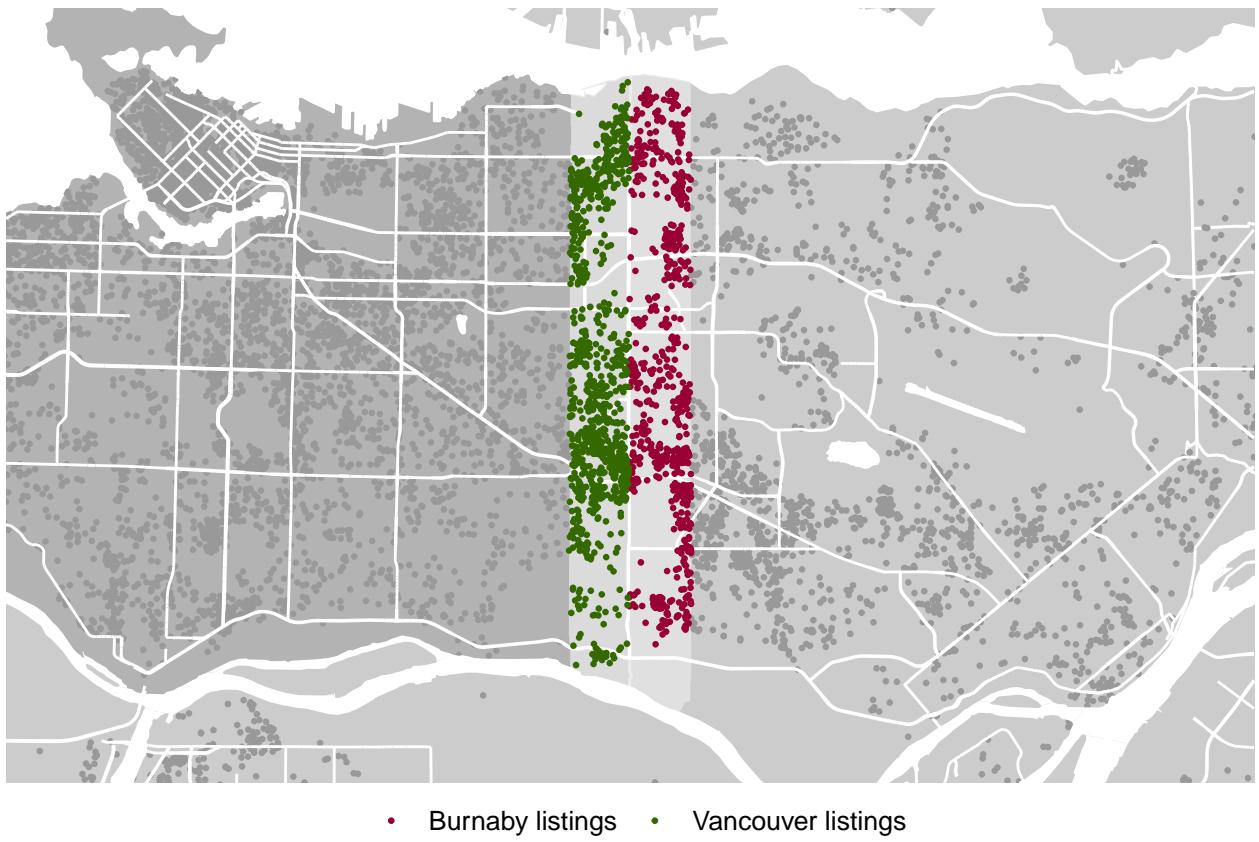


Figure 20: *Study area for comparison: a 1-km strip on either side of the Vancouver-Burnaby border*

The results of the comparison, shown in Figure 21 are highly illuminating. Listings located in Vancouver but near the border with Burnaby have been on a growth trajectory which resembles nearby listings in Burnaby in some respects, and which resembles the rest of the City of Vancouver in others. First of all, growth trajectories across all listing types have been significantly lower in the Vancouver border listings than the Burnaby border listings since the implementation of the City's STR regulations in 2018. This provides clear and compelling evidence that the regulations have reduced STR activity. However, there is a substantial difference between the patterns with respect to FREH listings (dedicated commercial operations) and multilistings (listings operated by a host who is simultaneously operating other listings). Multilistings in the Vancouver border area have grown far less quickly since 2018 than their counterparts in Burnaby, and nearly identically to multilistings elsewhere in Vancouver. But FREH listings in the Vancouver border area have grown extremely rapidly—not as quickly their counterparts in Burnaby, but more than twice as quickly as the rest of Vancouver. Both of these categories of listings will be in violation of the City's principal residence requirement, but multilistings have evidently been much more significantly restrained by the regulations than FREH listings have been. This is the same pattern that the comparison of the City of Vancouver with the rest of the Vancouver CMA revealed.

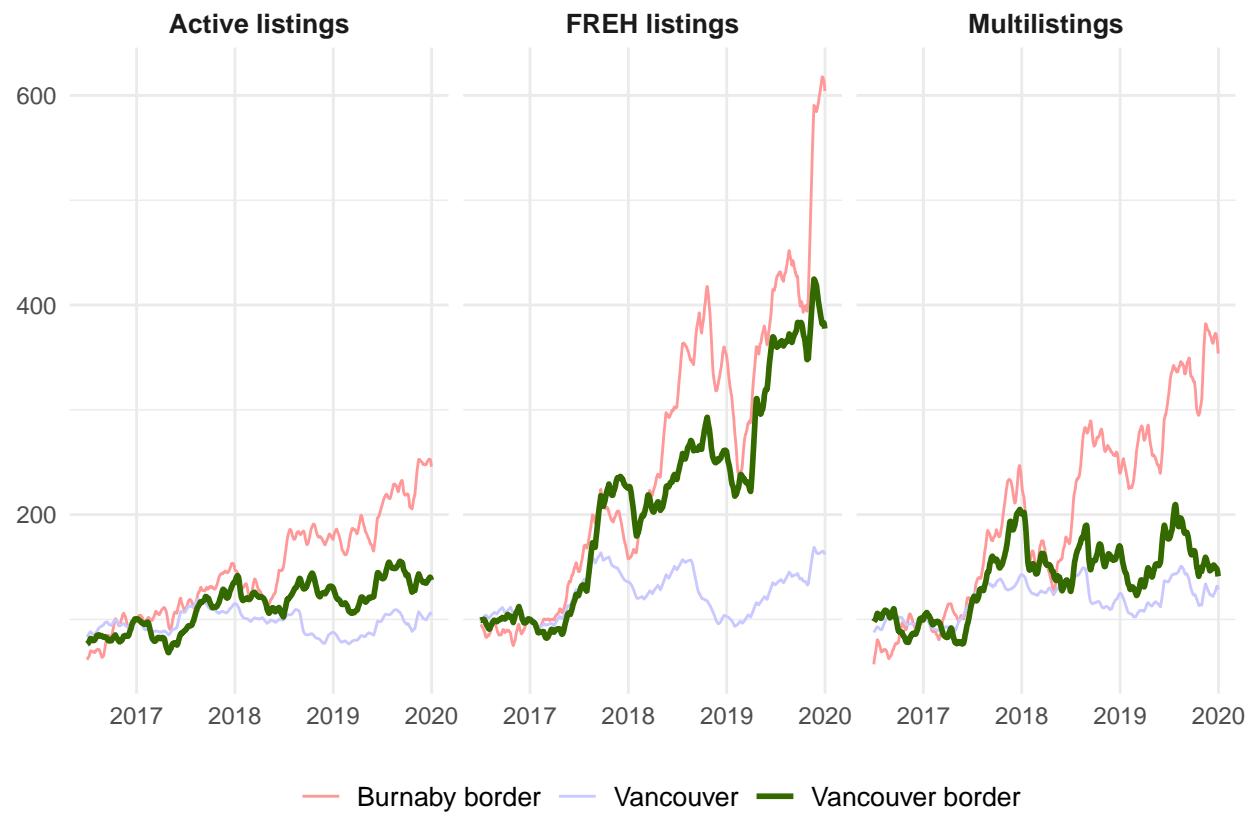


Figure 21: *Active listings (L), FREH listings (C), and multilistings (R) along the Vancouver-Burnaby border (2017-01-01 = 100)*

3.6 Conclusions

This chapter has presented a variety of comparisons designed to isolate the impact of the City of Vancouver’s 2018 STR regulations on Vancouver’s STR market. Across the different comparisons, the following findings emerged:

- The initial implementation of the City’s licensing system and Airbnb’s subsequent mass removal of non-licensed listings created a one-time negative shock in the number of STR listings in Vancouver in mid-2018. But this shock was disproportionately concentrated among listings which were present on STR platforms but not actively being rented, and active listings grew more quickly in 2019 to partially counteract the effects of this shock.
- Trend analysis sets a plausible range for the longer-term regulatory impact on total active listings of between 600 and 1,510 listings removed, or 14.2% to 35.8% of the total number of listings. The plausible range for the longer-term impact on commercial listings is between 80 and 980 commercial listings removed, or 3.0% to 35.0% of the total commercial listings.
- Comparisons with other jurisdictions uniformly suggest that the real impact of the City’s STR regulations is at the higher end of the trend analysis scenarios. Since 2018 Vancouver’s STR market has developed more slowly and in a less commercialized direction than Montreal or Toronto, while a substantial amount of commercial STR activity has relocated to nearby municipalities in Metro Vancouver.
- Comparisons with nearby municipalities suggest that, among commercial STR operations, multilistings have been particularly constrained by the City’s regulations, while dedicated FREH listings have grown less than they otherwise would have, but at something closer to the rate expected in the absence of regulations. This pattern is consistent with the scenario where the City’s licensing system has discouraged hosts from licensing multiple listings, but has failed to discourage hosts from operating single listings in a full-time fashion, despite the fact that both these categories of use are non-compliant with the City’s principal residence requirement.
- Based on the scenario modelling and the results of the jurisdictional comparisons, we estimate that the City’s regulations have returned between 300 and 500 units of housing to the long-term market.

4 Short-term rentals in Vancouver: Regulatory compliance

Throughout 2019, the percentage of STR listings operating with valid STR licenses increased consistently, from 30.7% at the beginning of the year to 77.0% at the end. Among listings active in mid-October 2020, 29.0% were operating with a valid license, 32.2% with an expired license, and 33.7% with an invalid or fake license, or with no license at all. FREH listings had the highest rate of valid licenses (56.9%) among listing categories, although all commercial listings are per se in violation of the City's principal residence requirement. 10.6% of active entire-home listings displayed a license number used by at least one other active entire-home listing, suggesting that license numbers are being shared in violation of the regulations. Non-conforming listings are concentrated in and around Downtown Vancouver; the West End is the area with the highest percentage of non-conforming listings (79.4%). Entire-home listings with license numbers are booked more frequently and earn more revenue than listings without licenses, but there is no substantial difference between listings with valid or non-conforming license numbers, suggesting that STR guests are reluctant to book reservations in listings without a license number.

