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Short-term rentals in Canada: Uneven growth, uneven impacts

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Abstract
In the last several years, Airbnb and other short-term rental services have grown precipitously across Canada, but very little is known about the scale and character of this activity or its impact on housing. Relying on spatial analysis of big data, this study presents the first comprehensive analysis of Airbnb in Canada, with an emphasis on the interaction between the short-term rental market and long-term housing. Airbnb activity is highly concentrated geographically—nearly half of all active listings are located in the Toronto, Montréal and Vancouver metropolitan areas—and highly concentrated among hosts, the top 10% of whom earn a majority of all revenue. Contrary to the rhetoric of "home sharing", almost 50% of all Airbnb revenue last year was generated by commercial operators who manage multiple listings. Moreover, 31,000 entire homes were rented frequently enough last year that they are unlikely to house a permanent resident. This housing pressure disproportionately affects cities in British Columbia. While current Airbnb activity is concentrated in major cities, active listings, total revenue, hosts with multiple listings, and frequently rented entire-home listings are all growing at substantially higher rates in small towns and rural areas.

Keywords: Short-term rentals, Airbnb, housing, spatial analysis

Résumé
Au cours des dernières années, Airbnb et d'autres services de location à court terme ont connu une croissance précipitée partout au Canada, mais on sait très peu de choses sur l'ampleur et la nature de cette activité ou sur son impact sur le logement. S'appuyant sur l'analyse spatiale des mégadonnées, cette étude présente la première analyse complète d'Airbnb au Canada, en mettant l'accent sur l'interaction entre le marché de la location à court terme et le logement à long terme. L'activité d'Airbnb est très concentrée géographiquement (près de la moitié de toutes les annonces actives sont situées dans les régions métropolitaines de Toronto, de Montréal et de Vancouver) et fortement concentrée parmi les hôtes, dont les 10 % les plus riches génèrent la majorité de tous les revenus. Contrairement à la rhétorique du « partage de logement », près de 50 % de tous les revenus d'Airbnb l'année dernière ont été générés par des opérateurs commerciaux qui gèrent plusieurs annonces. De plus, 31 000 logements entiers ont été loués suffisamment fréquemment l'année dernière pour qu'il soit peu probable qu'ils puissent accueillir un résident permanent. Cette pression sur le logement affecte de manière disproportionnée les villes de la Colombie-Britannique. Alors que l'activité actuelle d'Airbnb est concentrée dans les grandes villes, les annonces actives, les revenus totaux, les hôtes avec plusieurs annonces et les annonces de logements entiers fréquemment loués augmentent tous à des rythmes nettement plus élevés dans les petites villes et les zones rurales.

Mots-clés : locations de courte durée, Airbnb, logement, analyse spatiale

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Short-term rentals in Canada: An overview

From Haida Gwaii to St. John's, in large cities and in small villages, policymakers are increasingly grappling with the impacts of short-term rental (STR) platforms such as Airbnb. Since 2016, when the province of Québec became the first Canadian jurisdiction to regulate STRs through a host registration scheme, most major cities and many smaller ones across the country have either implemented, proposed, or undertaken studies of STR regulations. This trend reflects the spread of concerns about STRs beyond policymakers and housing advocates to community members: a Canada-wide poll recently reported that 54% of respondents feel Airbnb should be regulated like a hotel, up from 43% two years prior (Angus Reid 2018).

Short-term rentals are not a new phenomenon, but the availability of online peer-to-peer STR platforms such as Airbnb and VRBO has dramatically expanded their availability and popularity. Since its founding in 2008, Airbnb has had over 300 million guest check-ins worldwide (Airbnb 2018b). Currently Airbnb's platform offers over 5 million listings (Airbnb 2018c), which is larger than the number of rooms offered by the top three largest hotel chains combined (Dingman 2018). In Canada alone, Airbnb listings have hosted nearly 5 million guest check-ins (Airbnb 2018a). Despite Airbnb's increasing prominence and use, little is known about how activity is distributed across the country and how it is impacting Canadians: the rapid growth of both STRs themselves and public interest in STRs has not been met with equal growth in research. Most significantly, while several studies have examined STR activity in Canada's largest cities (Hohol and Godfrey 2017; Wachsmuth et al. 2017; Wieditz 2017), there has not yet been a comprehensive analysis of STRs which includes smaller communities. The piecemeal production of knowledge and lack of comparative grounding creates an information vacuum for policymakers and researchers. For rural jurisdictions or smaller municipalities, this problem is particularly acute; they face the dual issues of a lack of scholarly attention and comparatively fewer resources than major municipalities with which to conduct their own research.

Accordingly, this study provides the first comprehensive analysis of short-term rental activity in Canada, with a specific focus on Airbnb's impact on Canadian housing. We perform big-data spatial analysis on a dataset of all daily Airbnb activity in Canada between September 2016 and December 2018, to answer three questions:

- Where and when is Airbnb activity happening in Canada?
- Who is making money on Airbnb and how?
- Are short-term rentals threatening long-term housing in Canada?

We find that Airbnb activity is highly concentrated geographically—nearly half of all active listings are located in the Toronto, Montréal and Vancouver metropolitan areas—and highly concentrated among hosts, the top 10% of whom earn a majority of all revenue. Contrary to the rhetoric of "home sharing", almost 50% of all Airbnb revenue last year was generated by commercial operators who manage multiple listings. Moreover, 31,000 entire homes were rented frequently enough last year that they are unlikely to house a permanent resident. This housing pressure disproportionately affects cities in British Columbia. While current Airbnb activity is concentrated in major cities, active listings, total revenue, hosts with multiple listings, and frequently rented entire-home listings are all growing at higher rates in small towns and rural areas.

Short-term rentals and housing in Canada and abroad

There is now a growing body of scholarly knowledge regarding short-term rentals and cities, coming mainly from tourism studies, legal studies and urban studies. The tourism literature has analyzed the impacts of Airbnb on the accommodation sector (Oskam and Boswijk 2016; Zervas et al. 2017), examined how hosts set prices (Gibbs et al. 2017), and investigated Airbnb's relationship to new forms of urban tourism (Füller and Michel 2014). The legal studies literature has been concerned above all with how and why cities are regulating STRs (Gottlieb 2013; Lines 2015). The urban studies literature, meanwhile, has analyzed the impacts of STRs on housing availability and affordability, the broader neighbourhood-scale impacts, and municipal regulatory options. The key finding from this

work is that the growth of STRs has come at the expense of both housing availability and affordability in cities around the world, both by facilitating the conversion of apartments and homes into dedicated short-term rentals and by increasing the economic value of properties which host STRs either full-time or part-time (Barron et al. 2017; BHJ-Advisors 2016; Elíasson and Ragnarsson 2018; Horn and Merante 2017; Lee 2016; Mermet 2017; Samaan 2015; Wachsmuth et al. 2017; Wachsmuth et al. 2018; Wachsmuth and Weisler 2018). Some scholars have further drawn a connection between STRs and gentrification (Gant 2016; Mermet 2017; Wachsmuth and Weisler 2018), arguing that the financial incentives which STRs offer to landlords drives the displacement of low-income residents in favour of tourists, which Wachsmuth and Weisler (2018) describe as a "short-term rent gap". However, this body of work has almost exclusively focused on large urban areas, and the state of research in smaller towns and rural areas is much less well developed (although c.f. DiNatale et al. 2018 and Gurran et al. 2018).

As more jurisdictions have moved to regulate STRs, questions concerning the appropriate regulatory mix and the impacts of regulations have increasingly been on the scholarly agenda (Gurran and Phibbs 2017; Crommelin et al. 2018; Leshinsky and Schatz 2018; Guttentag 2015; Schäfer and Braun 2016; Wegmann and Jiao 2017). While Guttentag (2015) and Leshinsky and Schatz (2018) focus on the difficulty in regulating STRs generally, the remaining literature tends to evaluate STR regulations in individual jurisdictions (Gurran and Phibbs 2017; Schäfer and Braun 2016) or compare STR regulations across several major cities (Crommelin et al. 2018; Wegmann and Jiao 2017). While several policy reports have addressed the Canadian STR regulatory context (Jamasi 2017; Wachsmuth et al. 2017; Wieditz 2017), there has not yet been any peer reviewed research to do so.

In fact, with the partial exception of an industry study (Hohol and Godfrey 2017), there has been no comprehensive research on the state of STRs and Airbnb in Canada and no scholarly research on possible implications of STRs for the housing markets in Canadian cities and rural areas. The limited scholarly research that does exist focuses on the relationship between STRs and tourism. Gibbs et al. (2017) examine how Airbnb listings set nightly price, while Sovani and Jayawardena (2017) examine how the sharing economy impacts Canadian tourism broadly. Grey literature has investigated the relationship between STRs and housing availability in Canada, but only in the country's largest cities. In their study of the impact of Airbnb on housing in Montréal, Toronto and Vancouver, Wachsmuth et. al (2017) found that Airbnb is likely removing thousands of units of housing from the long-term rental market in each of these cities, and found an increasing commercialization of Airbnb operators. Other third party reports have likewise argued that Airbnb is having a negative effect on housing markets in Montréal and Toronto respectively (Desmirarais 2016; Wieditz 2017). To address these gaps, in this study we apply a housing-focused analysis to all Airbnb activity across Canada.

Methods

The analysis in this study was conducted using a comprehensive dataset of all Airbnb activity in Canada from September 2016 to December 2018. The data was compiled by the consulting firm Airdna, on the basis of daily "scrapes" of Airbnb's public website. It provides canonical information about individual listings (e.g. the listing title; whether it is an entire home, private room or shared room; the number of bedrooms; and the cancellation policy), and daily estimates for listing activity (reserved, available or blocked) and prices.1 Our dataset includes 279,763 listings, 212,883 of which were active on Airbnb's website in 2018. In total, we aggregated and analyzed 143 million data points concerning daily Airbnb transactions, using a set of custom functions written in the R programming language, and relying on the open-source packages cancensus, circlize, cowplot, dplyr, forcats, foreign, ggforce, ggplot2, gridExtra, lubridate, polyCub, purrr, readr, scales, sf, spatstat, stingr, tibble, tidyr, tmap, tmaptools, and zoo (Baddeley et al. 2015; Baptiste 2017; Grolemund and Wickham 2011; Gu 2014; Henry and Wickham 2019; Meyer 2019; Müller and Wickham 2019; Pebesma 2018; Pedersen 2019; R Core Team 2018a, 2018b; Tennekes 2018a; 2018b; von Bergmann et al. 2018; Wickham 2016; 2018; 2019a; 2019b; Wickham and Henry 2019; Wickham et al. 2018; 2019; Wilke 2019; Zeileis and Grothendieck 2005).

