

Measuring Rental Price Changes for Prospective Tenants Using Rental Listing Microdata

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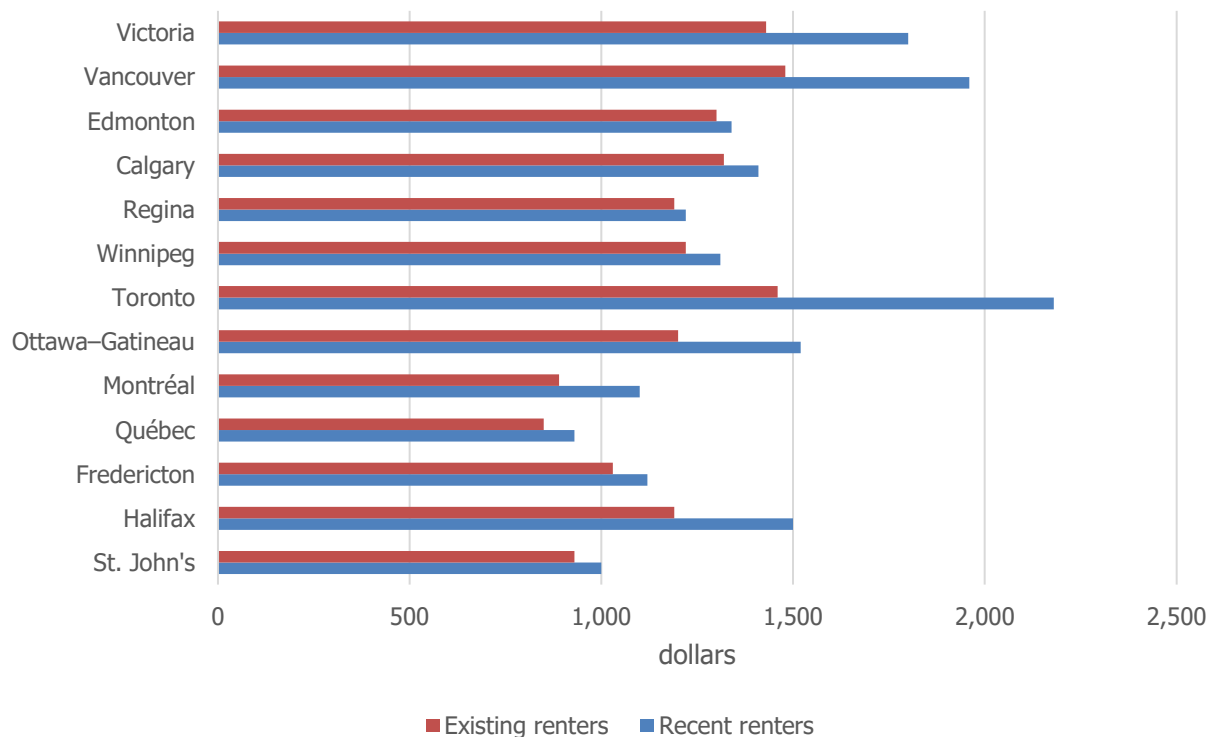


Outline

- Motivation and the rental price index
- Rental listing microdata
- Index estimation: hedonics
- Preliminary results
- Challenges and limitation, and sensitivity analysis
- Upcoming work

Motivation

Median monthly shelter cost of two-bedroom dwellings for recent and existing renters in selected Census Metropolitan Areas



Source: Statistics Canada, Census of Population, 2021.

Rent Growth for Turnover Units and Non-turnover Units, 2022

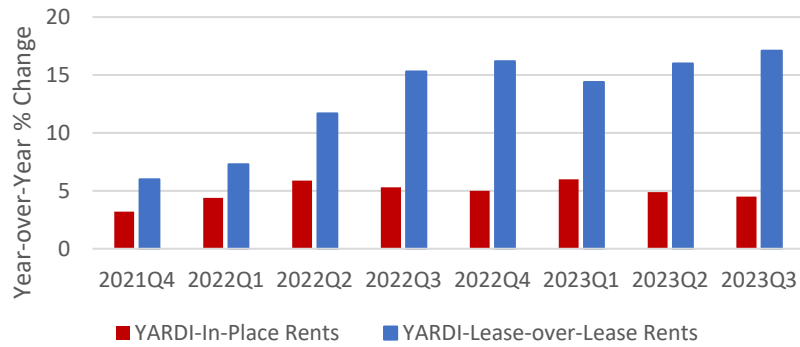
Rent Growth (YOY % change)	Turnover units	Non-turnover units
National	18.3	2.9
Toronto	29.1	2.3
Vancouver	23.9	3.9
Montréal	14.5	3.5

Source: Canada Mortgage and Housing Corporation (CMHC) rental market report 2023. Rent growth is calculated for purpose-built, 2-bedroom units.

