The Impact of Housing Completions on Average Rents in Small Canadian Cities: A Regression Analysis

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This research paper examines whether housing completions between 1999-2009 have an impact on average rents in 24 Canadian cities with populations under 110,000 between the years 2009 and 2019. Using three different datasets, we create three variables to measure the average yearly number of row housing and detached housing unit completions from 1999 to 2009 in each city, and the average yearly change in average rental price of a two-bedroom home from 2009 to 2019. We also include a qualitative variable for the percentage GDP growth of each city's province from 2009 to 2019 as a fraction of Canada's percentage GDP growth over the same time period. After conducting a regression analysis based on multiple specifications, we find no statistically significant relationship between housing completions and average rents. Our findings suggest that factors other than the supply of housing may be more important in driving changes in average rents in small Canadian cities.

In many parts of the world, the availability and affordability of housing have become a critical issue, and Canadian cities are no exception. Given the essential role of housing supply in influencing home prices, it is a matter for policymakers and researchers to examine the influence of house completions on average rents. The demand for housing in Canada increased significantly, according to a report issued by the Canadian Mortgage and Housing Corporation from January 2023. This increase in demand was driven by a variety of factors, such as the increased migration resulting from relaxed COVID traffic restrictions. The demand has been driven by the fact that newcomers tend to rent. As a result of rising mortgage rates and high property prices, the overall tendency to rent has increased, making the transition to ownership more costly. A surge in the growth of rentals has been driven by tighter housing markets, which have now reached a new record.

Literature has widely studied the relationship between housing supply and demand. Several studies have shown that an increase in housing supply can lead to a decrease in housing prices and rents (Glaser and Gyourko (2003); Green and Hendershott (2001)). However, the magnitude of this effect may depend on the local market conditions, such as the level of demand, the cost of construction, and regulatory restrictions (Glaeser, Gyourko, and Saks (2005); Quigley and Raphael (2005)). Moreover, some studies have found that the impact of new housing supply on prices and rents may be limited in the short run, as it takes time for the market to adjust to the new supply (Fuerst and McAllister (2011)). Canadian re-

search on the relationship between housing supply and rents has focused mainly on large urban centers such as Toronto and Vancouver. Housing affordability has become a pressing issue due to rapid population growth and limited land availability (Pivo and Fisher (2010)). However, there is a dearth of research on the impact of housing completion on average rents in small Canadian cities. A study by Blair (2016) found that the impact of new housing supply on rents was more significant in cities with lower population densities, suggesting that small cities may be more responsive to changes in housing supply. However, their study did not differentiate between row and detached housing units, which may have different impacts on rents.

In this research paper, we aim to examine whether housing completions between 1999-2009 have an impact on average rents in 24 Canadian cities with populations under 110,000 between the years 2009 and 2019. Specifically, we are interested in investigating the effects of an increase in the number of detached and row housing units built per year on average from 1999-2009. By analyzing the relationship between these variables, we hope to provide insights into the factors that affect housing affordability and inform policies that can promote affordable housing development in Canadian cities. Using three different datasets, we create three variables to measure the average yearly number of row housing and detached housing unit completions from 1999 to 2009 in each city, and the average yearly change in the average rental price of a two-bedroom home from 2009 to 2019. We also include a qualitative control variable for the percentage GDP growth of each city's province from 2009 to 2019 as a fraction of Canada's percentage GDP growth over the same time period. After conducting a regression analysis based on multiple specifications, we find no statistically significant relationship between housing completions and average rents. Our findings suggest that factors other than the supply of housing may be more important in driving changes in average rents in small Canadian cities.