An inherent limitation of spatial analysis of Airbnb data is that the exact location of properties cannot be ascertained, because the publicly displayed latitude and longitude coordinates of a listing on Airbnb's website are randomly shifted up to 200 metres from their true location. To compensate for this obfuscation, we aggregate listings at the dissemination-area scale, and use a Bayesian spatial inference technique which uses the distribution of housing units across a city to weight the probability that a given listing came from a given dissemination area (described in Wachsmuth et al. 2019). (Dissemination areas are small, relatively uniform areas with a target population of 400-700, and they are the smallest scale at which all Canadian census data is disseminated.) We then further aggregate listings at

the census metropolitan area (CMA) or census agglomeration (CA) scales for cross-country comparisons. In order to avoid overestimating the impacts of STRs on housing and neighbourhoods, we exclude non-housing listings such as igloos, vans, boats, parking spaces, hotels, and bed and breakfasts. We excluded approximately 11,400 such listings, which generated 3% of Airbnb host revenue in Canada in 2018.

In addition to the Airbnb listings data from Airdna, the other data sources we rely on are the Canadian Census and the Canada Mortgage and Housing Corporation (CMHC) Comprehensive Rental Market Survey. For the Census, 2016 data has been used. The CMHC data is from the October 2016 Comprehensive Rental Market Survey, supplemented with data from earlier years where relevant.

Where and when is Airbnb activity happening in Canada?

Airbnb activity in Canada spans the entire country. Figure 1 shows the distribution of active Airbnb listings. The distribution of Airbnb activity roughly mirrors Canada's distribution of population, as shown by the high concentration of Airbnb activity in the Windsor to Québec City corridor and other major urban areas, and the comparative lack of activity in remote northern portions of the country. Nearly half (46%) of all active Airbnb listings are located in Montréal, Toronto or Vancouver, despite the fact that these CMAs only house 36% of Canada's population (Table 1). In total, 71% of Airbnb listings are located in one of Canada's 35 CMAs (which house 69% of the country's popu-

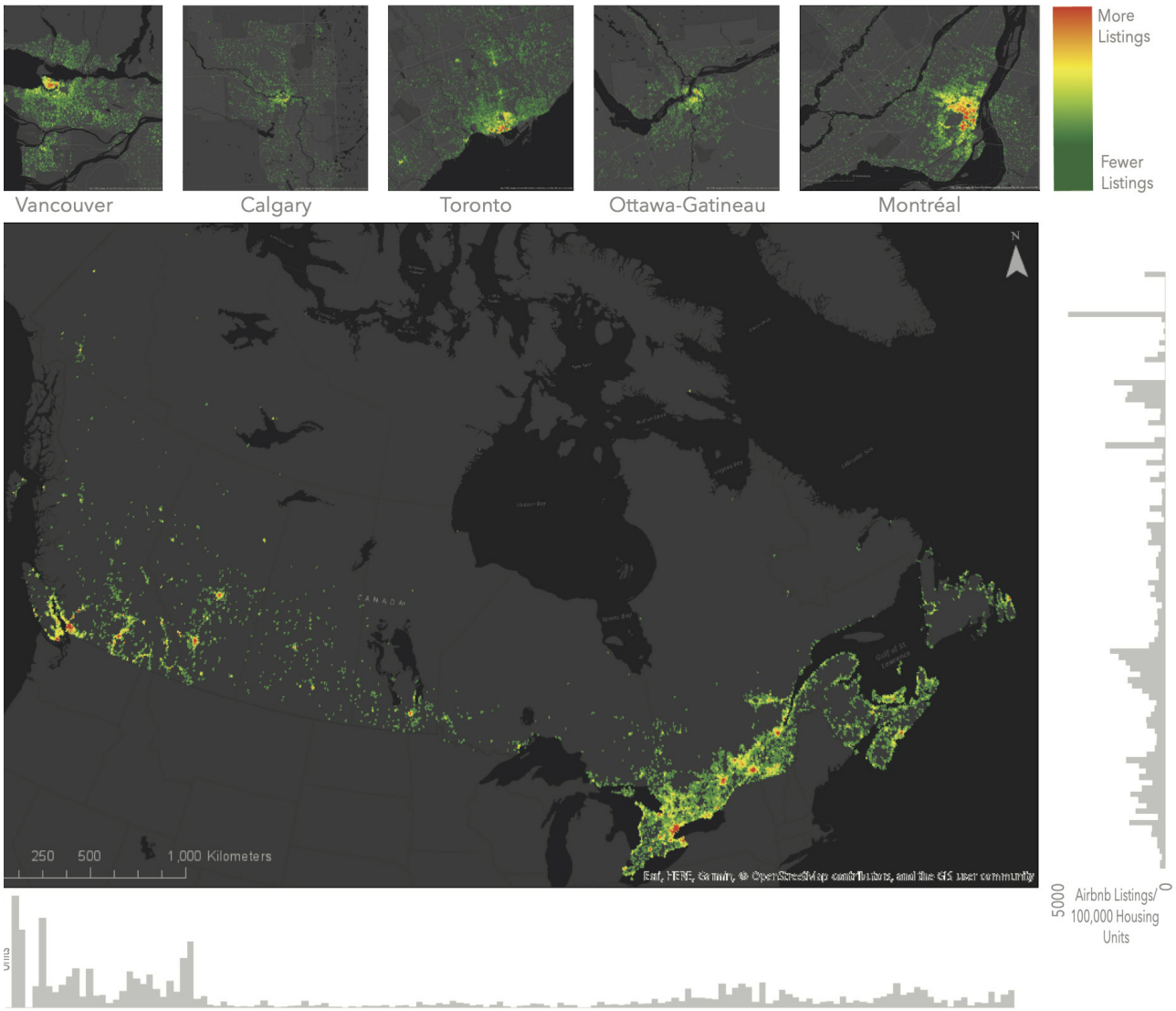

Figure 1: Airbnb listings across Canada and in the five largest CMAs, with histograms of the distribution of listings by longitude and latitude.

Table 1: Airbnb listings across Canada.

Geography	Listings active May 1, 2017 to April 30, 2018 (% of total)	Percent year-over-year growth in active listings	Revenue generated between May 1, 2017 and April 30, 2018 (% of total)	Percent year-over-year growth in revenue
CMAs	112,700 (74%)	28%	$823.3 million (63%)	63%
Montréal, Toronto, Vancouver	*72,900 (48%)*	*27%*	*$555.2 million (42%)*	*88%*
CAs	11,400 (7%)	86%	$107.0 million (8%)	163%
Rural	29,800 (19%)	74%	$383.6 million (29%)	160%
All of Canada	*153,800 (100%)*	*38%*	*$1,314.0 million (100%)*	*90%*

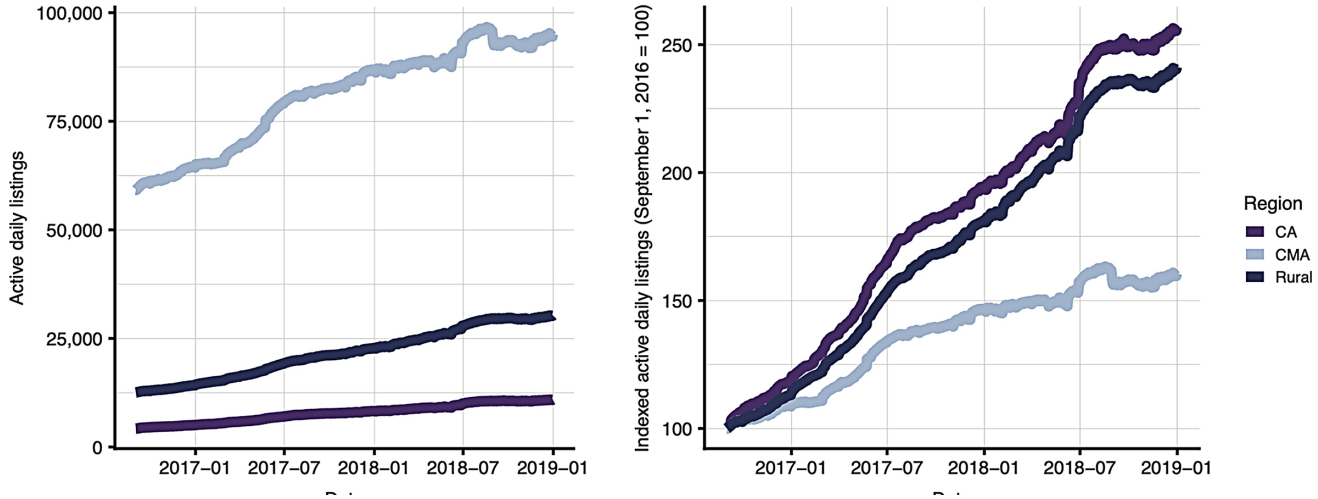

Figure 2: Raw and indexed growth of daily active Airbnb listings by settlement type.

lation), 8% are located in one of its 117 CAs (which house 11% of the country's population) and the remaining 21% are located in rural areas (which house 19% of the population). The histograms bordering the density map in Figure 1 offer a view of Airbnb activity in Canada normalized by population, showing the number of active listings per unit of housing at different latitudes and longitudes. The large spikes in the number of listings per housing unit in the western portion of the country indicate that, while activity may be concentrated in southern Ontario and Québec in absolute terms, the West Coast sees higher levels of activity relative to population. Numbers of listings per unit also peak around Calgary and Edmonton, and further north in Whitehorse (which receives summer tourists well out of proportion with its year-round population).

Based on Canada's distribution of population alone, CMAs have a higher percentage of the country's Airbnb listings than expected, while CAs have less than expected. However, the annual growth rate of active listings in CAs (42%) and rural areas (44%) is significantly higher than in CMAs (19%), indicating that today's high concentration of Airbnb activity within CMAs is giving way to a future of more evenly dispersed activity (Figure 2).