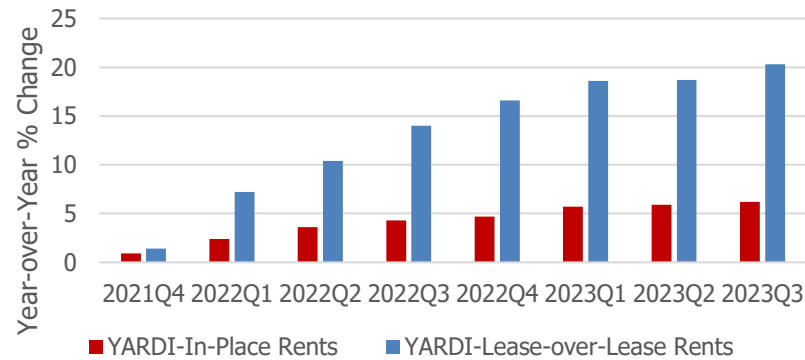
Motivation

Yardi Multifamily Report (2021Q4 – 2023Q3)

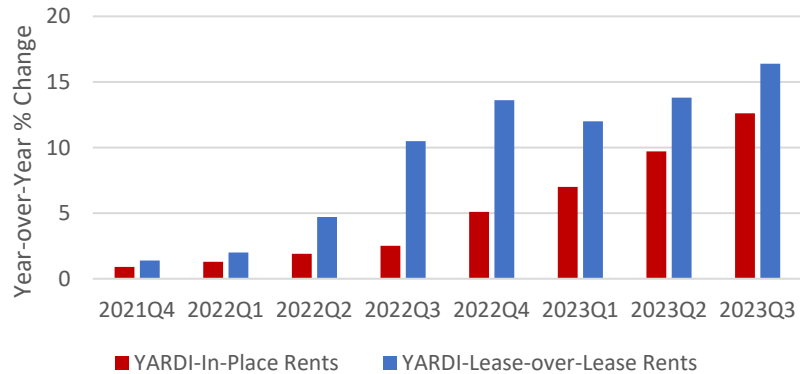
Vancouver



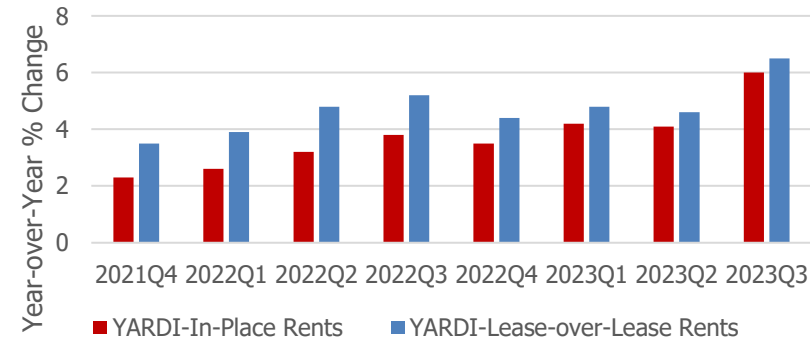
Toronto



Calgary



Montreal



In-Place Rents:

Monthly rent per unit for all leases, including new lease rents, renewal lease rents and existing leases

Lease-Over-Lease Rent Growth:

Percentage change in monthly rent between a new lease and the previous lease for the same unit

Source: Yardi Canadian National Multifamily Report

Motivation

- Divergent trends are observed in different segments of rental market in recent years
- Fill in the data Gap
 - Lack of price index reflecting monthly/quarterly changes in rental price faced by prospective tenants
 - CPI rent – the change in the rents paid by *all tenants* from a sample of occupied rental units
 - CMHC annual report – *annual* rent change for apartment/condo and townhouse only
 - Yardi quarterly report – *annual* rent change for primary rental market
- Potential application of the rental index for prospective tenants
 - One of the important indicators for changes in the affordability of households
 - Quickly reflect changes in market condition

The Rental Price Index (RPI)

- **The Rental Price Indexes (RPI)** measure changes over time in the asking rents that landlords advertised for their available rental units.
- Data available at Census Metropolitan Area (CMA), provincial and national level
- Frequency: monthly
- Potential users:
 - Policy makers and economic analysts
 - General public

Rental Listing Microdata

- Data provider: *Rentals.ca*, online listing services
- Period: 2019.01 – 2023.10
- Coverage: both primary and secondary rental markets
- Key variables:
 - Monthly advertised rent
 - Address
 - Dwelling type
 - # of bedroom/bathroom
 - Floor area (sqft)
 - Utilities included (electricity, heat, water, internet, cable)
 - Unit features (furnished status, fridge, stove, microwave, dishwasher, in-suite laundry, balcony) and building amenities (shopping center, public transit, and sports complexes)

Number of listings per month by CMA (2019-2023)

CMA	Average listings	Range
Vancouver (BC)	1,400	600 – 3,100
Calgary (AB)	9,000	5,900 – 11,800
Toronto (ON)	6,000	3,600 – 9,300
Montreal (QE)	2,500	600 – 3,900

Rental Listing Microdata: data cleaning

- Observations dropped: hotels, retirement homes, vacation rentals, Co-op housing and Rent-Geared-to-Income housing
- Address geocoding and standardization
 1. Geocoding → correct input errors and impute missing elements (e.g. postal code)
 - Locate the rental units
 - Assign geographic classifications (e.g., FSAs, CMAs) → control for neighborhood effects in regression analysis
 2. Address standardization → group by building address → impute missing building-level characteristics
- Duplicates removal
- Data cleaning procedures for asking rents
 1. Drop rents < \$300 or rent > \$10,000
 2. Adjust the number of bedrooms for units with rent per room < \$300
 3. Drop outliers
- Categorization of dwelling type and # of bedrooms/bathrooms