4.1 How many listings have licenses?

As of mid-2018, all STR operators in Vancouver are required to have a municipal license. This means that all listings displayed on Airbnb and VRBO (with the exception of properties rented exclusively for 30 days at a time or longer, and hotels and other tourist accommodations which are regulated separately) must have a license. For listings currently operating in Vancouver, license numbers are publicly displayed, and below we compare listing activity with license status. However, it is not possible to exhaustively connect past individual listings with past individual licenses in the past, since many listings have been removed from STR platforms. So we instead compare the total number of displayed STR listings to the total number of non-expired licenses to evaluate aggregate compliance levels in Vancouver.

Figure 22 shows the total number of listings that were displayed on the Airbnb platform on a given day in comparison with the number of non-expired STR licenses active on a given day. In a situation of complete regulatory compliance, these two indicators should be close to equal, but in 2019 the number of licenses ranged from 30.7% at the beginning of the year to 77.0% at the end. Because licenses expire on December 31 each year, the license rate plummets at the beginning of each year as many or most listings expire, and then gradually increases as hosts receive new licenses. In 2020 the rate at which hosts acquired STR licenses flattened noticeably after the onset of the Covid-19 pandemic in March. Between March 14 and September 30, only 307 new licenses were issued. but because the total number of displayed STR listings has plummeted, 2020 is on track to see similar license rates by the end of the year as 2019.

4.2 Listing regulatory compliance

In order to analyze regulatory compliance among currently active listings, we scraped all Vancouver listings on the Airbnb website in mid-October (then again at the end of October for verification purposes) and recorded the license number displayed on each listing.

Figure 23 shows the 4,976 listings that displayed on Airbnb in mid-October when we performed our scrape of license numbers. The top row (A) organizes listings by their license status. Out of the total 4,976 listings, 29.0% had a valid license. A further 5.1% claimed to be exempt, and 32.2% had a license which had previously been valid but which had expired. This leaves 33.7% of listings which either had an invalid license number (an entry in the license field which was not in the proper format of YY-####), a fake license number (an entry which was in the proper format but which did not correspond to an actual license number issued by the City), or no license number at all. Commercial STRs (either FREH listings or multilistings) are over-represented among listings which have valid licenses, while listings with expired licenses or no licences

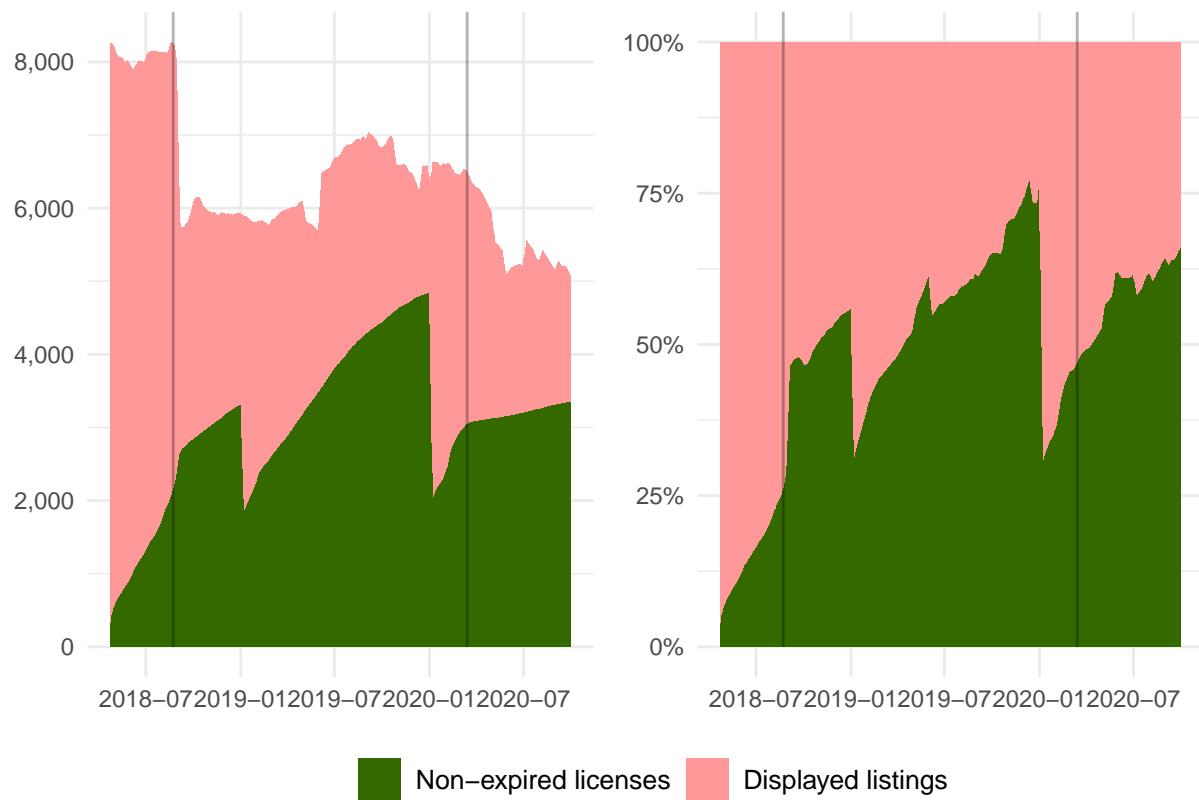


Figure 22: *Displayed STR listings and non-expired STR licenses in Vancouver (7-day average), in absolute (L) and relative (R) terms*



Figure 23: License status and listing status (in September 2020) for listings displayed on Airbnb in mid-October 2020

at all were disproportionately likely to be listings which had not been active on Airbnb in the month of September.

The bottom row (B) of Figure 23 organizes listings by their activity status on Airbnb in the month of September 2020. It demonstrates that FREH listings are the only category of listing for which a majority (56.9%) had valid licenses. To be clear, all commercial operations are per se non-compliant with the City's licensing rules, since a host cannot operate a frequently rented entire-home listing or multiple entire-home listings in their principal residence. But these listings were disproportionately likely to have a license. Only 6.4% of FREH listings were missing a license, compared to the 27.8% of other listings which were missing a license. It is not a safe assumption that listings displaying a valid number are in fact operating in conformity with the City's regulation, however. 83 (10.6%) of active entire-home listings displayed a license number which was being used by at least one other active listing. Unless these listings are duplicates of the same property, most of them must be operating in violation of the City's regulations. Most (41.8%) listings which had been inactive on Airbnb in September had a license number which had previously been invalid but was now expired—the highest rate of any listing category, and an indication that many of these inactive listings are no longer operating as STRs despite continuing to be displayed on Airbnb.

4.3 Geographic distribution of non-conforming listings

Listing validity displays a clear spatial pattern. The local areas with the most non-conforming listings (i.e. listings with fake, invalid, expired, or missing license numbers) in both absolute and relative numbers are those closest to Downtown Vancouver (Figure 24). The area with the highest percentage of non-conforming listings is the West End (78.2%), followed by Fairview (76.9%).

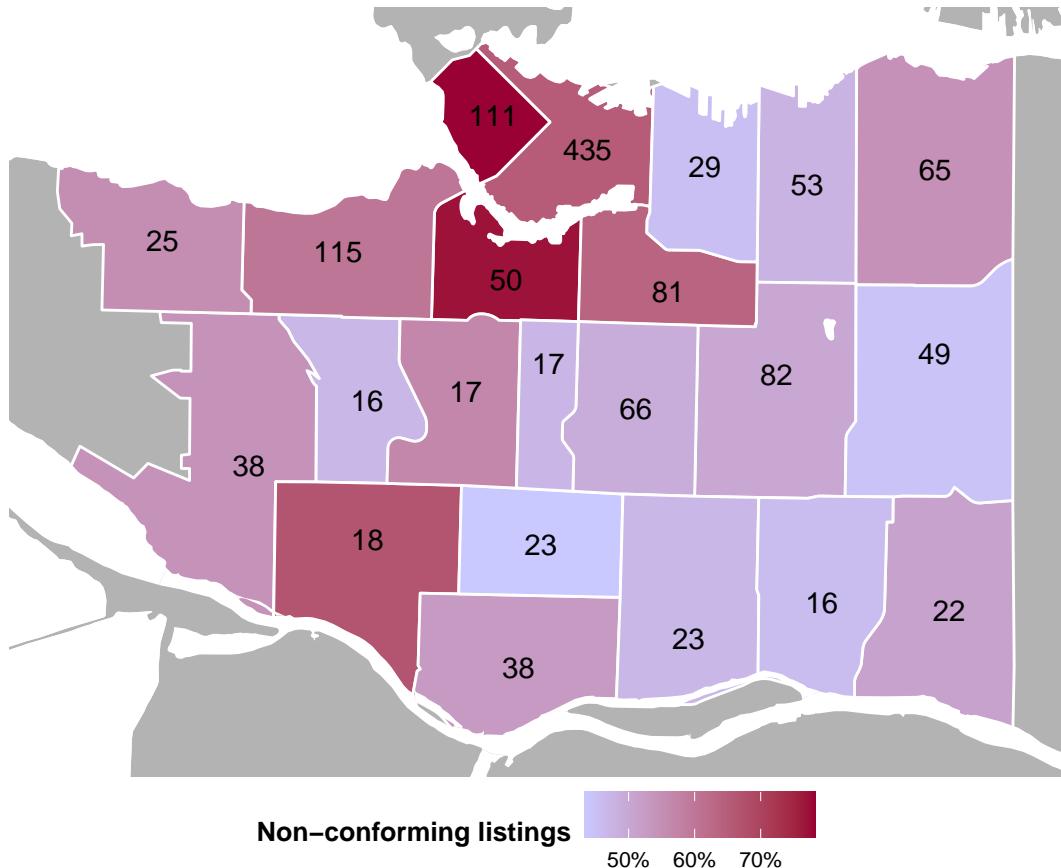


Figure 24: *Geographical distribution of non-conforming listings.*

Table 9: STR activity by license status

License status	Listings	Nights available	Nights reserved	Nights blocked	Revenue per night since Covid-19	Revenue per night since regulations
All listings	1,810	33.7%	34.9%	31.4%	\$46	\$72
Valid	833	31.6%	40.6%	27.8%	\$52	\$80
Exempt	71	38.8%	34.4%	26.7%	\$46	\$69
Non-conforming	906	35.2%	29.7%	35.1%	\$40	\$64
Expired	458	37.6%	28.9%	33.5%	\$40	\$78
Invalid	28	32.2%	43.9%	23.9%	\$59	\$80
Fake	152	31.8%	41.5%	26.6%	\$61	\$77
No license	268	33.4%	22.8%	43.8%	\$26	\$31

4.4 Daily activity of entire-home listings by regulatory compliance

How does registration conformity impact business in the short-term rental market? We analyzed reservation, availability and revenue patterns of all active entire-home listings to understand the relationship between displaying a valid license number and STR activity. Table 9 summarizes this information. Entire-home listings with valid licenses have significantly higher reservation rates (40.6%) than listings with non-conforming licenses (29.7%). They have also earned more revenue per night since the 2018 regulations were introduced and since the onset of the Covid-19 pandemic. However, among listings which do not have a valid license number, it is listings with fake license numbers (i.e. numbers which follow the correct YY-#### format but do not correspond to a number actually issued by the City) which have earned the most revenue since the onset of the pandemic, at \$61 compared to \$52 for listings with valid licenses. Listings operating without displaying any license at all have earned dramatically less revenue than any other listing category—less than half the average revenue of listings with valid licenses over both time periods.