In rural areas, 15% of all listings and 28% of all revenue are concentrated in just four municipalities which collectively house fewer than 0.15% of rural residents but are major national tourism destinations. These are Whistler, British Columbia; The Blue Mountains and Prince Edward County, Ontario; and Mont-Tremblant, Québec. Most rural municipalities follow a relatively linear relationship between size and Airbnb listings, but these four municipalities demonstrated substantially higher earnings in 2018 than expected (Figure 3). Even amongst these top earners, Whistler demonstrates extreme revenue concentration: Airbnb hosts earned $88.8 million in revenue there in 2018

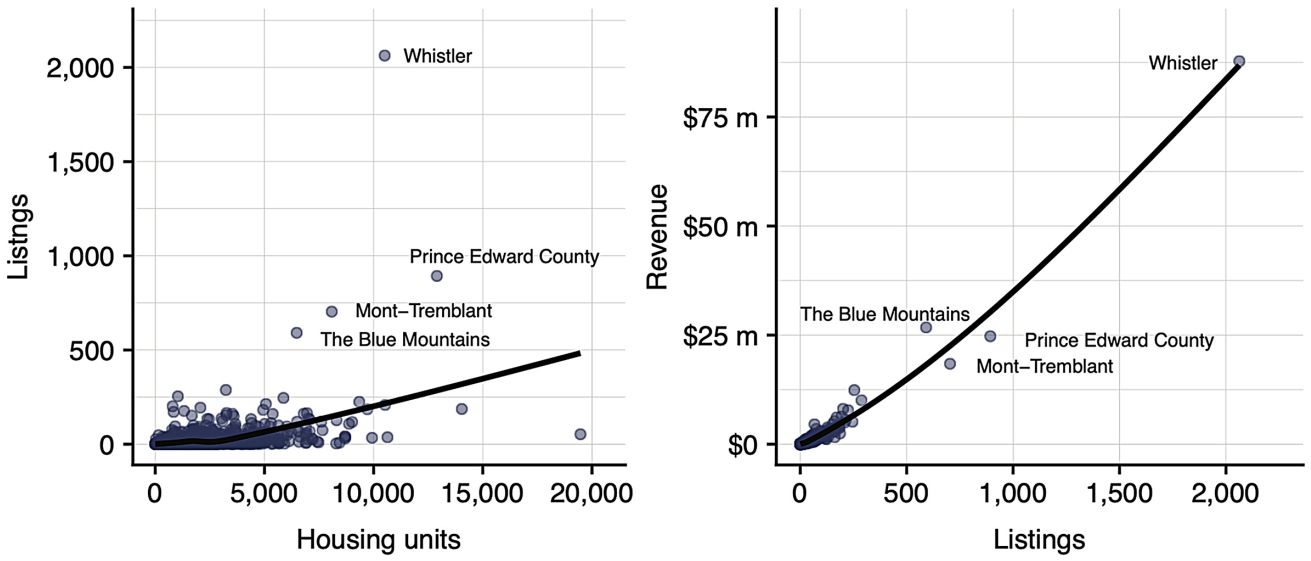

Figure 3: Average daily listings by total housing units (left) and total 2018 revenue by average daily listings (right) in rural municipalities.

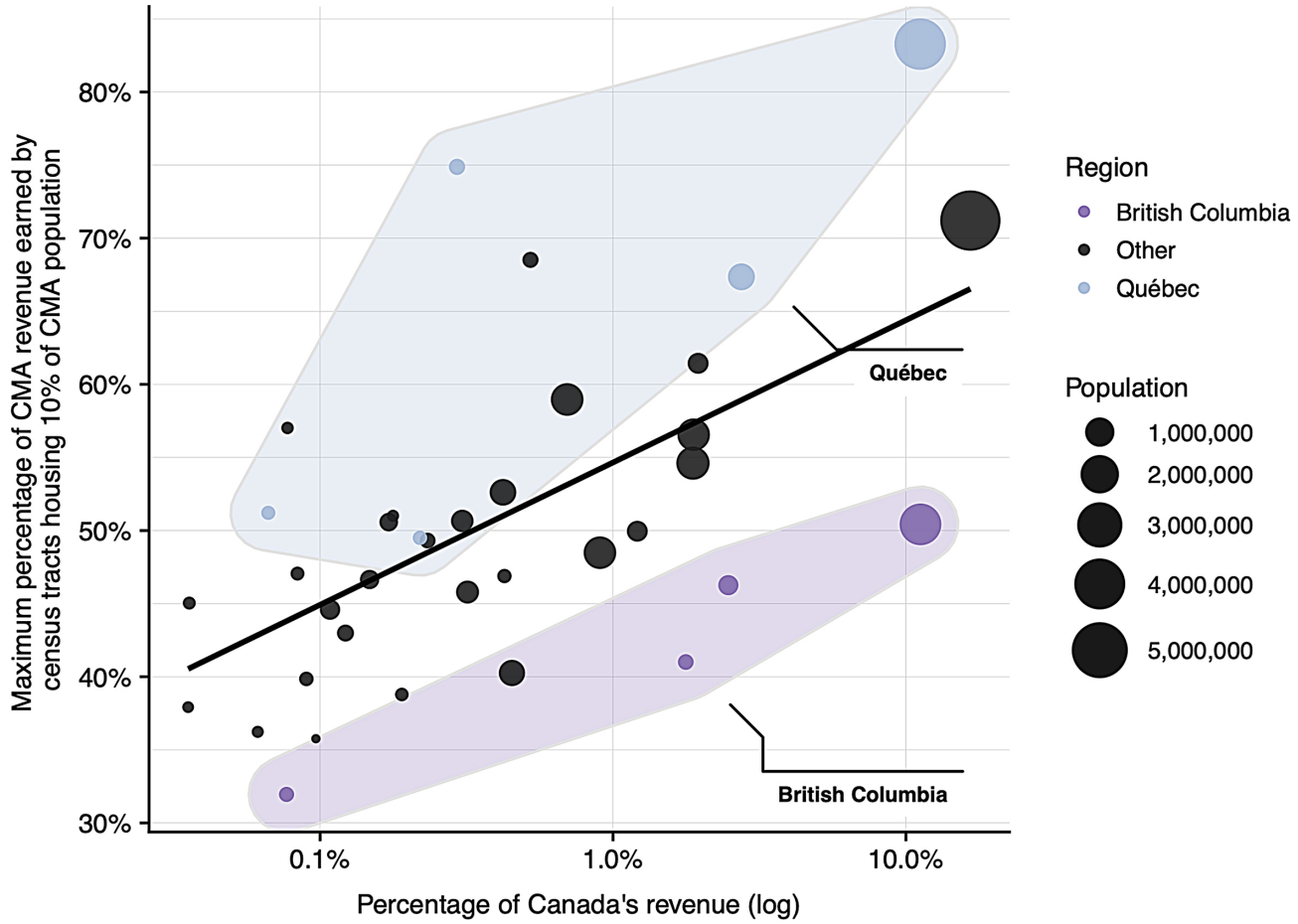

Figure 4: Concentration of Airbnb revenue per CMA (as measured by the maximum percentage of revenue earned by census tracts housing 10% of CMA population) by the percentage of total Canadian Airbnb revenue the CMA earned .

(15.4% of total rural earnings), which was $8,360 for every housing unit in the municipality. Comparatively, Airbnb hosts earned $4,130 per housing unit in The Blue Mountains, $2,280 in Mont-Tremblant, and $1920 in Prince Edward County, but only $27 per housing unit in the remaining rural areas. As the right panel of Figure 3 shows, however, revenue per listing is broadly in line with other rural municipalities. Moreover, Whistler, Mont-Tremblant, and Prince Edward County show slower revenue growth than rural areas outside of the four largest markets, indicating that high overall STR growth rates in rural areas are being driven by smaller markets.

The spatial concentration of Airbnb activity within CMAs varies significantly between cities, as shown in Figure 4. In general, CMAs with more absolute revenue (as represented by their share of total national Airbnb revenue) also exhibit higher levels of revenue concentration (as represented by the maximum proportion of CMA revenue generated in census tracts housing 10% of the CMA population), suggesting that the costs and rewards of the platform's use are highly localized. Montréal, which generates roughly 11% of all Canadian Airbnb revenue, produces over 80% of its revenue in census tracts that house 10% of the CMA's population. On the other end of the spectrum is Abottsford-Mission; the CMA produces less than 0.1% of Canada's revenue, and generates only 32% of its own revenue in census tracts that house 10% of its population. While the overall correlation between total revenue and revenue concentration is quite strong ($r = 0.52$), cities in Québec and British Columbia stand out as partial exceptions to this pattern. In Québec, spatial concentration of revenue is substantially higher than expected given the proportion of revenue its cities earn, while in British Columbia, concentration is lower than expected.

Airbnb activity also exhibits temporal concentration; on average, after adjusting for secular growth patterns, listings earn the largest share of their total yearly revenue in July and August (Figure 5). The intensity of this pattern varies by region. In Atlantic Canada, Airbnb revenue is highly seasonal: listings earn almost 50% of their total yearly revenue in July and August alone. The strong concentration of Airbnb revenue in the summer period suggests a larger dependence on seasonal leisure tourists in Atlantic Canada, as opposed to business travellers who require lodging year-round.