Index Estimation

Rental units advertised change from month to month

→ quality adjustment is needed

Three hedonics methods:

1. Pooled time dummy hedonics
2. Rolling window time dummy hedonics
3. Characteristics prices and imputation method

Index Estimation

1. Pooled time dummy hedonics

$$\ln p_i^t = \beta_0 + \sum_{k=1}^K \beta_k x_{ik}^t + \sum_{m=1}^M \beta_m FSA_{im}^t + \sum_{t=1}^T \delta^t D_i^t + \varepsilon_i^t$$

where

$\ln p_i^t$: the logarithm of the asking rents for rental unit i at period t

x_{ik}^t : the k^{th} characteristics for rental unit i at period t

FSA_{im}^t : the m^{th} location dummy for rental unit i at period t ,

D_i^t : time dummies

Index: $I_{0,t} = \exp(\hat{\delta}^t)$

Index Estimation

2. Rolling window time dummy hedonics

- Window length: 13 months
- Splicing: mean splice method
- Linked series: linking to the published series

3. Characteristics Prices and Imputation Method

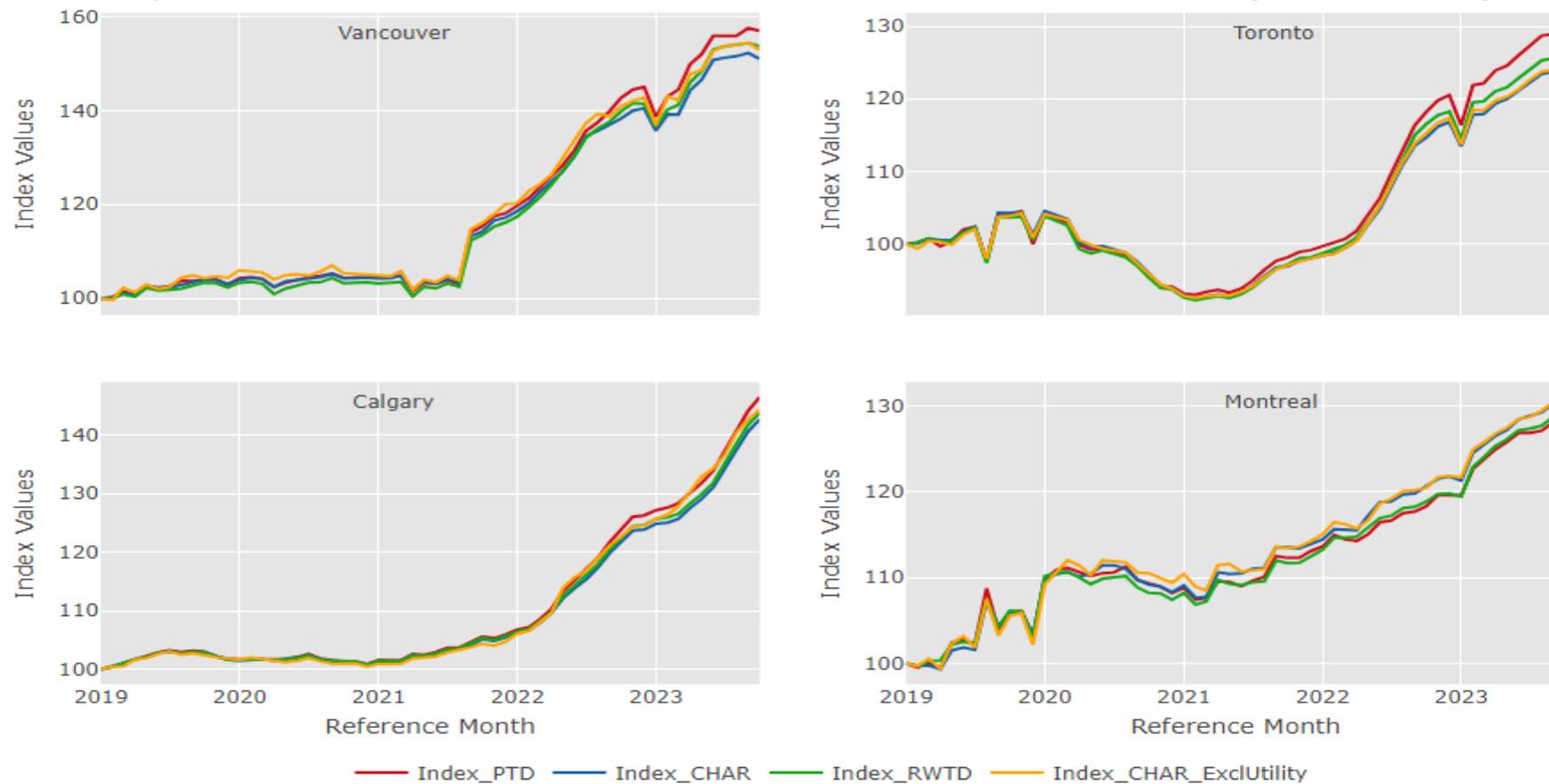
regression model:
$$\ln p_i^t = \beta_0^t + \sum_{k=1}^K \beta_k^t x_{ik}^t + \sum_{m=1}^M \beta_m^t FSA_{im}^t + \varepsilon_i^t$$