The implications of this analysis are: 1) displaying a license number is associated with greater success in the STR market in Vancouver, and 2) it is not important whether the license number is valid. Visitors to Vancouver are not in a position to independently verify the validity of license numbers, but are evidently reluctant to book listings for which no license is displayed.

5 Covid-19: The impact of the pandemic on the STR market

STR activity in Vancouver has suffered an unprecedented collapse during the Covid-19 pandemic. Reservations from March to September 2020 are down 57.6% over 2019. Prices for reservations which did occur are down 33.0% from their previous trend. In total, the pandemic has reduced STR host revenue in Vancouver by \$130.7 million from March to September. The number of frequently-rented entire home listings dropped from 2,680 in January 2020 to just 940 in August 2020. 39.2% of FREH listings were permanently deactivated and 22.9% were temporarily blocked.

5.1 The disruption of STR activities in March 2020

Business-as-usual for short-term rentals came to a halt in 2020 due to the Covid-19 pandemic. Both local and international travel restrictions and patterns have had serious effects on STR markets worldwide. On March 14th, 2020, Airbnb announced a new emergency cancellation policy in light of the Covid-19 pandemic, which enabled guests to cancel their reservations if the reservation start date was between March 14 and July 31, 2020 (Airbnb 2020). This policy, in combination with the broader decline in travel demand, caused an unprecedented collapse in STR activity in the City of Vancouver.

5.2 Reservations and prices collapsed during Covid-19

Figure 25 shows the number of STR listings available and reserved each day in Vancouver. In general, reservations spike during the winter holidays, but otherwise are low from November to February, and then increase steadily from March to August before reclining again. Available nights follow a roughly opposite pattern, since availability is higher when fewer reservations are made. Although the total number of active daily listings declined in 2019 in comparison to 2018 (as discussed in section 1), the number of listings reserved each day continued to increase. There were 4.9% more nights reserved in Vancouver STRs in 2019 than there were in 2018—peaking at 3,900 STR nightly reservations at the beginning of August 2019. (The 14-day rolling average shown in Figure 25 peaks slightly lower.)

In March 2020, however, when reserved nights should have been steadily increasing en route to the summer peak, they instead collapsed in the face of Covid-19. While total reserved nights from January to February 2020 increased a rapid 79.8% compared to 2019, reserved nights from March to September 2020 decreased 57.6% compared to the previous year.

Figure 26 provides a closer look at daily reservations since 2019, comparing the actual trajectory of reservations during the pandemic with what the trajectory of reservations would have been expected to be in the absence of the pandemic. (To do this, we use seasonal decomposition to identify the regular seasonal fluctuations in STR activity and separate them from the underlying patterns of growth or decline.)

On September 30, 2020, only 870 STRs were reserved in Vancouver. But the trajectory of STR activity established prior to the pandemic, combined with the fact that bookings normally increase rapidly through the spring and summer, suggests that, in the absence of the pandemic, Vancouver would have been expected to receive 3,720 reservations instead. The Covid-19 pandemic, therefore, depressed STR activity by 76.7%, or 2,850 reservations, on that date. In total, from March through September 2020, we estimate that there have been 538,300 fewer STR nights reserved than would normally have been expected to occur. The 252,700 total nights reserved in this time period is only 31.9% of the 791,000 nights total that would represent the previous growth trend.

The collapse of the STR market in Vancouver extends beyond the drop in reservations, because the bookings that were made occurred at sharply lower nightly prices than would have been expected. Nightly prices follow roughly the same pattern of seasonality as reservations, with lower prices in the winter and higher in the summer, plus a spike during the winter holidays. The trajectory of STR pricing since the arrival of Covid-19 in Vancouver has not followed this pattern. Indeed, prices lowered when they would have been expected to

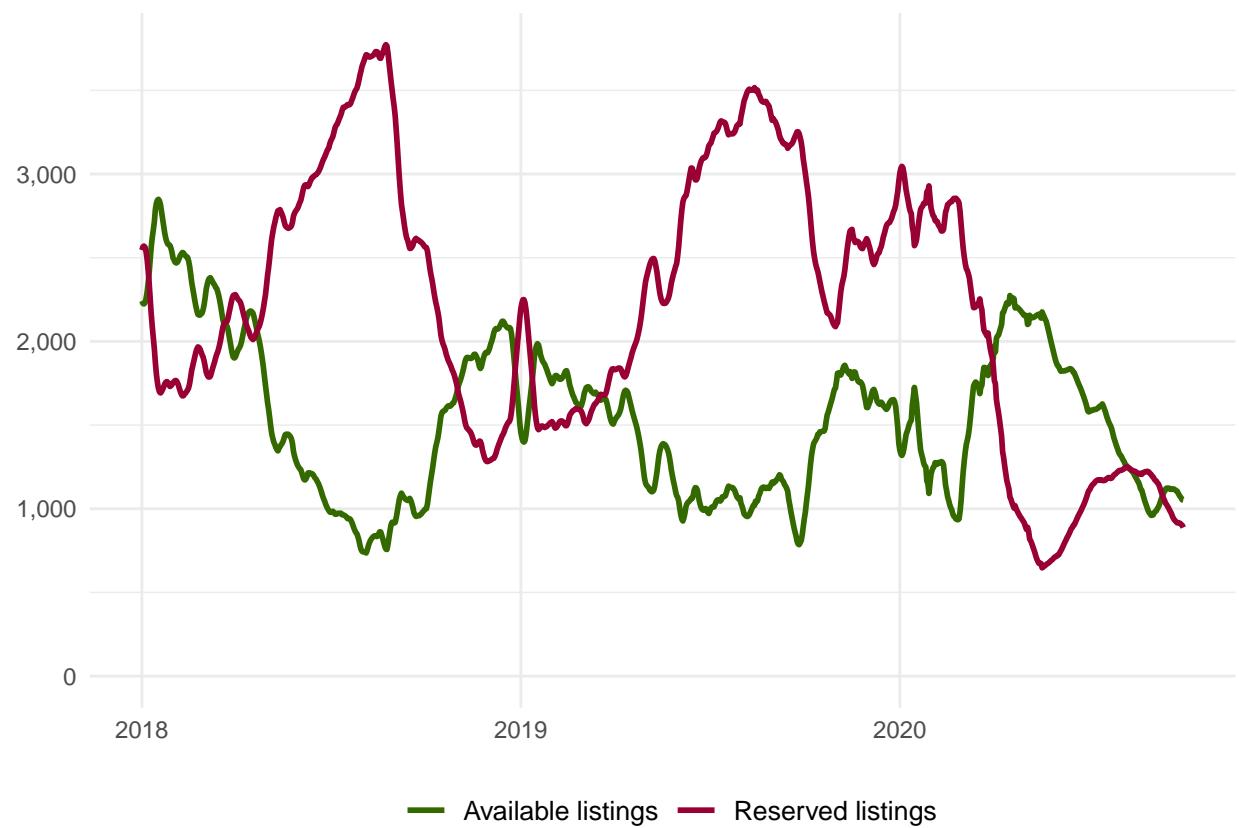


Figure 25: *Available and reserved listings since 2018 (14-day average)*

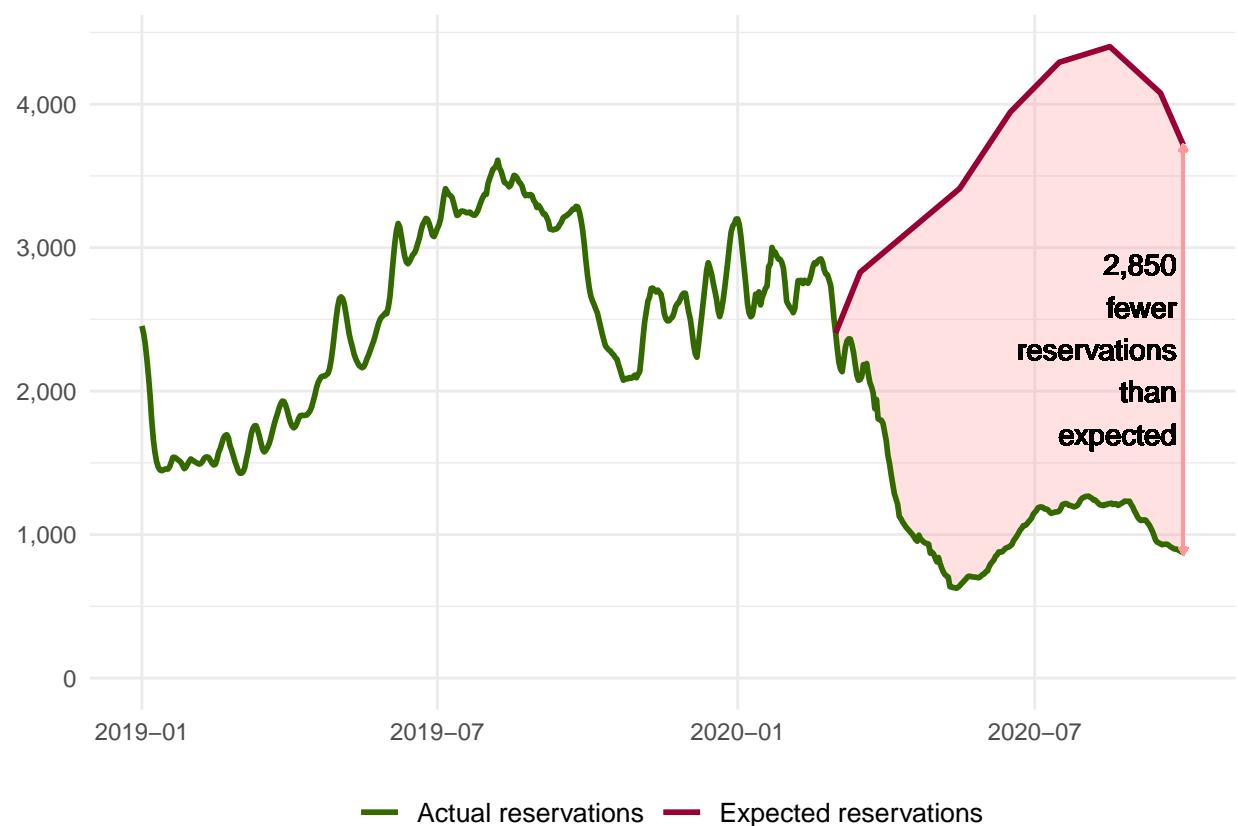


Figure 26: *Actual and expected reservations during the Covid-19 pandemic (7-day average)*

start increasing throughout the spring, and did not rise in the summer as expected. Average prices have consistently been lower than previous trends would have predicted (Figure 27). This is a symptom of a large number of STR hosts chasing a vastly smaller amount of demand for their listings, and cutting prices as a result.