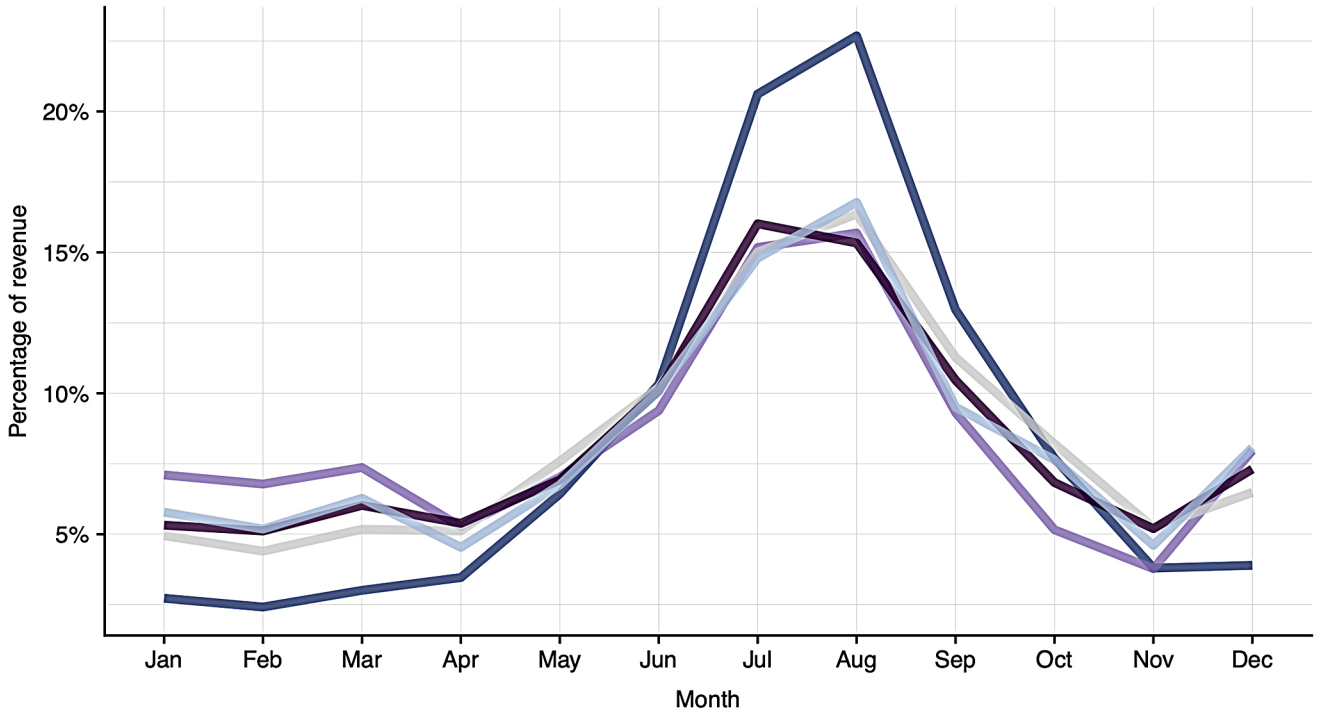

Figure 5: Percentage of annual Airbnb revenue earned each month (growth adjusted).

Who is making money on Airbnb and how?

Airbnb hosts are earning unprecedented revenue in Canada, but a smaller and smaller share of operators are earning a larger and larger piece of the pie. In 2018, hosts across the country earned $1.8 billion, which was a 40% increase in revenue over the previous year, despite the fact that the number of active listings only increased by 25%. This revenue was not evenly distributed, however. Among the 103,290 hosts that earned revenue in 2018, the median host earned $3,180, while the average host earned $13,290.

Revenue is highly concentrated amongst a small number of hosts at all scales of analysis. In general, CMAs, CAs, and rural areas show similar levels of concentration; for each settlement type, the top 1% of hosts earn 20% of all revenue and the top 10% of hosts earn more than half of all revenue (Figure 6). However, discrepancies in host revenue concentration exist between CMAs. Specifically, the cities which exhibit high levels of geographically concentrated revenue—notably Montréal, Québec City, and Toronto—also exhibit high levels of revenue concentration amongst hosts. The parallels between different metrics of revenue concentration serve to highlight the uneven patterns of Airbnb inequality across Canada. Of the CMAs, Montréal shows the highest revenue concentration amongst hosts—the top 1% of hosts earn 30% of all revenue—whereas Abbotsford - Mission has the lowest amount of concentration —the top 1% of hosts earn just over 5% of all revenue.

An important policy question concerning short-term rentals is the extent to which STR operators are part-time home sharers or dedicated commercial operators. Indeed, Airbnb frequently asserts that most of its hosts are families engaging in part-time home sharing to supplement their regular income (e.g. Bannerjee 2017). The preceding host revenue analysis shows this claim to be at minimum misleading, since most revenue is earned by the top 10% of hosts while the bottom 80% of hosts only earn a small fraction of total platform revenue in nearly every jurisdiction in the country. However, another way to approach the question of host revenue concentration is by identifying STR commercial operators—those whose listings are dedicated STRs as opposed to being their primary residences. While there is no practical way to exhaustively identify commercial operators (a survey of hosts would be necessary), a conservative minimal definition is hosts with "multilistings"—two or more entire-home listings or three or more private-room listings. This definition will likely produce many false negatives—e.g. a host who owns a condo as an investment property and rents it on Airbnb as an entire-home listing, but who does not have any other listings on

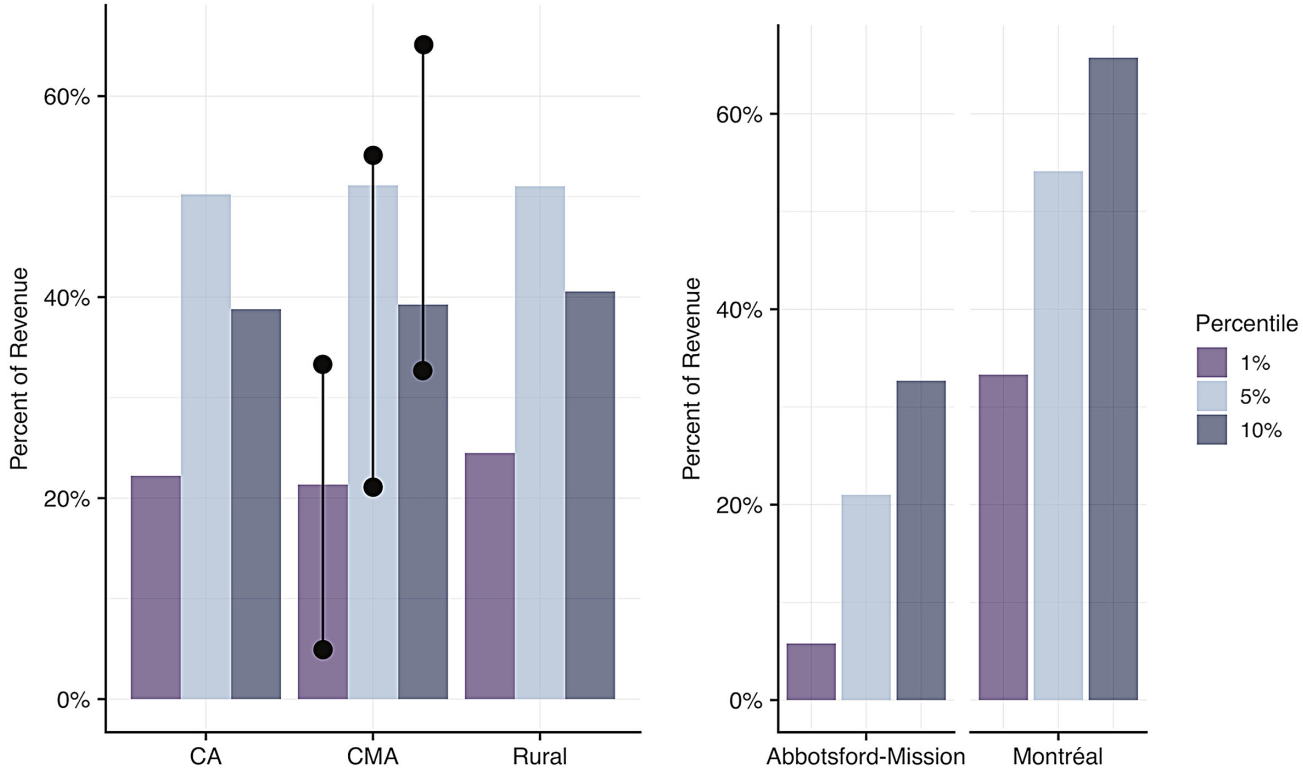

Figure 6: Percentage of revenue earned by the top 1%, 5%, and 10% of hosts in CMAs, CAs, and rural areas over the last twelve months (hosts with no revenue in the last twelve months are excluded).

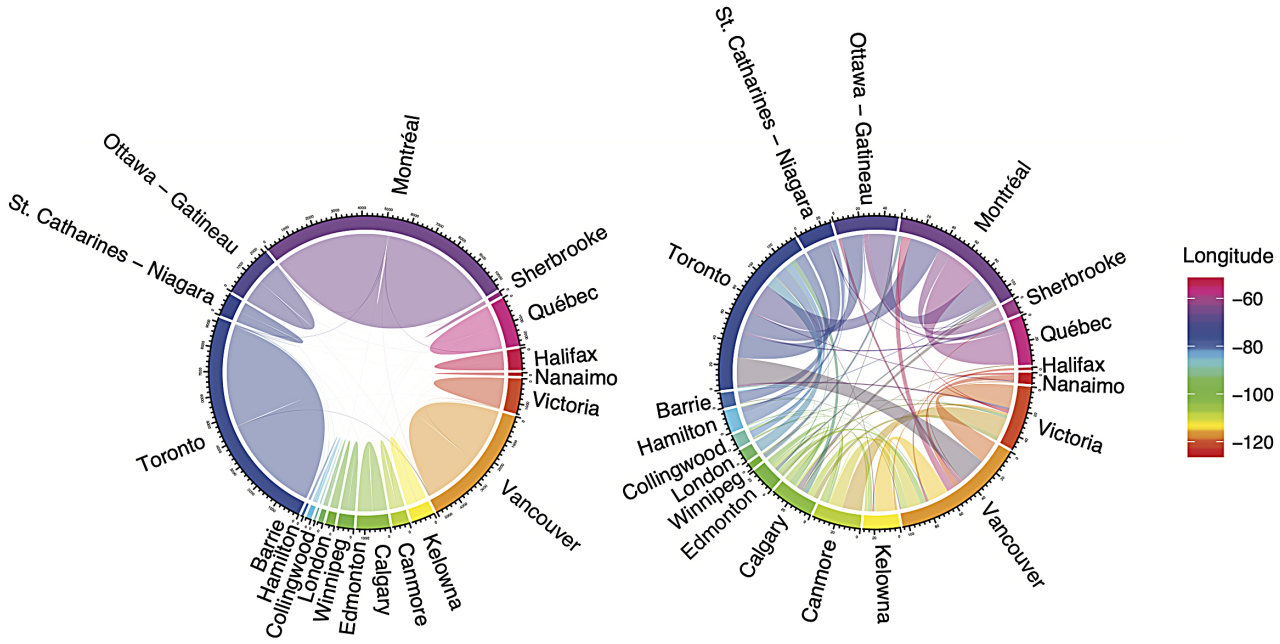

Figure 7: Distribution of multilistings within and between cities. The left panel shows the geographical location of multilistings organized by host (each line connects two listings operated by the same host), and demonstrates that most multilisting hosts operate within a single city. The right panel shows the same relationships, but only for hosts with listings in multiple cities, and demonstrates strong regional interconnections as well as interconnections between the largest CMAs.

the platform—but will produce very few false positives, since any host with multiple entire-home listings cannot by definition have each of them be their principle residence. By this minimal definition, commercial operators are earning large and growing amounts of all Airbnb revenue in Canada. CMAs and rural areas are slightly more commercialized than CAs: 48% of all revenue is earned by commercial operators in the former, while in the latter they earn 45% of all revenue. Furthermore, across all settlement types the share of both listings and host revenue accruing to commercial operators increased between 2017 and 2018, indicating that the STR market in Canada is becoming increasingly commercialized over time.