predicted price:
$$\hat{p}_{t,\tau} = e^{\left(\hat{\beta}^t x^\tau + 0.5 \hat{\sigma}_t^2\right)}$$

index:
$$I_{0,t} = I_{0,t-1} \times I_{t-1,t}$$

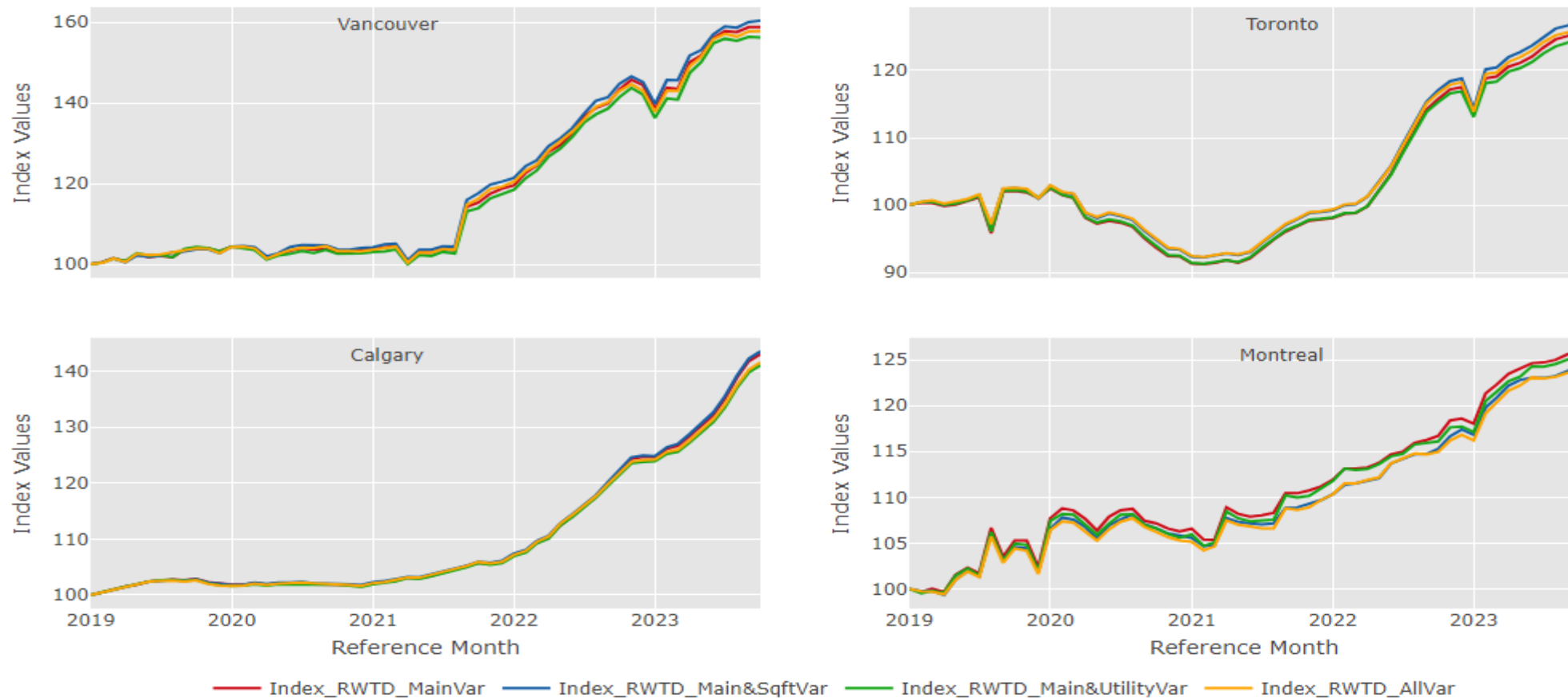
Preliminary Results: Various Hedonics Methods

Comparison of Rental Indexes for Selected CMAs: Various Hedonic Methods (Jan 2019=100)