Figure 27: *Actual and expected average nightly prices for entire-home listings during the COVID-19 pandemic (7-day average)*

Throughout the May-September period of 2020, nightly prices have been an average of 33.0% lower than expected. Spread across the 252,700 nights reserved during this period, this means that STR operators collectively earned \$16.1 million less than they would have on their bookings in the absence of the pandemic. When the lower prices on reservations which did occur is combined with the reservations which did not occur, our estimate is that Vancouver's STR hosts lost a total of \$130.7 million in revenue between March and September 2020 because of the Covid-19 pandemic.

5.3 Covid's impact on frequently rented entire-home listings

We estimate conversions to dedicated entire-home STRs (what we call “frequently rented entire-home”, or FREH, listings) using a statistical model described above in section 1. The model uses three months of a listing’s activity (nights available, reserved or blocked) in combination with historical data incorporating a year of activity for listings which have existed for that long to determine whether a listing’s current activity is consistent with it being a dedicated STR.

According to the model, the number of housing units in Vancouver lost due to commercial STRs reached its all-time peak (2,680) at the beginning of 2020 since the beginning of the regulations (the true peak being in October of 2017 at 2,700). Most of these (2,450) were FREH listings, with the remainder (230) being

ghost hostels—clusters of private-room listings operated out of a single housing unit. As of August 2020, the number of FREH listings had dropped to its lowest amount since we began tracking it in 2016, with just 940 listings displaying availability and reservations consistent with historical patterns of full-time STR activity in Vancouver.

One possibility is that these formerly FREH listings are no longer operating as STRs, either permanently (the listings were deactivated) or temporarily (the listings were blocked from receiving reservations). Under this possibility the listings may have been returned to the longer-term rental market. Another possibility is that the listings have remained open for business as short-term rentals, but the dramatically decreased demand for tourist accommodations means that the listings have not received the level of reservations which our model expects in order to classify the listings as frequently rented.

We adjudicate between these possibilities by comparing the activity of listings which had FREH status in January or February 2020—the months before the pandemic arrived—and listings which did not have this status. There were 2,720 listings which we consider likely to have been FREH in either or both of January and February 2020. Of these listings, 1,070 were no longer listed on Airbnb or VRBO as of September 30, 2020. This is 39.2% of these listings—almost twice as high as the 20.6% of listings which were FREH in either January or February 2019 and were no longer listed on the STR platforms by the end of August 2019. In total, 52.6% of non-FREH listings active in January or February 2020 were deactivated by the end of August 2020, while the corresponding figure last year was 31.3%. This means that non-FREH listings have been deactivated at a higher rate this year than last year, but FREH listings have been deactivated at a substantially higher rate this year than last year (Figure 28).

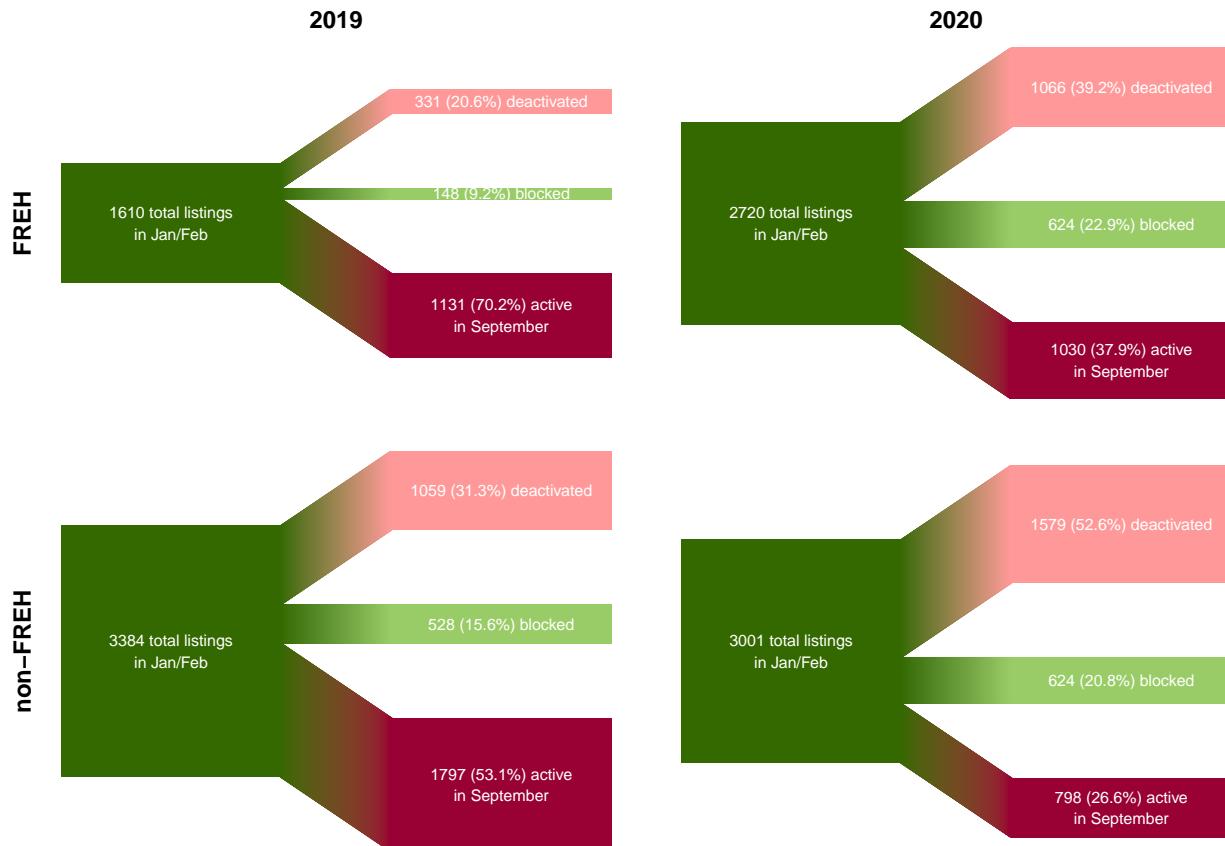


Figure 28: *Activity trajectories of FREH and non-FREH listings in 2019 and 2020*

Of the 1,650 FREH listings which remained listed throughout March - September, 620 (37.7%) were blocked (i.e. not available for reservations) for all of the month of September, and 990 (59.8%) were blocked for a

majority of the month. This is extremely rare behaviour for a dedicated STR listing, since September is usually one of the busiest months for tourist accommodations in Vancouver. In 2019, only 11.6% of listings which were FREH in January or February were blocked for all of September, and only 23.0% were blocked for a majority of the month.

Figure 29 compares the activity of the FREH and non-FREH listings which have remained active during the pandemic. The left panel shows the total reserved nights which occurred in each of these two groups. Unsurprisingly, it demonstrates that the large majority of reservations in the months prior to the pandemic occurred in these FREH properties. For example, in the month of February 2020, 58.5% of all reserved nights were booked in these FREH properties. In March 2020, reservations declined in both the FREH and non-FREH properties, but the decline is far larger in both relative and absolute terms among the FREH properties. The right panel aggregates the same data in a different fashion, showing the average number of booked nights per listing per month across the FREH and non-FREH listings. The same general pattern is observable: FREH listings receive substantially more bookings per month than non-FREH properties until March 2020, at which point both groups see their reservations decline, but the FREH listings decline much more sharply.

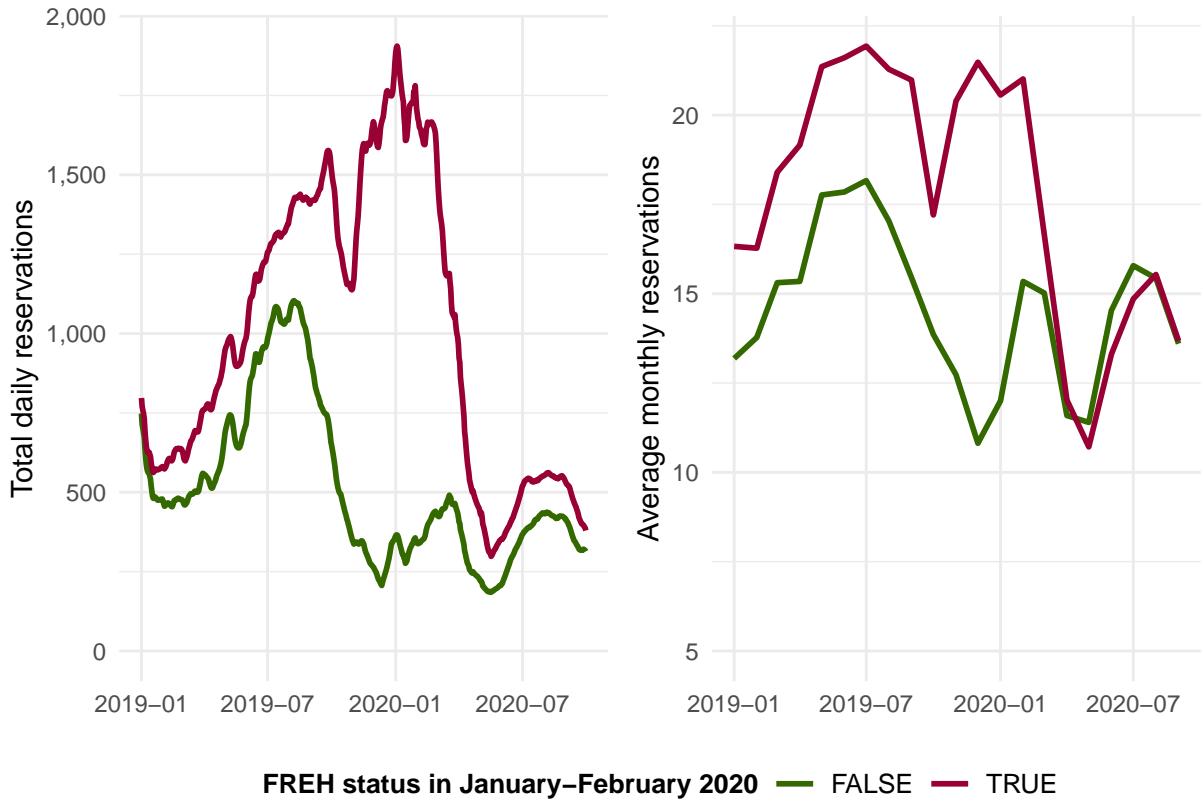


Figure 29: *The total number of reservations per day (L) and the average reservations per listing per month (R), for listings which had FREH status in January or February 2020 and listings which did not (14-day average)*

The conclusion is that, while the entire STR market in Vancouver has suffered an unprecedented collapse during the Covid-19 pandemic, this collapse has been disproportionately concentrated among dedicated STRs which have been responsible for thousands of units of rental housing lost in the city over the past several years. This raises the possibility that some of these units many have returned to the long-term rental market—a possibility that has been noted anecdotally in cities across Canada (McSheffrey 2020). We explore this possibility systematically in the next chapter.