I. Data Description

Our analysis is based on three different datasets. The first two are panel datasets provided by the Canada Mortgage and Housing Corporation (CMHC) database: one containing average rents for areas with a population of 10,000 and over, and another containing annual housing starts, units under construction, and completions in large urban areas. To create our analysis sample, we merge the two CMHC datasets into one and drop entries for cities present in only one of the two original datasets. We then filter the new dataset for entries from 1999-2009 inclusive and calculate the average number of row and detached housing units completed in each city in each covered year. This results in two quantitative variables: *avgyearlyrowyearlycompletions99to09* represents the average number of yearly row housing unit completions in a city from 1999 to 2009, and *avgyearlydetachedyearlycompletions99to09* represents the average number of yearly detached housing unit completions in a city from 1999 to 2009. Next, we

filter the dataset for entries from 2009-2019 inclusive, and compute the yearly percentage change in average rental price of a two-bedroom home in each year in each city. We take the average across covered years for each city, resulting in the quantitative variable *change09to19*, which represents the average change per year in the average price of a two-bedroom home in a city from 2009 to 2019. Finally, we use Statistics Canada's annual provincial GDP dataset, filtering it for entries from 2009-2019 inclusive. We calculate each province's percentage growth in GDP as a fraction of Canada's national percentage growth in GDP and add a variable for the corresponding province's value to each city in our merged dataset. This creates the qualitative variable *growthofprovincerelativetocanada*. For example, if a city grew at twice the rate of Canada, the variable would take value 2.

Our analysis sample consists of n=24 units of observation, each describing a city and its relevant characteristics. These include the city's average yearly number of row and detached housing unit completions from 1999 to 2009, its average yearly change in average rental price of a two-bedroom unit from 2009 to 2019, and the percentage GDP growth of its province from 2009 to 2019 as a fraction of Canada's percentage GDP growth over the same time period. The summary statistics for these four variables are presented below.

Table 1—Summary statistics

Variable	N	Mean	St. Dev.	Min	Max
prctrentchange09to19	24	0.308	0.14023	-0.3382	0.9060
avgdetachedcomplete99to09	24	164.330	104.082	47	427
avgrowaptcomplete99to09	24	34.408	38.398	0.818	141.1818
prctnatlgdpgrowth09to19	9	0.950	0.178	0.631	1.197

II. Model

We aim to answer our research question by fitting a multiple linear regression model of the form

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon_i$$

where $Y_i i$ (*change09to19*) represents the average yearly percentage change in average two-bedroom rent from 2009-2019 in city i, X_{1i} (*avgyearlyrowyearlycompletions99to09*) represents the average yearly completions of row housing units from 1999-2009 in city i, X_{2i} (*avgdetachedrowyearlycompletions99to09*) represents the average yearly completions of detached housing units from 1999-2009 in city i, and X_{31} (*pctnatlgdpgrowth01to19*) is a control variable representing a city's province's percentage GDP growth from 2009-2019 as a proportion of Canada's percentage GDP growth over the same period.

The selection of these variables was based on their relevance to the research question and the available data. The two housing completion variables were chosen as they are measures of changes in the supply of different types of housing units, which could impact rental prices. Additionally, the differentiation between row and detached units allows us to examine potential differences in price effects from housing supply between the two types of units - establishing that one type of housing unit is more effective than another in improving housing affordability may provide useful information for municipalities attempting to address a housing crisis. The choice of two-bedroom units was made as they are likely the most representative, represent a median option between our dataset's two other options of one-bedroom units and units with three or more bedrooms. To allow sufficient time for potential price effects from housing supply to take effect, we use a ten-year lag between measurements of housing completions (1999-2009) and measurements of rental prices (2009-2019). In addition to preventing issues with reverse causality that would arise if the same time period were used, this delay in measurement is based on the assumption that rental prices exhibit similar "stickiness" to wages, responding to changes in supply with a delay.

Our coefficients of interest are $\beta 1$ and $\beta 2$, representing the effect on average two-bedroom rent increase per year from 2009-2019 in city i of a one-percent change in average yearly completions of row and detached housing units, respectively, from 1999-2009 in city i. The control variable X_{3i}, representing the province's growth relative to Canada, is included to account for the effect of a province's overall economic prosperity on the rental market.