Across CMAs, Montréal, Québec City, and St. Catharine's - Niagara show the most commercialization, with 59%, 54%, and 51% of their revenue derived from multilistings respectively. In general, larger CMAs with more mature Airbnb markets have higher levels of commercialization: Toronto (49%), Moncton (49%), Halifax (46%), Ottawa – Gatineau (46%) and Edmonton (46%) are also among the CMAs with the largest proportion of their revenue derived from multilistings, while Abbotsford-Mission (13%), Guelph (21%), and Lethbridge (23%) are at the bottom of the list. Within CMAs, there is no strong spatial pattern of revenue generated by commercial operators; rather than being concentrated in a particular portion of the cities, multilisting hosts generate revenue with similar spatial distributions to other hosts. Figure 7 shows connections between multilistings owned by the same host, illustrating that properties managed by commercial operators are significantly more likely to be clustered within one CMA than spread across multiple CMAs (left panel). However, an analysis of cross-CMA multilisting connections (right panel) demonstrates a number of distinct patterns. In general, multilistings are more likely to be located in cities that are in close proximity to one another, as exemplified by the strength of the connections between Montréal and Québec City, Victoria and Vancouver, and Ottawa and Montréal. Strong cross-country multilisting connections are likely to occur between larger CMAs, including Montréal, Toronto, Vancouver.

In almost all CMAs, the percentage of total revenue generated by commercial operators increased in the last year, with particularly high growth rates in Montréal and several smaller CMAs. Across Canada, there are fifteen hosts that managed over 100 active listings each in the past year, four of whom managed over 250 active listings each. The vast majority of these hosts also earned over $1 million in the last year. In total, 57 hosts earned more than $1 million in 2018.

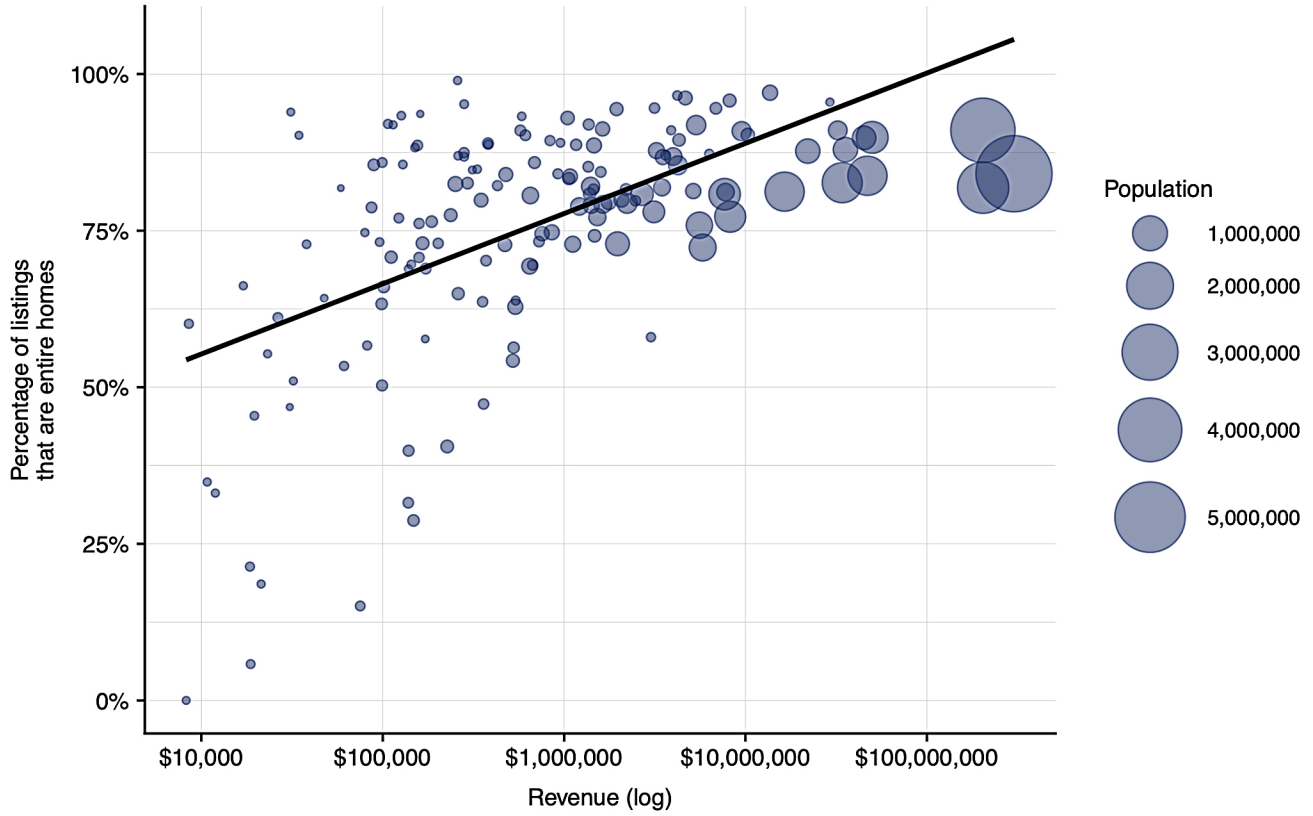

Figure 8: Percentage of revenue derived from entire home listings by revenue earned in the last year for each CMA and CA, weighted by population.

On average, entire-home listings make up a higher proportion of active listings (83%) and revenue (95%) in rural areas than in CMAs (63% of listings and 86% of revenue) or CAs (70% of listings and 89% of revenue). Figure 8 shows the relationship between city size, revenue, and percentage of revenue generated by entire-home listings. The largest, highest-earning cities (including CMAs and CAs) consistently earn very large proportions of their revenue from entire-home listings, suggesting that home sharing is not the predominant form of revenue generation in these areas. Conversely, low-earning cities show a much larger range of revenue generated by entire home listings. Within urban areas, the spatial pattern of revenue generated from entire-home listings is relatively weak, aside from the fact that central cities tend to earn slightly higher percentages of their revenue from entire-home listings than their surrounding regions.

Are short-term rentals threatening long-term housing in Canada?

Arguably the most important policy question associated with the rise of short-term rentals has been the extent to which they are increasing housing unaffordability and unavailability. The two plausible channels through which this could occur are 1) that long-term housing could be converted to full-time STRs and thus directly reduce the stock of housing available for residents; and 2) that STRs could increase the prevailing economic value of housing both through scarcity-inducing unit conversions and, even in the absence of unit conversions, because homeowners and tenants who are willing to host part-time STRs can bid up the price of housing. The latter channel requires comparative econometric modelling to measure; while this has not been conducted in Canada (and is outside the scope of this paper), Barron et al. (2017) analyzed the 100 largest metropolitan areas in the United States to determine that an increase in the number of Airbnb listings in a neighbourhood results in a systematic increase in both rents and house prices, an effect which was stronger in neighbourhoods with low rates of owner occupation. Since the US and Canada have similar housing systems and similar STR dynamics, it is likely that Canadian housing has likewise become more expensive due to the growth of STRs.

Table 2: Frequently rented entire-home listings across Canada last year.

Geography	Number of FREH listings in the last year (% of national total)	Percent year-over-year growth in FREH listings	Revenue earned by FREH listings in the last year (% of national total)	Percent year-over-year growth in FREH revenue
CMAs	20,130 (65%)	32%	$566.6 million (58%)	36%
Montréal, Toronto, and Vancouver	*12,320 (40%)*	*23%*	*$374.0 million (39%)*	*30%*
CAs	2,520 (8%)	51%	$71.9 million (7%)	47%
Rural	8,450 (27%)	60%	$323.9 million (34%)	69%
All of Canada	*31,100 (100%)*	*40%*	*$962.4 million (100 %)*	*47%*

The first channel—conversions of long-term housing units to short-term rentals—is amenable to estimation if not direct measurement. If an entire-home unit is rented for 365 nights in a year, it cannot possibly also be available in the long-term housing market, while an entire-home unit rented 30 nights in a year is more likely to be a long-term residence whose occupant was frequently out of town. To estimate STR-induced housing loss, we define a threshold of activity for entire-home listings. Frequently rented entire-home listings (FREH) are those which were available for rent at least half the year (183 nights) and actually rented at least 90 nights. FREH listings represent a conservative estimate for housing either directly converted to STR or under serious threat of conversion since it is highly unlikely that a home that spends the majority of the year listed on Airbnb is housing a long-term resident.