6 Covid-19: STRs returning to the long-term market

Using image recognition techniques, we identified 1,339 unique Airbnb listings which were posted as long-term rentals (LTRs) on Craigslist or Kijiji between March and September 2020. These former STRs have asking rents on average 25.6% higher than other LTR listings, but are correlated with a 13.5% decrease in overall asking rents in Vancouver. The evidence suggests that the overwhelming majority of STR listings transferred to LTR platforms are commercial operations. We estimate that 30.6% have fully transitioned back to the long-term market, 35.3% have been temporarily blocked on Airbnb and may return to being STRs in the future, and 34.1% failed to be rented on LTR platforms and instead remain active on Airbnb.

6.1 How many STR listings have returned to the long-term market?

As demonstrated in section 5, the COVID-19 pandemic has caused an unprecedented decline in STR activity in Vancouver. Under these circumstances, it would be reasonable to imagine that some STR hosts—particularly commercial operators who had come to expect large income streams from their properties—may have decided to return their listings to the long-term housing market, either temporarily or permanently. To investigate this possibility, we collected listing images from all properties posted to Craigslist and Kijiji in Vancouver between March and September 2020, and used image recognition analysis to match STR listings on Airbnb and Vrbo to long-term rental (LTR) listings on Craigslist and Kijiji. These latter two platforms represent only a portion of the LTR market, but provide useful insight into how STR hosts have responded to the collapse in accommodation demand during the COVID-19 pandemic. If the exact same photo of an apartment’s living room was uploaded to Airbnb in August 2019 and then to Craigslist in April 2020, this provides proof that the property in question has moved from the STR market to the LTR market. The image recognition software we developed is able to identify matches between images which are identical, but also images which the host has modified slightly, and thus allows us to reliably identify every match which exists between STR and LTR platforms (Figure 30).

Our image matching algorithm recognized 1,339 unique Airbnb listings which matched with 2,690 different LTR listings (as some units are posted multiple times) in the City of Vancouver. The matching LTR listings were predominantly found on Craigslist (2,495 listings, or 92.8%), with a small portion posted on Kijiji (195 listings, or 7.2%). Out of the 1,339 matching Airbnb listings, 54.6% (731 listings) were created or still active in 2020. We suspect that many or most of the remaining properties were also still active under a different listing ID and with a different photo, since commercial STRs are delisted and relisted quite frequently, and we thus consider the 1,339 Airbnb listings which we matched to Craigslist and Kijiji to be a lower bound for the number of unique housing units that went from the STR market to the LTR market due to the COVID-19 pandemic. (Each listing which we matched is guaranteed to have been listed first on Airbnb and then on either Kijiji or Craigslist, but there are certain to be additional listings which we did not match because they did not reuse the same photographs.)

All of the Craigslist listings we matched were long-term rentals. Out of the 107 Airbnb listings which we matched to Kijiji, 67.3% were identified by their hosts as “long-term rentals” and 32.7% were identified as “short-term rentals”. Among matched Kijiji listings, 36% specified lease lengths of one year, 30% specified month-to-month, and 35% did not specify.

6.2 When did STR listings move to the long-term market?

The first COVID-19 case in Vancouver was confirmed on January 28, 2020, but the pandemic did not fully erupt until the second week of March 2020, when public facilities and private businesses began to close, culminating in a Provincial declaration of public emergency on March 12. Consistent with this timeline, what was in early March a trickle of Airbnb listings moving to Craigslist or Kijiji began to accelerate in the middle of the month (Figure 31). By the end of the March, the number of daily transfers reached 27 listings. Daily numbers remained high through April (its peak being 62 listings transferred on April 21), but even

A. Airbnb

"Beautiful modern renovated 2 bedroom"

**B. Craigslist**

"Luxury 2 BR Suite Modern Style and Private Patio – apts/t

**C. Airbnb**

"Steps from The Drive"

**D. Craigslist**

"Steps from the Drive – fully furnished, modern studio"



Figure 30: Examples of listings matched between STR and LTR platforms. The first pair of images (A & B) is matched despite the images being tinted differently. The second pair of images (C&D) is matched despite the first image being digitally altered.

from May through September an average of 5.2 new Airbnb listings were transferred to Craigslist or Kijiji each day.

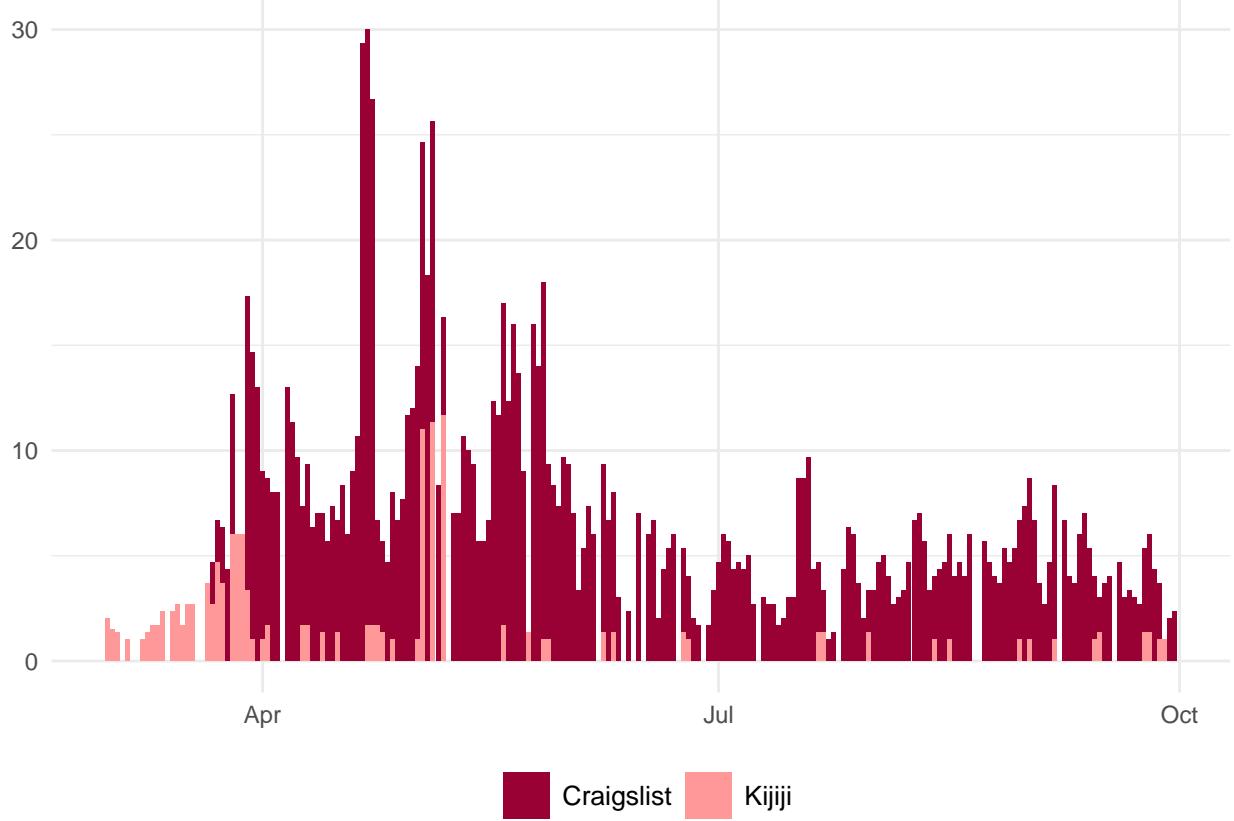


Figure 31: *The date on which matched Airbnb listings were first detected on Craigslist or Kijiji in the City of Vancouver (3-day average)*

6.3 Spatial distribution of matched listings

Out of the 1,339 unique STR listings matched to LTR listings in the City of Vancouver, nearly half (46.8%) were located in the Downtown area, with the remaining matches more evenly split between the other areas. 10.8% of matches were in West End, following by 7.8% in Kitsilano and 4.6% in Mount Pleasant. This distribution is distorted compared to general distribution of STR listings in the city: Downtown is highly over-represented in these matches. When controlling for the density of STR listings, Downtown is still slightly over-represented with respect to the number of STRs being relisted as long-term rentals. However, other areas have a listing density close to Downtown's (Figure 32). The number of STR listings matched to LTR listings in Downtown is equivalent to more than half (54.1%) of all the STR listings active in the area on March 1, 2020, and 29.1% of all the listings active in the borough in 2020.

6.4 Asking rents

The left panel of Figure 33 shows the average asking rents of listings posted to Craigslist and Kijiji between March and July 2020. (We do not have complete asking rent data for August and September, so those months are excluded.) The asking rents have remained dramatically higher than non-matched LTR listings. On March 13, when the average asking rent on LTR platforms in the City of Vancouver was \$2,438, the

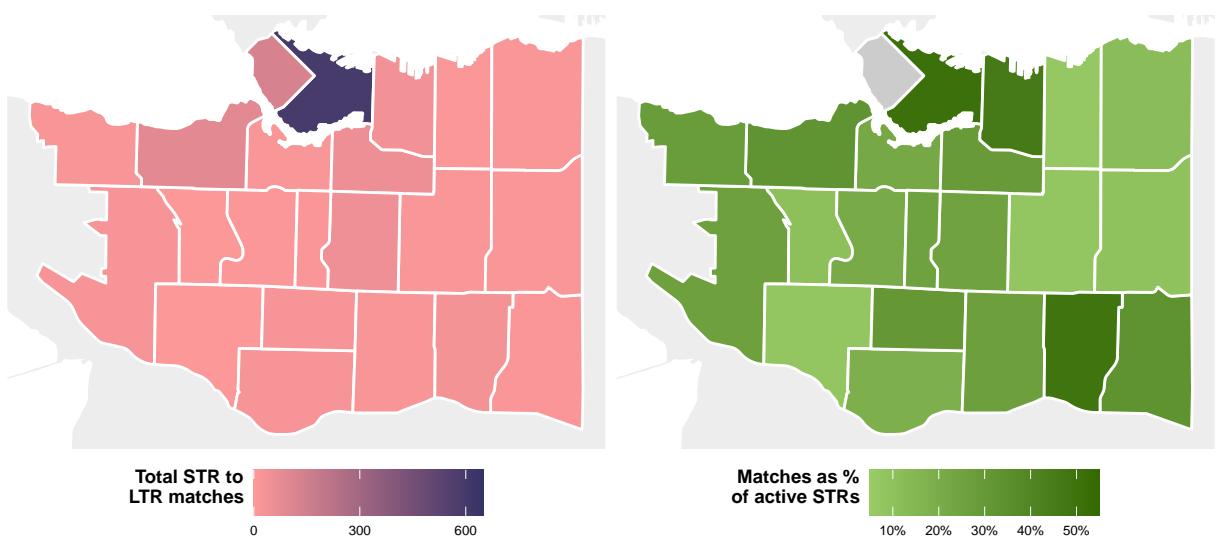


Figure 32: Total number of STR listings matched to LTR listings (L), and matched STR listings as a percentage of daily active listings on 2020-03-01 (R), by local area

average asking rent among listings which we matched to Airbnb was \$3,117— 27.8% higher. Over the course of March, average asking rents for LTR listings matched to Airbnb declined sharply, before increasing gradually for the next few months. At the end of July, the average asking rent was \$2,082 for all Craigslist and Kijiji listings and \$2,634 for the matches. Overall, from April to July, asking rents for properties matched to STR listings were 25.6% higher than the city-wide average.