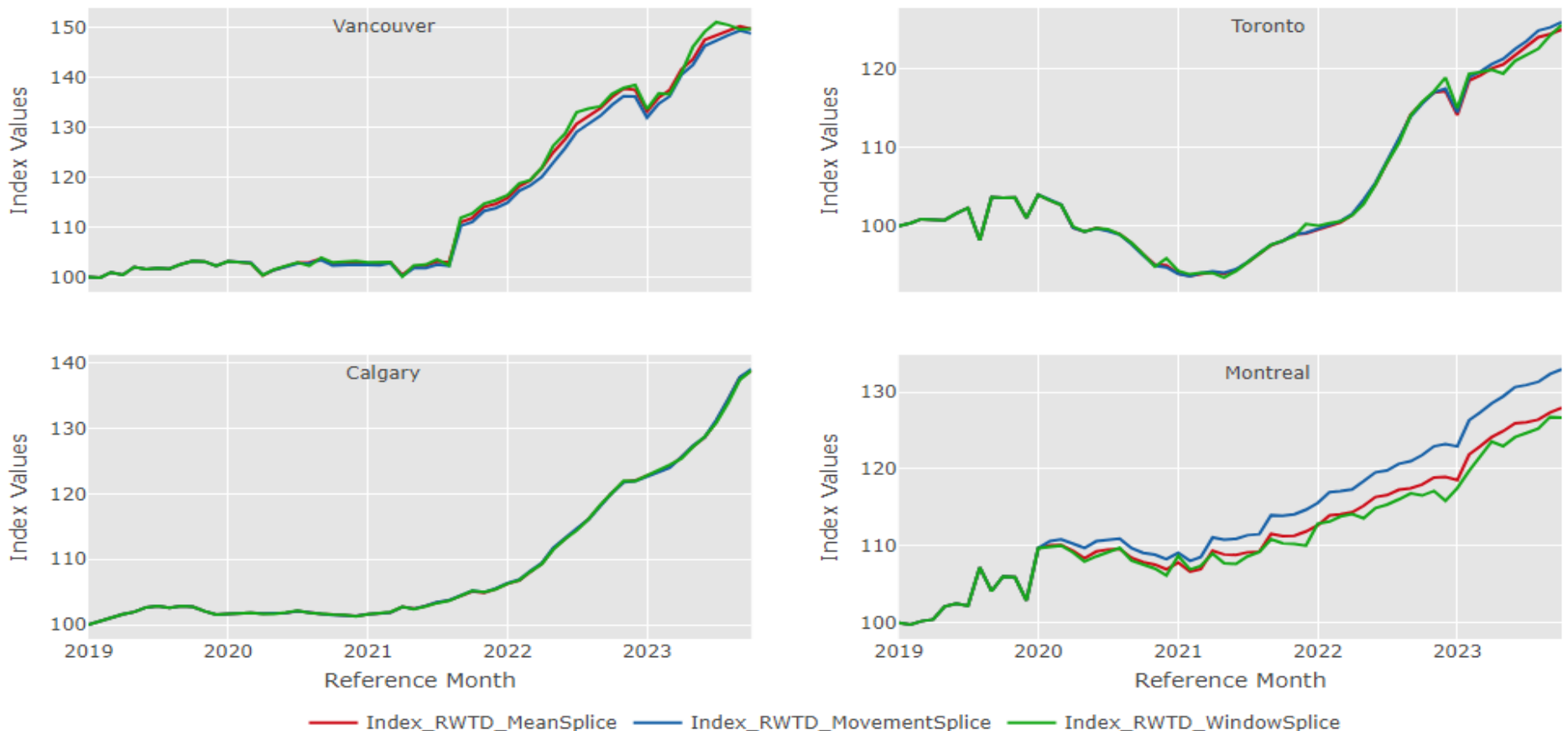
Preliminary Results: Selection of Regressors

Comparison of Rental Indexes for Selected CMAs: Various Regressors in RWTD Method (Jan 2019=100)



Preliminary Results: Splicing Strategy

Comparison of Rental Indexes for Selected CMAs: Various Splicing Strategy in RWTD Method (Jan 2019=100)



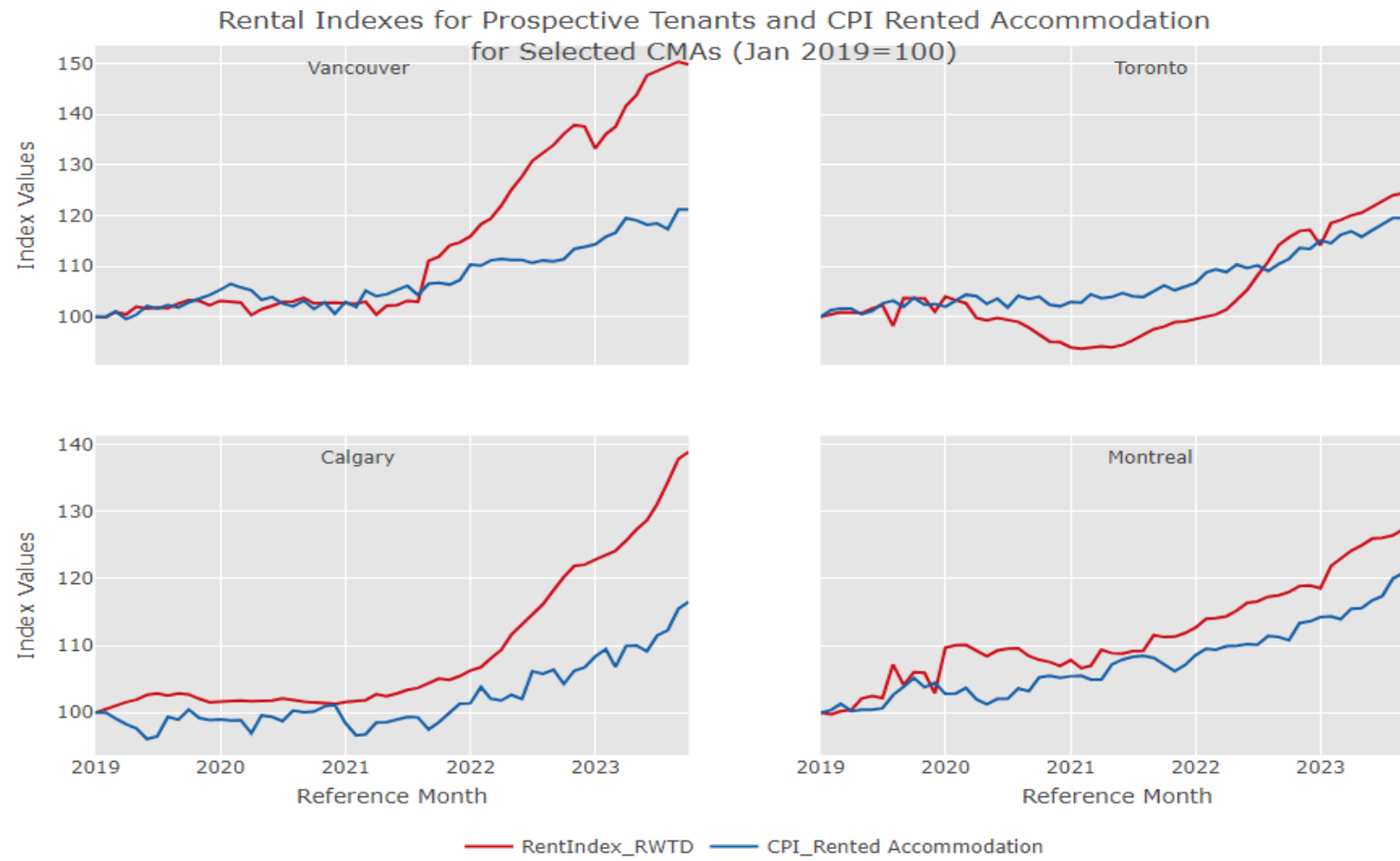
Preliminary Results: Comparison with CPI Rented Accommodation