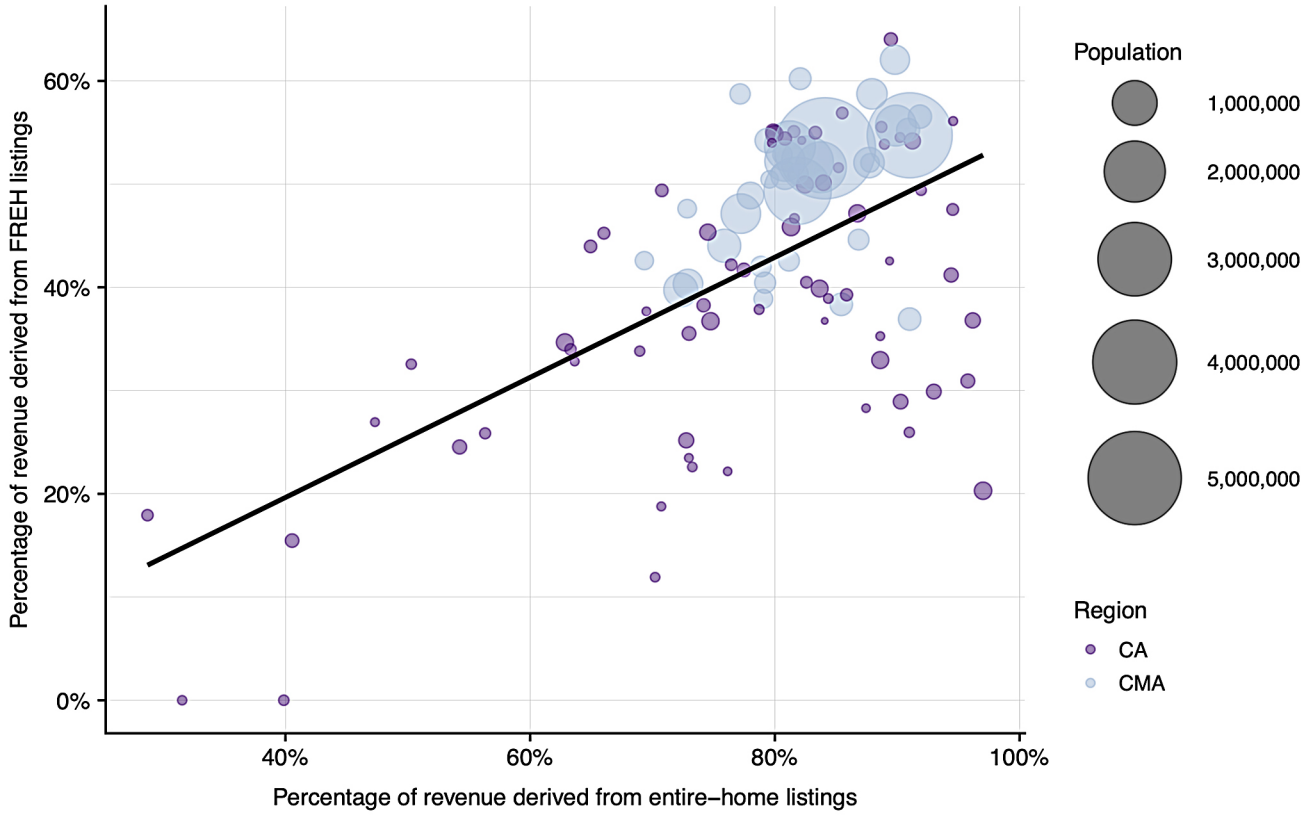

Figure 9: Percentage of revenue derived from entire-home listings and frequently rented entire-home listings

Using this estimate, Airbnb has removed approximately 31,100 units of housing from the long-term rental market (Table 2). These listings are concentrated in Montréal, Toronto, and Vancouver metropolitan areas: in the last year, these three CMAs housed 40% of FREH listings, while only housing 36% of the country's population. Canada-wide, the number of FREH listings grew by 40%. The slowest growth rates in terms of number of listings and revenue, although still substantial, were in Canada's three largest cities. In rural areas, the number of FREH listings grew by 60%. As FREH listings represent housing units that have almost certainly been removed from the long-term rental market, such high growth rates predict a future of increased STR pressure on housing availability.

FREH listings are proportionately more common in rural areas (21% of total listings) than in either CAs (16%) or CMAs (13%). Congruently, rural areas derive more revenue from FREH listings (57%) than either CAs (46%) or CMAs (53%). This pattern, however, is driven by the fact that entire-home listings are more common in rural areas (95% of all listings) than in CAs (63%) or CMAs (70%). An examination of only entire-home listings reveals the reverse pattern; while FREH listings comprise 46% of entire-home listings in CMAs, they only comprise 40% in rural areas and 42% in CAs. FREH listings are growing faster than other listing types in terms of number of listings and revenue. There is a strong correlation ($r = 0.67$) between the proportion of revenue generated by entire-home listings and the proportion of revenue generated by FREH listings (Figure 9). In general, large CMAs earn larger portions of revenue from FREH listings than expected based on the share of revenue they earn from all entire-home listings.

Despite substantial growth relative to other Airbnb listings, FREH listings are still a small fraction of total housing; they do not exceed more than 0.8% of total private housing units in any of Canada's CMAs. However, this fact disguises significant variation within CMAs. For example, in some census tracts in downtown Montréal two in ten housing units are frequently rented on Airbnb (Figure 10). Similarly high rates of housing frequently rented

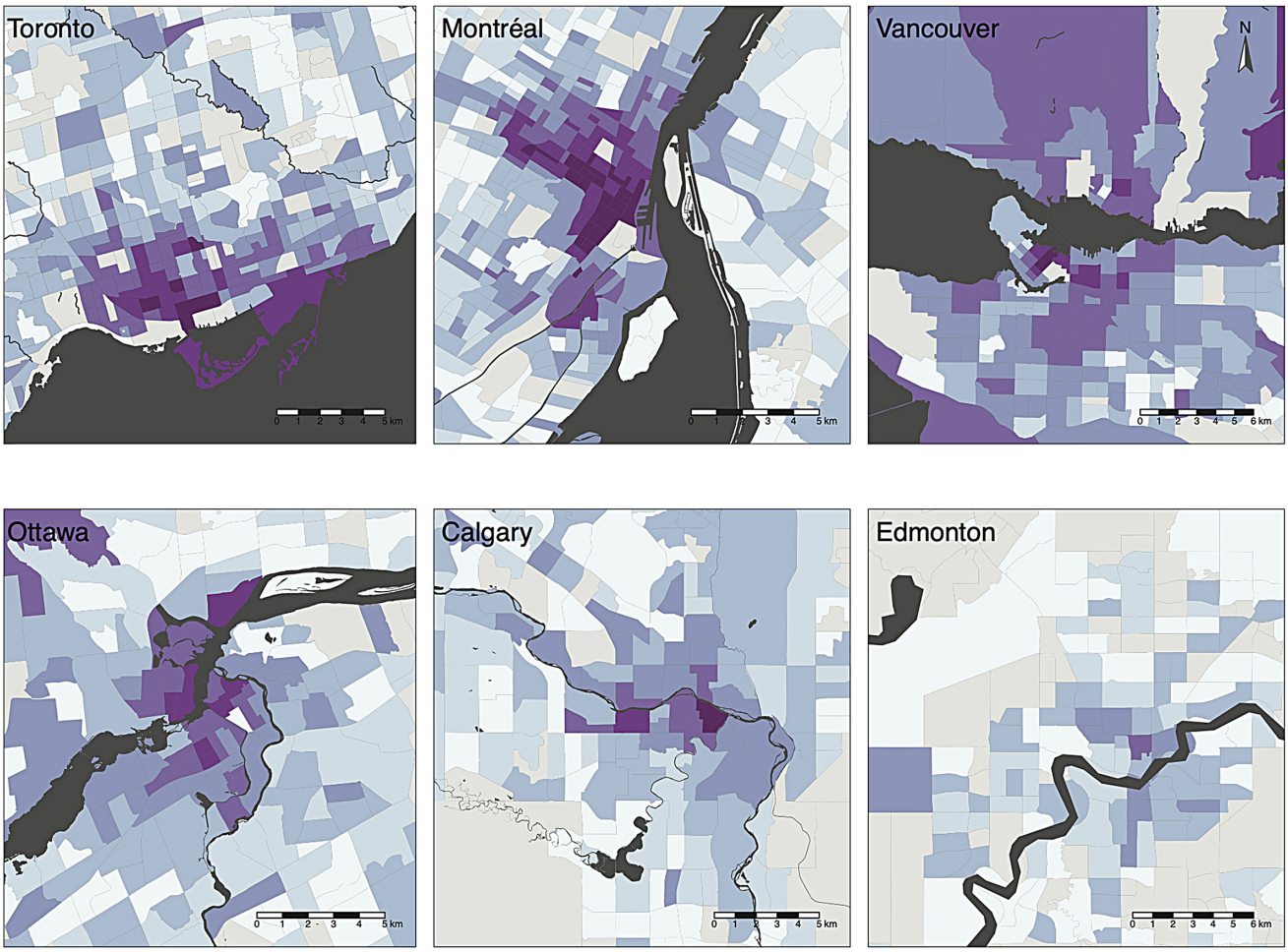

Figure 10: The proportion of housing units frequently rented on Airbnb as entire homes.