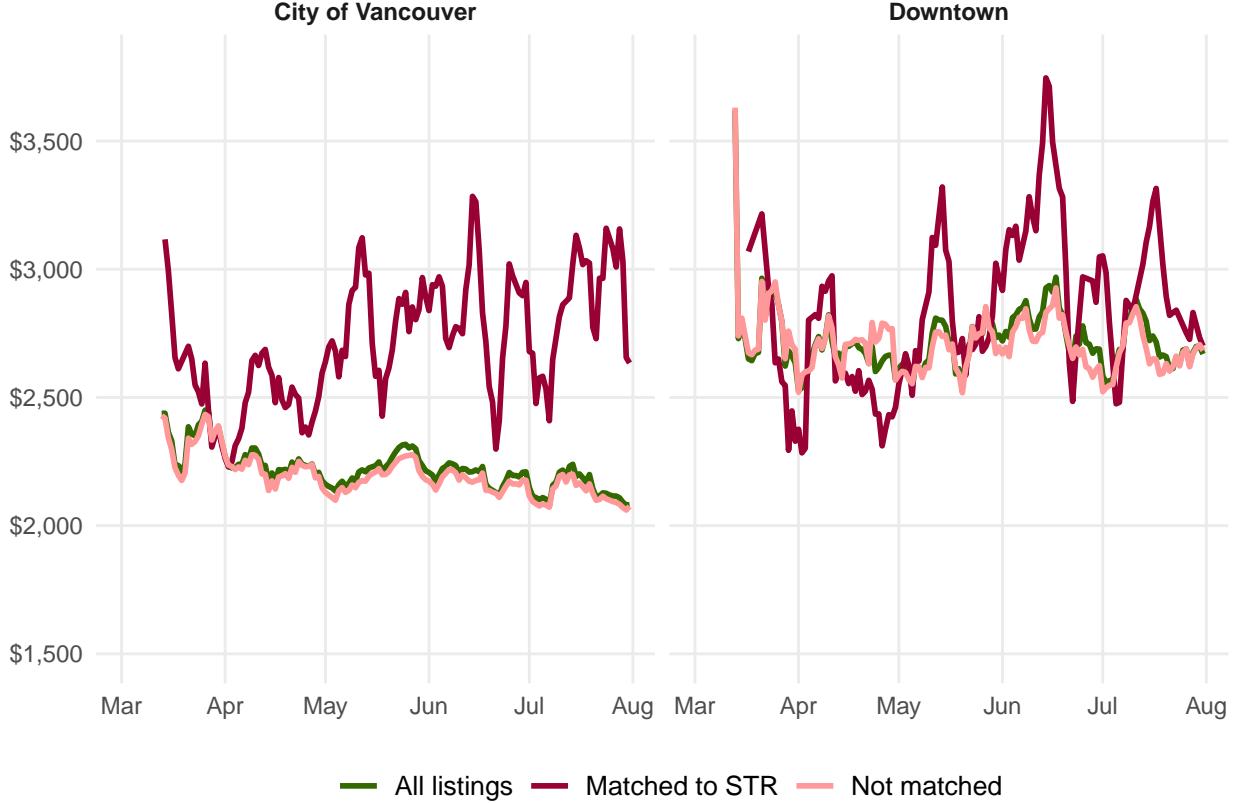


Figure 33: *Average asking rents on Craigslist and Kijiji in the City of Vancouver (L) and Downtown (R) (7-day average)*

The right panel of Figure 33 shows asking rents only in Downtown. A large portion of the divergence in asking rents between LTR listings matched to Airbnb and listings not matched is a compositional effect of the much greater frequency of a Downtown location (which commands higher prices than the rest of the city) among matched listings. Even in Downtown, however, LTR listings matched to Airbnb have been on average 4.2% higher than listings not matched. Overall STRs returning to the long-term market are correlated with a significant decline in asking rents. The average city-wide asking rent on Craigslist and Kijiji declined 13.5% from \$2,386 in late March 2020 to \$2,102 in late July 2020.

6.5 Listing amenities

Size: Table 10 shows the distribution of units by number of bedrooms for entire-home STRs, as well as all the units that were posted for rent on LTR platforms (both the ones that matched with an STR listing and the ones that did not match), and for the City of Vancouver’s overall primary (i.e. apartment and townhouse) rental housing stock. Two-bedrooms were overrepresented in both the matches (39.5%) and the non-matches (41.0%) compared to the STR market (5.2%) and the City (17.3%). Studios were overrepresented among LTR listings which matched to Airbnb or Vrbo (8.2%) compared with LTR listings which did not match

Table 10: STR and LTR listings by bedroom count

Category	Studio	1-bedroom	2-bedroom	3+-bedroom
City of Vancouver rental stock	15.2%	66.3%	17.3%	1.2%
STR market (2019)	5.2%	57.1%	24.8%	12.9%
LTRs matched to STR	8.2%	40.1%	39.5%	12.2%
LTRs not matched	3.9%	38.0%	41.0%	17.1%

(3.9%) and STR listings (5.2%), but were underrepresented when compared to Vancouver’s rental stock of studios (15.2%). Units with three bedrooms or more were far more common on STR and LTR platforms than their prevalence in the city would predict, while one-bedroom units were significantly less common on STR platforms than on LTR platforms or among all city apartments. The implication is that two-bedrooms and studios apartments were disproportionately likely to be moved from STR platforms to the long-term rental market, while one-bedroom apartments were disproportionately likely not to have been moved.

Furnished vs. unfurnished: To accommodate temporary guests, STR properties are overwhelmingly furnished. Unsurprisingly, properties that have moved from the STR to LTR market during the pandemic are listed as furnished at much higher rates than other listings on Craigslist and Kijiji. Of the 61,393 LTR listings we analyzed, 25.0% were listed as furnished and 74.8% as unfurnished (The remainder did not provide this information.) Listings which matched with STRs had a significantly higher proportion classified as furnished: 75.9% furnished and 24.1% unfurnished. These proportions suggest that, in approximately three quarters of the cases of STR operators listing their units on LTR platforms, the operators may intend to return their units to the STR market when demand returns, while in a quarter of cases the move to the LTR market appears to be reasonably permanent, since the host has gone through the effort of emptying the unit of furniture.

6.6 Are matched listings commercial operations?

Nearly all of the STR listings which we matched to LTR listings on Craigslist or Kijiji are likely to have been dedicated, commercial STRs. This is because it is highly unlikely that a casual home sharer operating a STR out of their principal residence would decide to vacate their home, list it on Craigslist or Kijiji, and reuse the photo they had used to advertise the short-term rental. It is therefore also likely that the STR listings found on LTR platform were non-compliant with the City’s STR regulations, since the fact that they were commercial operators makes it extremely difficult to also have the listing be operated out of a principal residence. We can test this intuition by examining the characteristics of the STR listings which we matched to an LTR platform.

Of the 1,339 unique STR listings that matched with the LTR market, 1,097 (83.5%) are entire-home listings and 206 (15.7%) are private-room listings. Examining the entire-home listings, 53.4% of them were identified as frequently rented entire-home (FREH) listings at some point, which means they were almost certainly operated commercially. Moreover, `r_match_eh_multi_pct` of entire-home STR listings which matched to LTR listings were multilistings at some point, which means they were operated by hosts controlling multiple listings simultaneously. In total, two thirds (66.8%) of entire-home listings had one of these two strong indicators of commercial activity.

The 206 private-room listings require some further analysis, because each of these listings matched to a Craigslist or Kijiji listing advertised as an entire housing unit. Our analysis suggests that these listings break down into three categories. The first is miscategorizations. 7 (3.4%) of the LTR listings that matched to STR private-room listings had titles such as “1 fully furnished bedroom” or “swap”. This suggests either that these listings were rooms located in the host’s principal residence incorrectly listed as entire homes, or that images of the Airbnb private room listing were reused to conduct an exchange of leases between tenants. These STR listings are not commercial listings and their appearance on LTR platforms likewise does not constitute housing being returned to the market.

The second category of private-room Airbnb listings matched to entire-home LTR listings is ghost hostels—clusters of private-room listings which may appear as a series of “spare bedrooms” on Airbnb or Vrbo but are in fact one or more housing units converted to a dedicated STR. 113 (54.9%) of the 206 private-room listings which matched to Craigslist or Kijiji belong to ghost hostels in Vancouver. The remaining 86 private-room Airbnb listings which matched to Craigslist or Kijiji are likely to be ghost hostels which our algorithms failed to identify, or smaller housing units similarly subdivided into private rooms. (Our procedure for identifying ghost hostels only considers clusters of three or more private rooms, but two-bedroom apartments can also be listed as pairs of private rooms.) On balance, the likelihood is that these listings also represent commercial STRs returning to the long-term market.

Focusing on the unambiguous case of the entire-home listings which matched between STR and LTR platforms, 27.1% of the commercial listings active at any point in 2020 have been transferred to Craigslist or Kijiji since March. But, given the rapidity with which individual listings are posted and removed, this significantly understates the scope of listings moving from Airbnb to the long-term market. Expressed as a percentage of the commercial listings active on March 1, 2020, at the onset of the pandemic, the matches represent 47.8% of these listings. In other words, something between a quarter and a half of Vancouver’s commercial short-term rentals may have shifted to the long-term rental market between March and September.

Figure 34 shows the age in years of STR listings which matched a LTR platform (left panel) and which did not match (right panel). The age distribution of matched listings is skewed to the left, which means that a large proportion of matched listings are less than a year old. By contrast, STR listings which did not match tend to be older. This pattern suggests that newer commercial STR listings may have been in a weaker financial position at the onset of the pandemic, prompting their hosts to change strategies more rapidly than established hosts.