CPI Rented Accommodation:

- All-tenants index
- Real transaction prices
- Include rent, tenants' insurance premiums, and tenants' maintenance, repairs, and other expenses

Rental price index for prospective tenants:

- Potential tenants only
- Asking rents



Preliminary Results: Comparison with Yardi

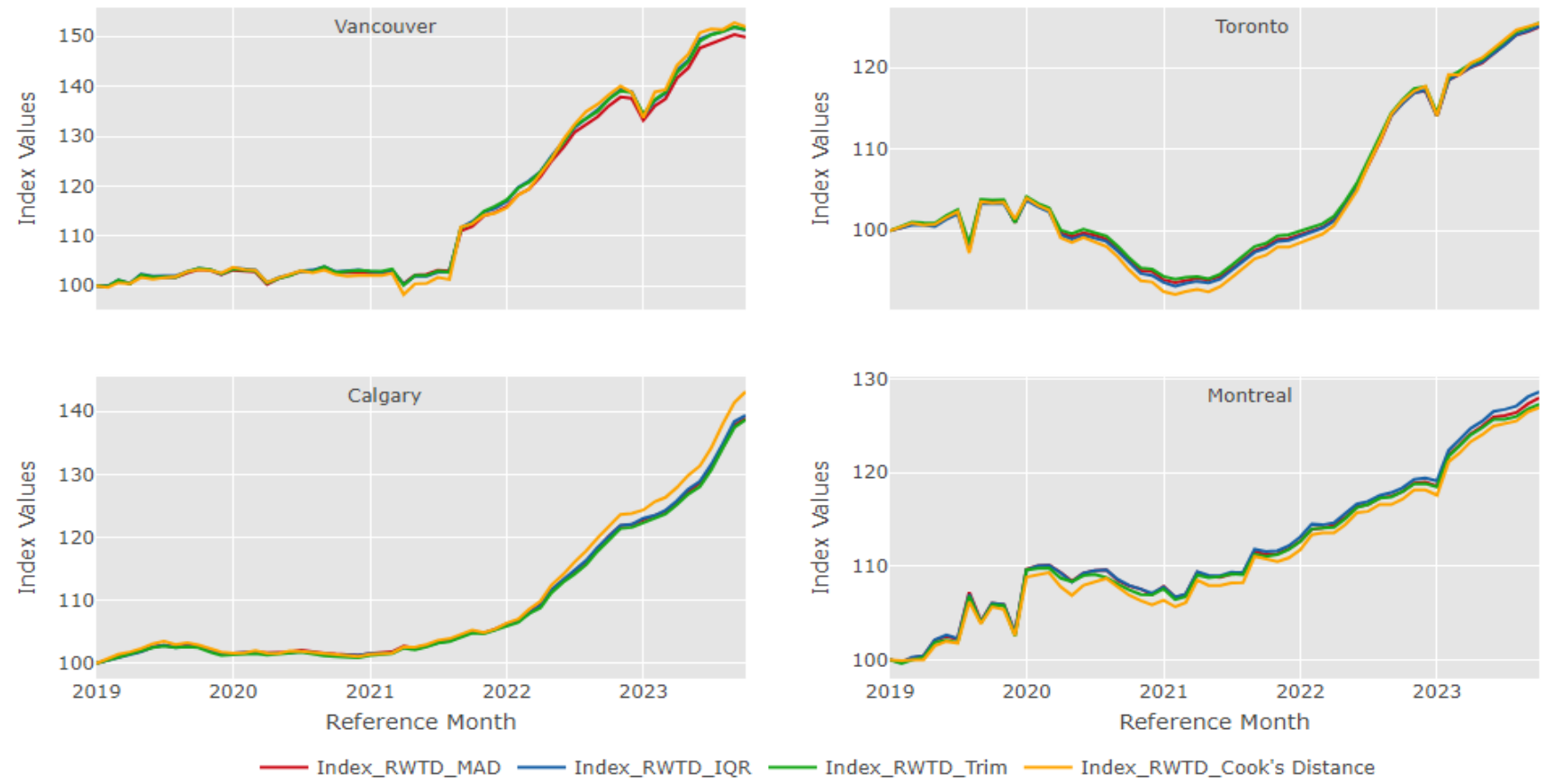
Comparison of Rental Indexes for Selected CMAs: Various Year-Over-Year Growth Rates