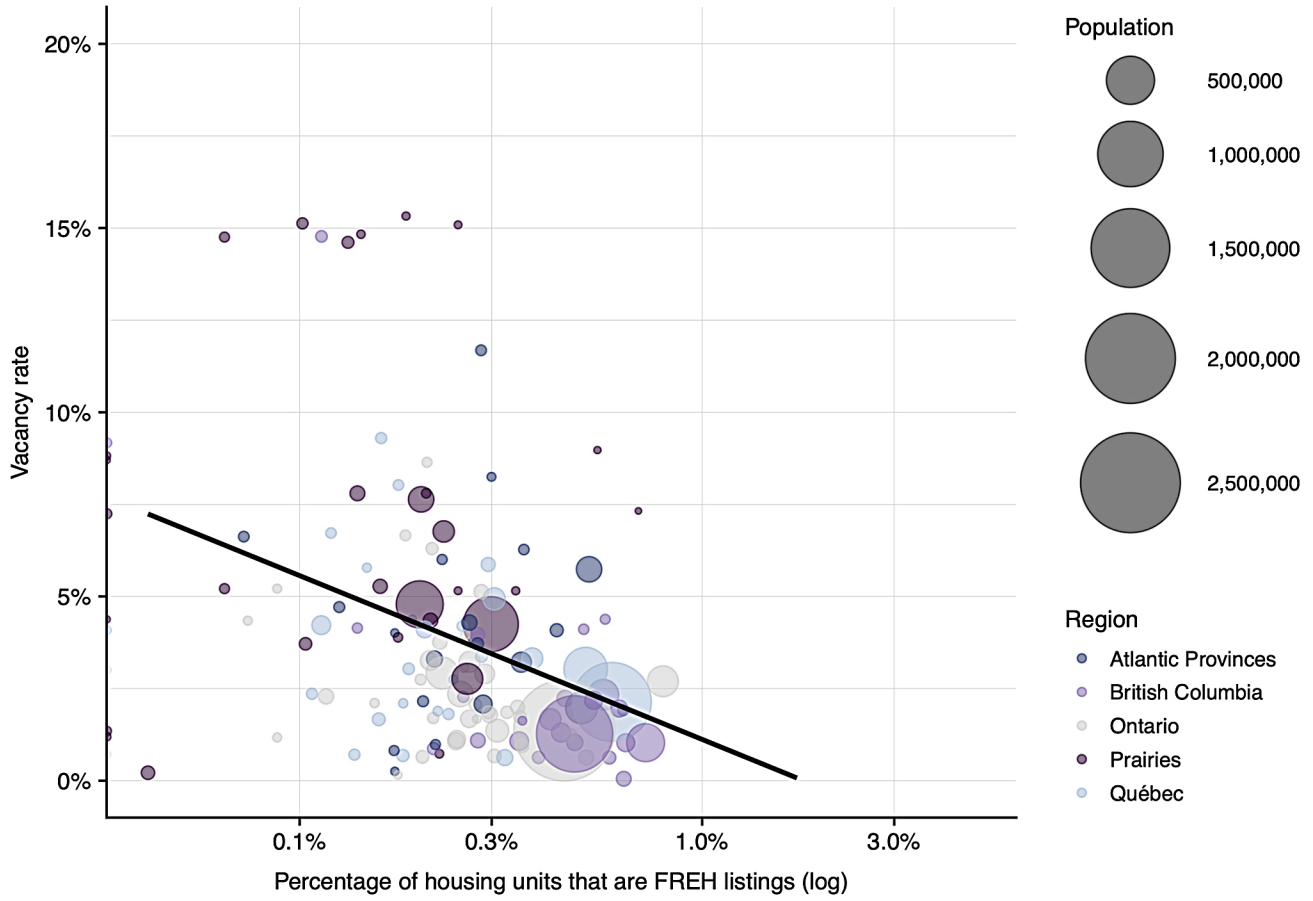

Figure 11: Vacancy rate vs. percent of housing units frequently rented on Airbnb by CMA and CA.

on Airbnb can be seen outside major cities. In the small coastal vacation community of Tofino, British Columbia, approximately 18% of all housing units were frequently rented in 2018. By contrast, less than 0.05% of housing was frequently rented on Airbnb in Lethbridge, Alberta. This suggests that STR pressures on housing availability and affordability are highly localized.

A useful measure of STR impacts on housing availability is the ratio of the percentage of housing units in a CMA that are Airbnb FREH listings to the local rental vacancy rate. Cities with high percentages of the housing stock frequently rented on Airbnb and simultaneously low rental vacancy rates are areas with heightened STR-induced housing pressure—areas where fewer renters can find apartments to rent while those who can pay higher rents. In Figure 11, the cities experiencing high levels of STR-induced housing pressure are located below the trend line. Cities in British Columbia and Ontario have particularly high portions of frequently rented listings and very low vacancy rates, while cities in the Prairies exhibit relatively low levels of FREH listings but high vacancy rates.

Through removing housing that would otherwise be available on the long-term rental market, Airbnb is reducing housing supply and, in turn, housing affordability. These impacts are unevenly distributed. While the three largest Canadian cities have lost over 12,000 housing units from their long-term rental markets, housing loss in smaller CMAs in British Columbia (such as Kelowna and Abbotsford-Mission) is compounded by low vacancy rates and therefore may be more acutely felt. In other communities, Airbnb appears to have so far had a minor impact on housing availability, but these patterns may soon change, since Airbnb is growing significantly faster outside the major cities than within them. Particularly alarming is the high growth rate of FREH listings. Across all settlement types, this growth exceeds the growth in other listings, suggesting an increasing commercialization of STRs and a correspondingly increasing threat to housing affordability across Canada.

Conclusions: Decreasing housing availability, increasing commercialization, and the way forward

This study has provided the first comparative analysis of Airbnb activity in communities across Canada. It reveals highly uneven impacts. Across multiple metrics, Canada's largest CMAs have more concentrated and commercialized Airbnb activity than CAs and rural areas. A larger share of CMA revenue is derived from frequently rented entire-home (FREH) listings and commercial multilistings, and both revenue and activity are more concentrated within specific neighbourhoods and census tracts. Montréal in particular has highly concentrated Airbnb activity, with over 30% of all Airbnb revenue earned by just 1% of its hosts, and census tracts where one in ten total housing units is frequently rented on the platform. In total, Airbnb has likely removed approximately 31,100 units from Canada's long-term rental markets. Of the 31,100 FREH listings, 44% of these are located in Canada's three largest CMAs and 68% are located within a CMA, although FREH listings are growing much more quickly in CAs and rural areas. Due in part to low rental vacancy rates, British Columbia's cities may be feeling the impact of high levels of Airbnb activity most acutely.

Five years ago, short-term rentals in cities—both in Canada and abroad—were almost universally illegal with the exception of licenced bed and breakfasts. STRs were illegal either through bans on commercial uses in residential areas, through fire codes and regulations on lodgings, or through explicit bans on rentals below a certain threshold of nights. Despite operating in a legal grey area at best, STRs facilitated by Airbnb and other online platforms have proliferated. Canadian public regulations are only now starting to catch up, struggling to deal with the complexity of regulating STRs concurrently with other digital platforms such as Uber (Brail 2018). In April 2016, the Province of Québec became the first Canadian jurisdiction to introduce a law regulating short-term rentals. They have since been followed by an increasingly long list of provinces and municipalities. Notably, in 2018 both Toronto and Vancouver introduced new short-term rental regulations, as did Montréal's largest borough Ville-Marie. As of the end of 2018, Calgary, Ottawa, Edmonton, and Saskatoon were studying the possibility of new regulations, and a number of smaller cities and towns across Canada have introduced new regulations or are in the process of doing so.

While the number of jurisdictions moving to regulate short-term rentals suggests the perceived scope and size of the public policy issues they pose, the effectiveness of regulation remains to be seen. Québec's path-breaking regulations required STR hosts to register with the province; however, as of March 2017 fewer than 5% were certified and paying Québec's provincial accommodation tax, contributing to the province missing out on a reported $3.7 million in tax revenue for 2016 (CBC News, 2017). (In August 2017 the Province signed a deal with Airbnb under the terms of which the latter began collecting the tax automatically.) These problems are not unique to Canada; in New York City, where most entire-home short-term rentals have been illegal for decades, one recent estimate suggested that two thirds of Airbnb platform revenue is earned from these illegal rentals (Wachsmuth et al. 2018). Broadly speaking, the experience of cities around the world which have attempted to aggressively regulate STRs suggests the difficulty of effective regulation, particularly in instances where Airbnb and the other platforms have attempted to resist or obstruct the regulation.

As challenging, therefore, as developing effective regulations will be for major Canadian cities, the challenges will be much greater in smaller communities with less governance capacity. After all, while Airbnb activity is currently concentrated in major cities, our analysis suggests this is changing. STRs are growing faster, concentrating faster, and removing housing from the long-term market faster in rural areas and CAs than in CMAs. These trends mean that, increasingly, it will not just be Canada's largest cities struggling with both the positive and negative impacts of STRs on communities. The result will almost certainly be an increased push to regulation among jurisdictions which have fewer resources and less leverage to exert over Airbnb and other STR platforms, this could make it difficult to prevent increasing housing affordability issues. Higher orders of government—particularly the provinces, which in two cases (British Columbia and Québec) have already struck deals with Airbnb regarding tax revenues—may therefore need to intervene on behalf of smaller communities. As new STR regulatory regimes are introduced across the country, evaluating the conditions for their success or failure should accordingly become an important priority for Canadian urban research.

References

Airbnb. 2018a. *Airbnb in Canada.* Retrieved from https://www.airbnbcitizen.com/data/#/en/canada.

Airbnb. 2018b. *Airbnb unveils roadmap to bring magical travel to everyone* [Press release]. Retrieved from https://press.atairbnb.com/airbnb-unveils-roadmap-to-bring-magical-travel-to-everyone/.

Airbnb. 2018c. *Fast facts*. Retrieved from https://press.airbnb.com/fast-facts/.

AngusReid. 2018. *As Canadians' awareness of Airbnb has grown, so has their desire to regulate it*. Retrieved from http://angusreid.org/airbnb-short-term-rentals/.

Baddeley, A., E. Rubak, and R. Turner, R. 2015. *Spatial point patterns: Methodology and applications with R*. London, UK: Chapman and Hall/CRC Press. http://www. crcpress.com/Spatial-Point-Patterns-Methodology-and-Applications-with-R/Baddeley- Rubak- Turner/9781482210200/.

Bannerjee, S. 2017. Small group of commercial property owners dominating Toronto, Montreal and Vancouver Airbnb market: Study. *Canadian Press*. Retrieved from https://www.thestar.com/business/2017/08/08/small-group-of-commercial-property-owners-dominating-toronto-montreal-and-vancouver-airbnb-market-study.html.

Barron, K., E. Kung, and D. Proserpio. 2017. The Sharing economy and housing affordability: Evidence from Airbnb. *SSRN Electronic Journal*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3006832.

Baptiste, A. 2017. gridExtra: Miscellaneous Functions for "Grid" Graphics. R package version 2.3. https://CRAN.R-project.org/package=gridExtra.

Barron, K., E. Kung, and D. Proserpio. 2017. The sharing economy and housing affordability: Evidence from Airbnb. EC '18: Proceedings of the 2018 ACM Conference on Economics and Computation. https://dl.acm.org/doi/abs/10.1145/3219166.3219180.

BHJ-Advisors. 2016. *Short changing New York City: The impact of Airbnb on New York's housing market*. Retrieved from http://www.hcc-nyc.org/documents/ShortchangingNYC2016FINALprotected_000.pdf.

Brail, S. 2018. From renegade to regulated: The digital platform economy, ride-hailing and the case of Toronto. *Canadian Journal of Urban Research* 27(2): 51–63.

CBC News. 2017. Quebec reaches 'landmark' deal with Airbnb. *CBC News*, August 29. https://www.cbc.ca/news/canada/montreal/quebec-airbnb-hotel-tax-1.4266355.

Crommelin, L., L. Troy, C. Martin, and C. Pettit. 2018. Is Airbnb a sharing economy superstar? Evidence from five global cities. *Urban Policy and Research* 36(4): 429–444.