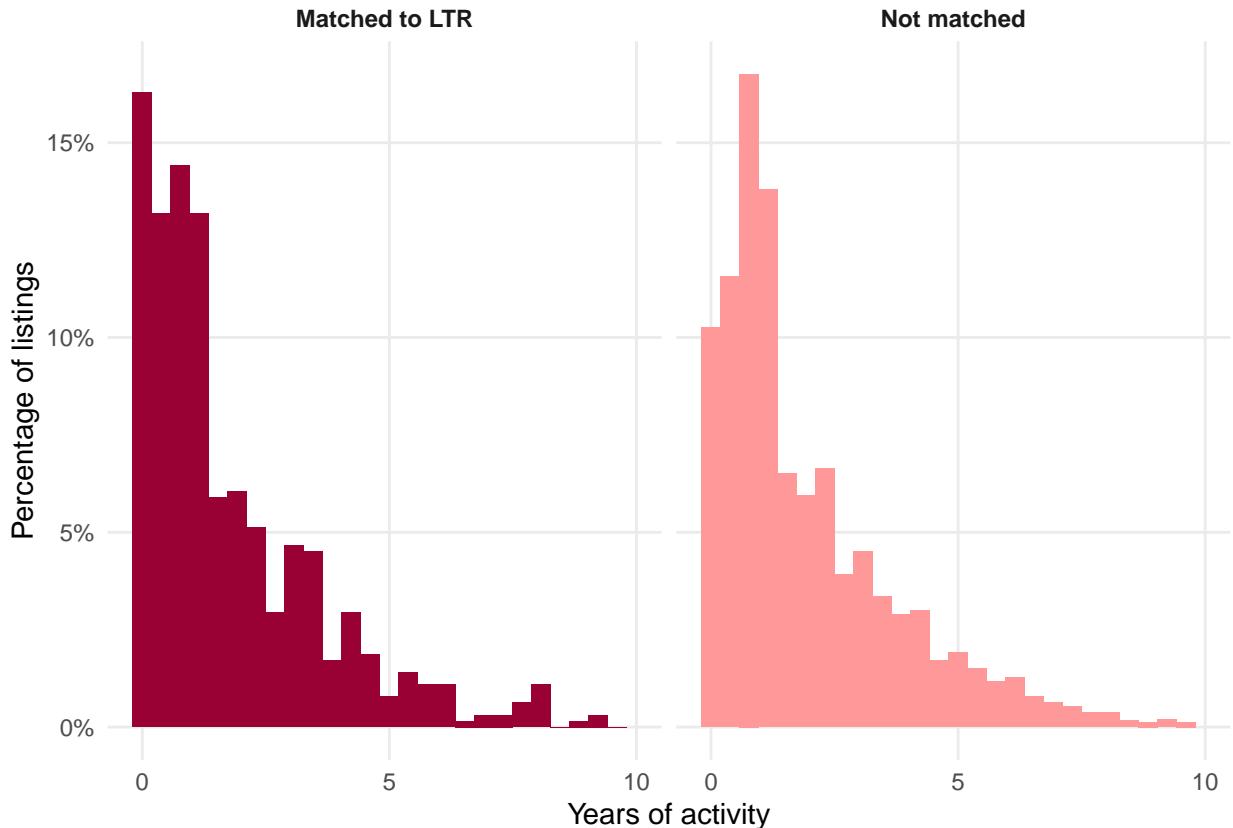


Figure 34: *STR listing age distributions for listings matched to LTR listings (L) and not matched (R)*

6.7 Which STR hosts transferred their listings to Craigslist and Kijiji?

In Vancouver, 743 unique Airbnb and Vrbo host IDs were linked to the 1,339 STR listings which we matched to LTR listings. 160 of these hosts posted more than one of their STR units on Craigslist or Kijiji. Almost two-thirds (62.2%) of the active properties of these 160 hosts were found on either Kijiji, Craigslist, or both. The fact that only a portion of the hosts' listings were found on LTR platforms suggests that the matches we have identified might be an underestimate of the total quantity of STRs that were posted on LTR platforms since the COVID-19 pandemic began. It would be intuitive to assume that a host who decides to post several of its listings on a LTR platform would post all or most of them. There are several factors which were likely at work here: some listings may have been posted, rented, and removed in between our weekly scrapes so we did not detect them; hosts may have not posted their higher-performing STR listings; and hosts may have used updated photographs for some of their listings, making it impossible to detect matches through our image matching algorithm.

STR hosts which transferred listings to the long-term rental market had substantially higher STR revenue in 2019 than hosts who did not transfer listings. The median listing revenue was \$9,000 in the entire City of Vancouver in 2019. The annual median revenue of hosts who transferred listings to the LTR market was \$19,600, while the median revenue of hosts who did not transfer listings was somewhat less at \$15,600. Moreover, many of Vancouver's highest earning STR hosts turned to LTR platforms during the COVID-19 pandemic. For example, 14 of the 28 hosts that made more than \$250,000 in the past year listed at least one of their STR units on an LTR platform. On average these top earning hosts listed 11 units on LTR platforms, compared to 1.6 units for all other hosts. Figure 35 compares the 2019 annual revenue distribution of STR hosts that shifted listings to the long-term market and hosts that did not. Hosts whose STR listings matched to LTR listings have a revenue distribution shifted substantially to the right, indicating that they earned more money.

6.8 Are matched listings successfully rented, or still active on Airbnb?

The mere presence of current or former Airbnb listings on LTR platforms is no guarantee that the actual housing units have shifted back onto the long-term market. In particular, these listings might have been posted but not successfully rented. It is not possible to determine with certainty whether a given listing was rented and therefore permanently transferred from the short-term to the long-term market, but we can use two indicators to estimate this: the length of time the listing was posted on an LTR platform, and the current activity status of the listing on the STR market.

On average, the STR matches found on LTR platforms stayed longer than the non-matches. STR matches were listed an average of 23.1 days on LTR platforms, while non-matches were listed only three quarters as long—17.1 days on average. This simplest plausible explanation for this disparity is the fact that listings coming from the STR market were both significantly more expensive than other listings and much more likely to be furnished, both of which factors may have decreased their viability in the rental market. Figure 36 shows the distribution of the length of stay for both matches and non-matches. The figure reveals quantitatively and qualitatively different patterns among matched and non-matched listings. Most non-matched listings were present for less than a week on Craigslist or Kijiji before being removed (and presumably rented), and the number of listings still present declines relatively smoothly as the length of time increases. By contrast, most matched listings were not rented after a week, and in fact the proportion which took a month or more to be taken down is higher not lower than the proportion which were taken down after several weeks. Our conclusion is that, regardless of their host's intentions, STR units listed on LTR platforms have been relatively unsuccessful at transitioning back to long-term rentals.

Further evidence about the extent to which STR hosts are successfully transferring their listings to the long-term market can be found by examining the activity of the STR listings themselves. Are hosts planning on renting on the long-term only temporarily, leaving the STR listing running for future bookings? Or have they deactivated the STR listing? Out of the total 1,339 STR listings which we identified on LTR platforms, 771 (57.6%) were present on Airbnb or Vrbo at the beginning of 2020. Out of this number, 467 (60.6%) were still present on September 30, while the other 304 (39.4%) had been deactivated. Extrapolating this

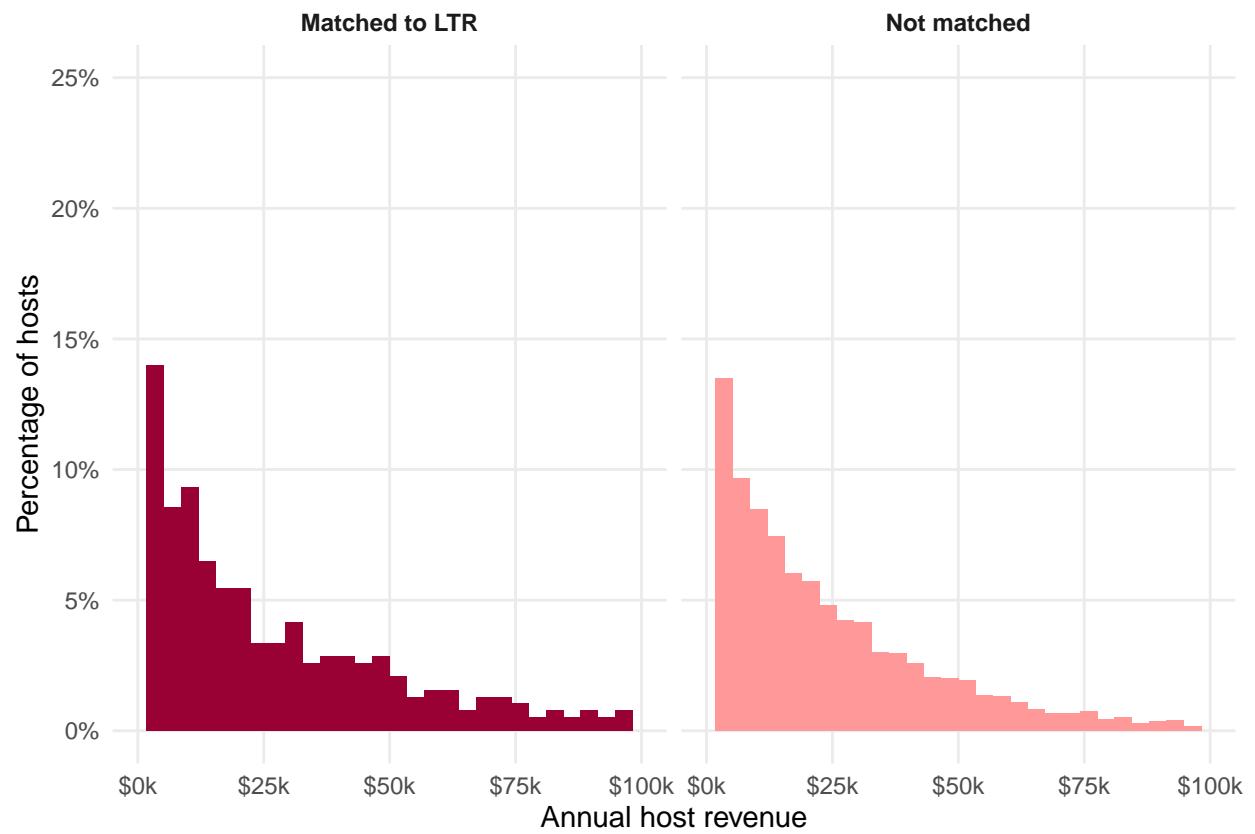


Figure 35: *STR host revenue distributions for hosts whose listings matched to LTR listings (L) and did not match (R)*