Sensitivity Test 1: Outlier Treatment

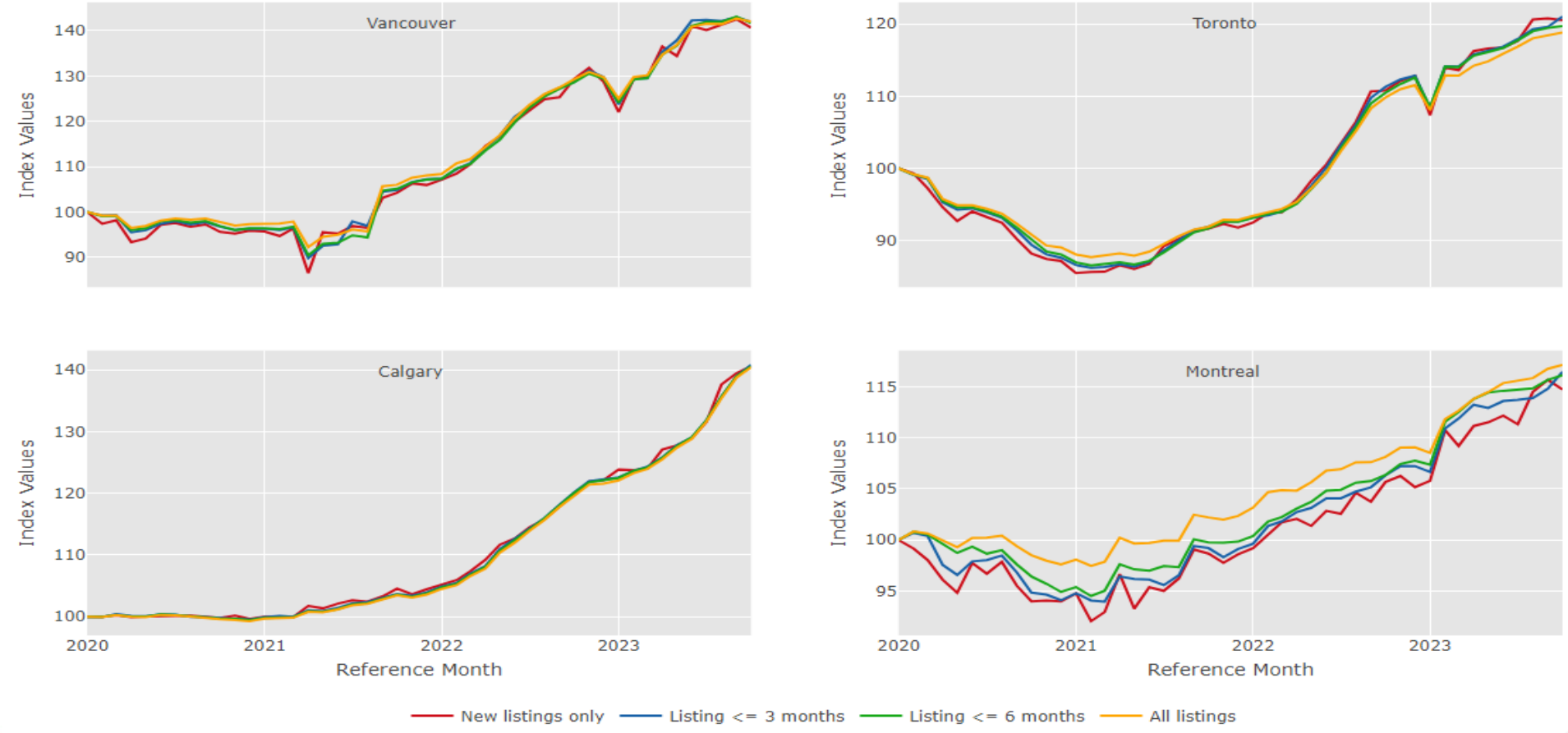
- MAD
- IQR
- Simple trimming
- Cook's distance

Comparison of Rental Indexes for Selected CMAs: Various Outlier Treatments (Jan 2019=100)



Sensitivity Test 2: Listing Duration

Comparison of Rental Indexes for Selected CMAs: Various Duration of Listing in RWTD Method (Jan 2020=100)