Desmarais, P. T. 2016. *LE PHÉNOMÈNE Airbnb: Bienfait ou calamité pour les locataires?* Retrieved from http://clpmr.com/wp-content/uploads/2016/11/CLPMR_phenomene_airbnb_FINAL_web.pdf.

DiNatale, S., R. Lewis, R. and R. Parker. 2018. Short-term rentals in small cities in Oregon: Impacts and regulations. *Land Use Policy* 79: 407–423.

Dingman, S. 2018. Why Airbnb is taking some lessons in hospitality from the hotel industry. *The Globe and Mail*, February 27. https://www.theglobeandmail.com/life/travel/why-airbnb-is-taking-some-lessons-in-hospitality-from-the-hotel-industry/article38139338/.

Elíasson, L., and Ö. P. Ragnarsson. 2018. *Short-term renting of residential apartments: Effects of Airbnb in the Icelandic housing market*. Retrieved from https://rafhladan.is/bitstream/handle/10802/15606/WP%2076.pdf?sequence=1.

Füller, H., and B. Michel. 2014. Stop being a tourist! New dynamics of urban tourism in Berlin-Kreuzberg. *International Journal of Urban and Regional Research* 38(4): 1304–1318.

Gottlieb, C. 2013. Residential short-term rentals: Should local governments regulate the 'Industry'? *Planning & Environmental Law* 65(2): 4-9.

Grolemund, G.and H. Wickham. 2011. Dates and times made easy with lubridate. *Journal of Statistical Software* 40(3): 1–25. http://www.jstatsoft.org/v40/i03/.

Gu, Z., L. Gu, R. Eils, M. Schlesner, and B. Brors. 2014. circlize implements and enhances circular visualization in R. Bioinformatics. *Bioinformatics* 30(19): 2811–2812. https://doi.org/10.1093/bioinformatics/btu393.

Gant, A. C. 2016. Holiday rentals: The new gentrification battlefront. *Sociological Research Online* 21(3): 1–9.

Gibbs, C., D. Guttentag, U. Gretzel, J. Morton, and A. Goodwill. 2017. Pricing in the sharing economy: A hedonic pricing model applied to Airbnb listings. *Journal of Travel & Tourism Marketing* 35(1): 46–56.

Gurran, N., and P. Phibbs. 2017. When tourists move in: How should urban planners respond to Airbnb? *Journal of the American Planning Association* 83(1): 80–92.

Gurran, N., G. Searle, and P. Phibbs. 2018. Urban planning in the age of Airbnb: Coase, property rights, and spatial regulation. *Urban Policy and Research* 36(4), 399–416.

Guttentag, D. 2015. Airbnb: Disruptive innovation and the rise of an informal tourism accommodation sector. *Current issues in Tourism* 18(12): 1192–1217.

Henry, L., and H. Wickham. 2019. purrr: Functional Programming Tools. R package version 0.3.2. https://CRAN.R-project.org/package=purrr.

Hohol, F., and R. Godfrey, R. 2017. *An overview of Airbnb and the hotel sector in Canada*. Retrieved from http://www.hotelassociation.ca/pdf/An%20Overview%20of%20Airbnb%20and%20the%20Hotel%20Sector%20in%20Canada/Full%20Report.pdf.

Holm, K. 2017. *Regulating short-term rentals in Vancouver*. Retrieved from http://council.vancouver.ca/20170711/documents/rr1.pdf.

Horn, K., and M. Merante. 2017. Is home sharing driving up rents? Evidence from Airbnb in Boston. *Journal of Housing Economics* 38: 14–24.

Jamasi, Z. 2017. *Regulating Airbnb and the short-term rental market: An overview of North American regulatory frameworks*. Retrieved from https://www.policyalternatives.ca/sites/default/files/uploads/publications/Ontario%20Office/2017/06/Regulating%20Airbnb%20and%20the%20Short-Term%20Rental%20Market_FINAL.pdf.

Lee, D. 2016. How Airbnb short-term rentals exacerbate Los Angeles's affordable housing crisis: Analysis and policy recommendations. *Harvard Law and Policy Review* 10: 229–254.

Leshinsky, R., and L. Schatz. 2018. "I don't think my landlord will find out:" Airbnb and the challenges of enforcement. *Urban Policy and Research*. https://doi:10.1080/08111146.2018.1429260.

Lines, G. E. 2015. Hej, not hej da: Regulating Airbnb in the new age of Arizona vacation rentals. *Arizona Law Revue* 57: 1163.

Mathieu, E. 2017. Emptied Kensington apartments appear on Airbnb. *The Toronto Star*, June 19. https://www.thestar.com/news/gta/2017/06/19/emptied-kensington-apartments-appear-on-airbnb.html.

Mermet, A.-C. 2017. Airbnb and tourism gentrification: Critical insights from the exploratory analysis of the 'Airbnb syndrome'in Reykjavik. In M. Gravari-Barbas and S. Guinand (Eds.), *Tourism and gentrification in contemporary metropolises* (pp. 52-74). New York, NY: Routledge.

Meyer, S. 2019. polyCub: An R package for integration over polygons. *Journal of Open Source Software* 4(34): 1056. https://joss.theoj.org/papers/10.21105/joss.01056.pdf.

Müller, K., and H. Wickham. 2019. tibble: Simple Data Frames. R package version 2.1.1. https://CRAN.R-project.org/package=tibble.

Oskam, J., and A. Boswijk. 2016. Airbnb: The future of networked hospitality businesses. *Journal of Tourism Futures* 2(1): 22–42.

Pebesma, E. 2018. Simple features for R: Standardized support for spatial vector data. *The R Journal*. https://journal.r-project.org/archive/2018/RJ-2018-009/.

Pedersen, T. 2019. ggforce: Accelerating 'ggplot2'. R package version 0.2.1. https://CRAN.R-project.org/package=ggforce.

Pelley, L. 2018. Toronto's short-term rental bylaws could be delayed months over OMB appeals. *CBC News*, April 5. https://www.cbc.ca/news/canada/toronto/toronto-s-short-term-rental-bylaws-could-be-delayed-months-over-omb-appeals-1.4604901.

R Core Team. 2018a. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

——. 2018b. foreign: Read Data Stored by 'Minitab', 'S', 'SAS', 'SPSS', 'Stata', 'Systat', 'Weka', 'dBase', ... R package version 0.8-71. https://CRAN.R-project.org/package=foreign.

Samaan, R. 2015. *Airbnb, rising rent, and the housing crisis in Los Angeles*. Retrieved from http://www.laane.org/wp-content/uploads/2015/03/AirBnB-Final.pdf.

Schäfer, P., and N. Braun. 2016. Misuse through short-term rentals on the Berlin housing market. *International Journal of Housing Markets and Analysis*,9(2): 287–311.

Sovani, A., and C. Jayawardena. 2017. How should Canadian tourism embrace the disruption caused by the sharing economy? *Worldwide Hospitality and Tourism Themes* 9(4): 464–470.

Tennekes, M. 2018a) tmap: Thematic maps in R. *Journal of Statistical Software* 84(6): 1–39.

——. 2018b. tmaptools: Thematic map tools. R package version 2.0-1. https://CRAN.R-project.org/package=tmaptools.

von Bergmann, J., D. Shkolnik, and A. Jacobs. 2018. cancensus: Canadian census data and geography from the 'CensusMapper' API. R package version 0.1.6.

Wachsmuth, D., D. Chaney, D. Kerrigan, A. Shillolo, and R. Basalaev-Binder. 2018. *The high cost of short-term rentals in New York City*. Retrieved from https://mcgill.ca/newsroom/files/newsroom/channels/attach/airbnb-report.pdf.

Wachsmuth, D., D. Kerrigan, D. Chaney, and A. Shillolo. 2017. *Short-term cities: Airbnb's impact on Canadian housing markets*. Retrieved from http://upgo.lab.mcgill.ca/airbnb/Short-term%20Cities%202017-08-10.pdf.

Wachsmuth, D., X. Wang, and J. Combs. 2019. Overcoming big-data spatial obfuscation with dasymetric mapping: The case of Airbnb. Working paper available online at http://upgo.lab.mcgill.ca.

Wachsmuth, D., and A. Weisler. 2018. Airbnb and the rent gap: Gentrification through the sharing economy. *Environment and Planning A: Economy and Space* 50(6). https://doi.org/10.1177/0308518X18778038.

Wang, D., J. Nicolau. 2017. Price determinants of sharing economy based accommodation rental: A study of listings from 33 cities on Airbnb.com. *International Journal of Hospitality Management* 62: 120–131.

Wegmann, J., and J. Jiao. 2017. Taming Airbnb: Toward guiding principles for local regulation of urban vacation rentals based on empirical results from five US cities. *Land Use Policy* 69: 494–501.

Wickham, H. 2016. *ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York.

——. 2018. scales: Scale Functions for Visualization. R package version 1.0.0. https://CRAN.R-project.org/package=scales.

——. 2019a. forcats: Tools for working with categorical variables (factors). R package version 0.4.0. https://CRAN.R-project.org/package=forcats.

——. 2019b. stringr: Simple, consistent wrappers for common string operations. R package version 1.4.0. https://CRAN.R-project.org/package=stringr.

Wickham, H., and L. Henry. 2019. tidyr: Easily Tidy Data with 'spread()' and 'gather()' Functions. R package version 0.8.3. https://CRAN.R-project.org/package=tidyr.

Wickham, H., J. Hester, and R. Francois. 2018. readr: Read rectangular text data. R package version 1.3.1. https://CRAN.R-project.org/package=readr.

Wickham, H., R. François, L. Henry, and K. Müller. 2019. dplyr: A grammar of data manipulation. R package version 0.8.0.1. https://CRAN.R-project.org/package=dplyr.

Wieditz, T. 2017. *Squeezed out: Airbnb's commericalization of home-sharing in Toronto*. Retrieved from http://fairbnb.ca/wp-content/uploads/2017/09/Fairbnb_Report_Feb_29.pdf.

Wilke, C. O. 2019. cowplot: Streamlined plot theme and plot annotations for 'ggplot2'. R package version 0.9.4. https://CRAN.R-project.org/package=cowplot.

Zeileis, A., and G. Grothendieck. 2005. zoo: S3 infrastructure for regular and irregular time series. *Journal of Statistical Software* 14(6), 1–27.

Zervas, G., D. Proserpio, and J. W. Byers. 2017. The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry. *Journal of Marketing Research* 54(5): 687–705.