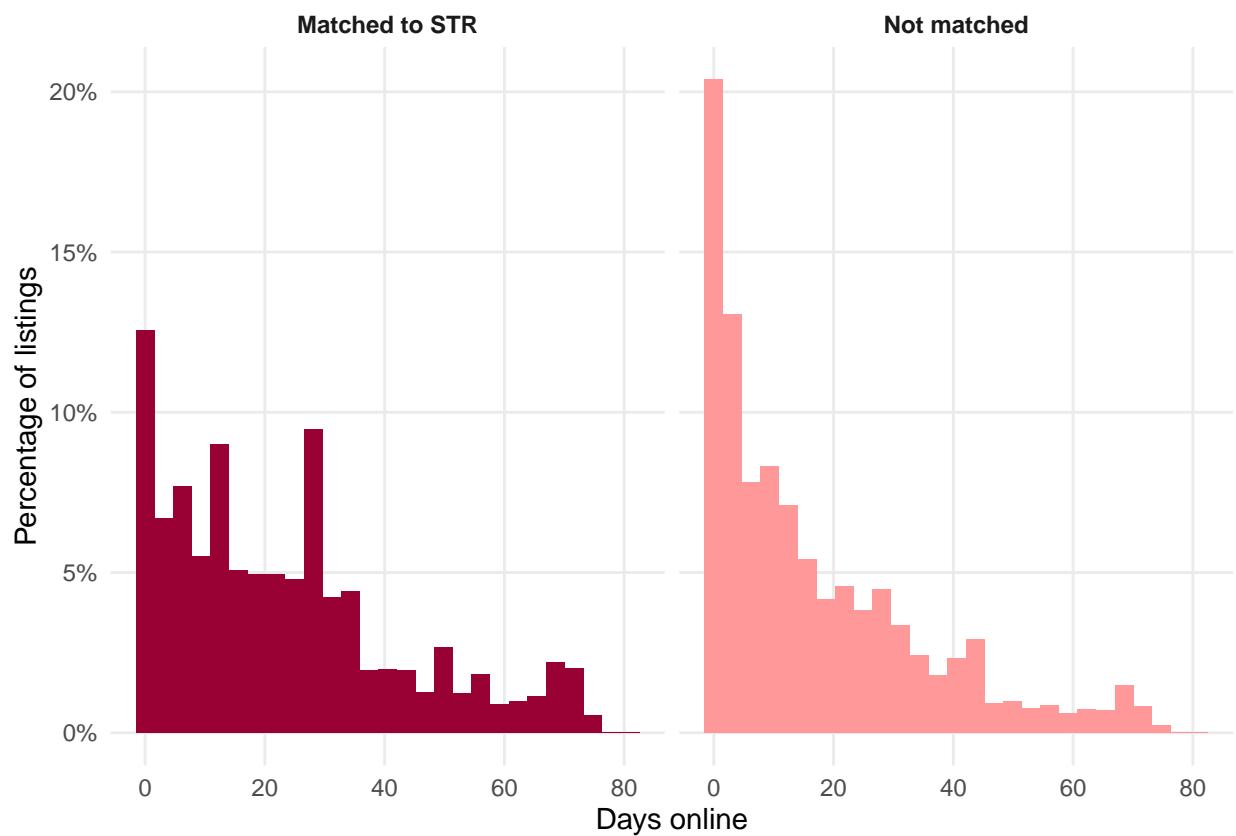


Figure 36: *LTR listing posting length distributions for listings matched to STR listings (L) and not matched (R)*

proportion across the entire set of matched listings we identified, we estimate that 527.9584955 matched listings have been deactivated from Airbnb or Vrbo during the pandemic, while 811.0415045 remain on the platforms. Listings removed from STR platforms are likely to have been durably shifted to the long-term market. However, 74.8% of these listings were rented as furnished rentals on Craigslist or Kijiji. These listings should therefore be considered at relatively high risk of returning to the STR market if demand recovers.

Listings which remain on Airbnb and Vrbo can nevertheless be inactive. If a host successfully rents their listing on Craigslist for several months, they can choose to block their calendar on their STR platform to make sure no new reservations occur, while keeping the listing intact for when the STR market recovers. Of the 467 matched listings present on Airbnb or Vrbo at the beginning of 2020 and still present by the end of Sep, 324 (69.4%) were blocked for the entirety of the month of September. This suggests that these listings are not active on the STR market and therefore have been rented on the LTR market, but the fact that the STR listings have not been taken down suggests that the hosts may plan to reactivate their units once STR demand recovers.

In total, taking into account the matched listings which have continued to see activity on Airbnb or Vrbo, we estimate that, of the total 1,339 STR listings which were advertised on Craigslist or Kijiji, 410 (30.6%) have been deactivated from Airbnb and Vrbo and have likely transitioned back to long-term housing (albeit often as furnished rentals which could be reconverted to STRs), 472 (35.3%) have been temporarily blocked on the STR platforms and have likely been rented in the long-term market but may return to being STRs in the future, and 457 (34.1%) failed to be rented on LTR platforms and instead remain active as STRs.

Appendix: Data and methodology

The analysis in this report is based on a combination of private and public data sources. The key sources are the following:

- Listing and activity data about Airbnb and VRBO short-term rental listings gathered by the consulting firm AirDNA. This data includes canonical information about every short-term rental (STR) listing on the Airbnb and VRBO (including HomeAway) platforms which was active in the City of Vancouver between January 1, 2016 and September 31, 2020. The data includes “structural” information such as the listing type (entire home, private room, shared room or hotel room), the number of bedrooms, and the approximate location of the listing. AirDNA collects this information through frequent web scrapes of the public Airbnb and VRBO websites. The data also includes estimates of listing activity (was the listing reserved, available, or blocked, and what was the nightly price?), which AirDNA produces by applying a machine-learning model to the publicly available calendar information of each listing. We use this data for our core analysis of the STR market, including our counts of active listings, our breakdown of different listing types, our estimates of STR-induced housing loss, and our estimates of listings which are commercial operations.
- Additional data about Airbnb listings collected by UPGo researchers. This includes information to verify activity and location, and listing photographs which were obtained through web scrapes.
- Data about long-term rental listings on Kijiji and Craigslist. This data includes the geographic location of listings advertised, the asking rent, the number of bedrooms, the number of bathrooms, the title, and the photographs attached to the posting. This data was collected by UPGo through web scrapes conducted each Monday from March 30 to October 12, 2020. We use this data to analyze the long-term rental market in Vancouver, and to identify STR listings which have been transferred to the long-term market.
- Data from Statistics Canada and the Canada Mortgage and Housing Corporation (CMHC). We use this governmental data to analyze population and dwelling counts, average rents, and rental vacancy rates.
- Data about property regulation of short-term rentals from the City of Vancouver. We use this data to conduct the regulation compliance analysis for the purposes of determining the impact and effectiveness of Vancouver’s STR by-laws.

This report analyzes the City of Vancouver, and, unless otherwise specified, “Vancouver” refers to the city. When other cities are compared to Vancouver, we are likewise referring to the municipalities (e.g. “Montreal” refers to the City of Montreal).

Data cleaning: We process the raw STR data we receive from AirDNA through an extensive data cleaning pipeline, the code for which is available at <https://github.com/UPGo-McGill/strr>. With the Craigslist and Kijiji data we scraped, we cleaned the dataset using techniques such as string distance, duplicate removal, and outlier filtering, following similar approaches used with comparable datasets, such as Boeing and Waddell (2017) and RCLALQ (2020).

Image matching: We used our own image recognition algorithm to match listings posted both to Airbnb and to either Craigslist or Kijiji. The algorithm converts the sequence of pixels in an image into a string of numbers representing the average brightness of regions of the image, which serves as a distinctive “signature” of the image, similar to a fingerprint. We compare these signatures to each other using the Pearson correlation coefficient. When the correlation is sufficiently high, we repeat the procedure using separate signatures for the images’ red, blue and green colour channels. All potential matches are then individually verified by human observation. The software package we developed to conduct this image matching is available at <https://github.com/UPGo-McGill/matchr>.

FREH modelling: We define “frequently rented entire-home listings” as entire-home STR listings which are available for a majority of the year (so 183 days or more in a 365-day period), and which are reserved at

least 90 days of that year. This is a consistent and conservative way to estimate listings operated sufficiently often that they are unlikely to be their host’s principal residence. But this indicator is slow to adapt to sudden shocks in STR activity, since it incorporates the past 12 months of a listing’s activity. Given that the COVID-19 pandemic caused STR activity to drop dramatically, we wanted to capture the associated changes at shorter timescales than the one year which our FREH concept allows us to. So we developed a linear regression model which predicts FREH status based on three months of listing activity instead of a full year, and which is calibrated both to routine seasonal variation and to a given market’s specific dynamics. All of the FREH results reported here are the results of this model rather than the raw FREH calculations themselves.

In order to facilitate public understanding and scrutiny of our work, complete methodological details, along with all the code used to produce this analysis, are freely available under an MIT license on the UPGo GitHub page at <https://github.com/UPGo-McGill/vancouver-analysis>.

Glossary

Active daily listings: listings which were displayed on the Airbnb.ca or VRBO.ca website on a given day, and were either reserved or available for a reservation. It is the clearest means of determining the overall size of the short-term rental market in a location, particularly with respect to change over time.

FREH (frequently rented entire-home listings): Entire-home listings which were available on Airbnb or VRBO a majority of the year (at least 183 nights) and were booked a minimum of 90 nights. Alongside ghost hostels, used as a proxy for long-term housing loss. For buildings that contain multiple FREH listings, see ghost hotel. For clusters of private rooms, see ghost hostel.

Ghost hostel: A cluster of private-room STR listings which may appear to be multiple spare bedrooms but are in fact an entire housing unit that has been subdivided into multiple dedicated STRs. We identify ghost hostels using a spatial analysis technique available at <https://github.com/UPGo-McGill/ghost>. Alongside FREH listings, used as a proxy for long-term housing loss.

Ghost hotel: Multiple frequently rented entire-home (FREH) listings located in a single building.

Listing type: One of “entire home or apartment”, “private room”, “shared room”, or “hotel room”, which an STR host chooses on Airbnb or VRBO to characterize their listing. Entire-home listings are the most common listing type in Vancouver, and they include any STR unit that is available entirely to the guests, which could be a single-family home, a townhouse, a condominium unit, or a secondary suite.

LTR (long-term rental): In this report, a long-term rental is a housing unit available for rent for extended periods of time (generally a year), in contrast to a short-term rental. It can include monthly or yearly rental arrangements. In this report, data from the online classified ad sites Kijiji and Craigslist were used to analyze the LTR market.

Multilisting: A listing operated by a host who is simultaneously operating other listings in such a manner that the listings cannot all be located at the host’s principal residence. If one host has two or more entire-home listings or three or more private-room listings active on the same day, those are multilistings.

STR - short-term rental: A housing unit available for rent for 31 days or fewer, typical of vacation rental platforms. In this report, we use STR to refer to a rental advertised on Airbnb or VRBO.

Vacancy rate: The CMHC calculates vacancy rates based on rental apartment structures and rental row (townhouse) structures. Owner-occupied units are not included in the rental building unit count. See CMHC (nd) for specifics.

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