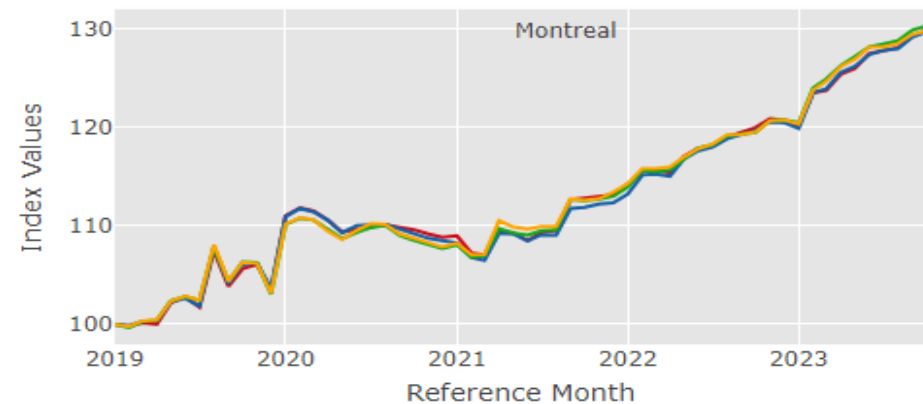
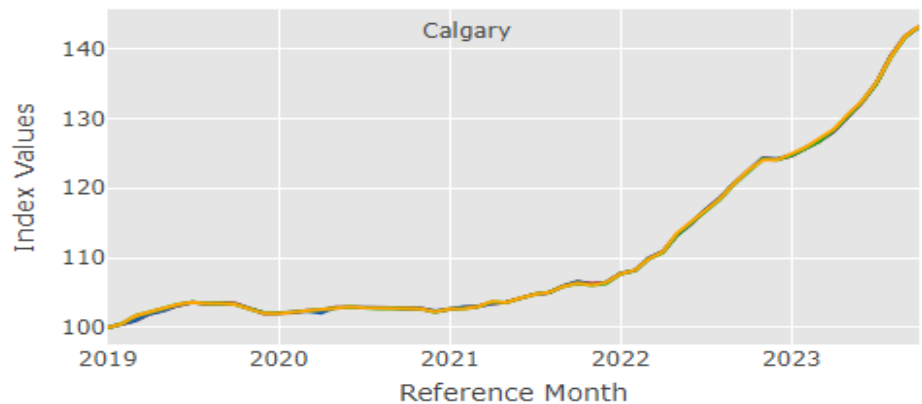
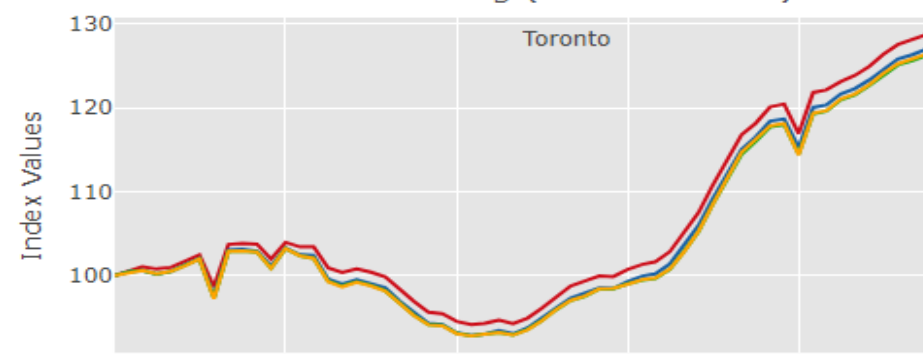
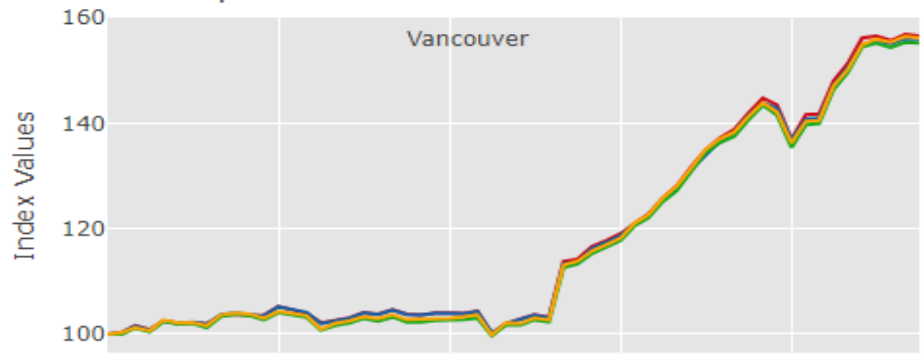
Sensitivity Test 3: Manual Editing

	Data 1	Data 2	Data 3	Data 4	
1. Standardizing addresses	No	Yes	Yes	Yes	
2. Imputing missing values based on the address and corresponding latitude and longitude.	Non-standardized addresses are used.	Standardized addresses are used.	Standardized addresses are used.	Standardized addresses are used.	
Steps of data editing	3. Validating data based on various platforms of rent listings.	No	No	Yes	Yes
	4. Further imputing missing values in the square footage of rental units based on the average size of similar rental units in the same area.	No	No	No	Yes
Sample size (Total)	1,890,700	1,941,345	2,011,341	2,046,370	



Sensitivity Test 3: Manual Editing

Comparison of Rental Indexes for Selected CMAs: Various Level in Manual Editing (Jan 2019=100)



— Index_Data 1 — Index_Data 2 — Index_Data 3 — Index_Data 4



Upcoming Work

1. Advertised price \neq transaction price

Potential solution: seeking new data sources including transaction prices

2. Distribution of listings by province does not consistent with the renter distribution across Canada suggested by Census data

Solution: construct weights when calculating overall rent growth at the national level