In summary, our multiple linear regression model aims to identify the relationship between changes in rental prices and changes in the supply of different types of housing units, while controlling for overall economic growth.

We applied this model using three different specifications. In Specification 1, we estimated the effect of changes in row housing unit completions from 1999-2009 on average two-bedroom rent increase per year from 2009-2019. In Specification 2, we estimated the same effect for detached housing units. In Specification 3, we included both row and detached housing unit completions as explanatory variables in the same model to determine the independent effects of each type of housing unit completion on rental price changes. All specifications include provincial percentage change in GDP from 2009-2019 as a fraction of national percentage change in GDP over the same period as a control variable. We believe that these specifications are meaningful for understanding the key results in our paper. They provide insight into the effects of different types of housing unit completions on rental prices and also control for potential confounding variables. The results of these three specifications are presented below.

III. Table of Results (on following page)

TABLE 2—

	Dependent variable:		
	change09to19		
	(1)	(2)	(3)
avgrowyearlycompletions99to09)	−0.0002		−0.0001
	(0.0004)		(0.001)
avgdetachedyearlycompletions99to09)		−0.0001	−0.00003
		(0.0002)	(0.0002)
growthofprovincerelativetocanada	0.277**	0.264**	0.271**
	(0.112)	(0.116)	(0.124)
Constant	0.048	0.067	0.057
	(0.116)	(0.128)	(0.138)
Observations	23	23	23
R^2	0.240	0.238	0.240
Adjusted R^2	0.164	0.162	0.120
Residual Std. Error	0.077 (df = 20)	0.077 (df = 20)	0.079 (df = 19)
F Statistic	3.151* (df = 2; 20)	3.131* (df = 2; 20)	2.003 (df = 3; 19)
Note:			*p<0.1; **p<0.05; ***p<0.01

IV. Discussion

Both coefficients of interest $\beta_1 = -0.0002$ and $\beta_2 = -0.0001$ are thus statistically insignificant, being smaller in magnitude than their associated standard errors of 0.0004 and 0.0002 respectively. Our analysis thus finds no statistically significant relationship between the number of housing units constructed between 1999-2009 and the average yearly percentage change in average rental price from 2009-2019 in Canada, and these results are consistent across our three different specifications: Specification 1 considering only row housing units (estimating only β_1), Specification 2 considering only detached housing units (estimating only β_2), and Specification 3 considering both (estimating β_1 and β_2). As these standard errors are already larger than our coefficient estimates, we do not evaluate heteroskedasticity or use White standard errors - as White standard errors are necessarily larger than regular standard errors, they would not change our interpretation of our results.

Multicollinearity is an obvious concern in Specification 3. If construction of new row housing units is associated with construction of new detached housing units (e.g. if a housing boom leads to increased construction of both types of unit) it would be the case that multicollinearity is present between avgyearlyrowyearlycompletions99to09 and avgyearlyrowyearlycompletions99to09, potentially making the coefficients of interest β_1 and β_2 challenging to interpret in Specification 3.

To address this, we run a variance inflation factor (VIF) test, finding that neither variable in Specification 3 has a VIF above 2.5. VIF test results are presented below.

Variable	VIF
avgrowaptcomplete99to09	2.255799
avgdetachedcomplete99to09	2.400124
prctnatlgdpgrowth09to19	1.153844

Using the typically accepted threshold of 10 for a problematic VIF Kim (2019), our VIF result indicates that significant multicollinearity is not present in our model, and that our coefficient estimates can be interpreted accurately. Despite these results, it would be premature to conclude that no relationship exists between housing construction and rental price. The publicly available data used in this research are limited in scope: we have observations of unit construction and rental price for only 24 different cities, and we have very limited access to control variables. In particular, our attempt at controlling for the effect of local prosperity by using provincial growth is quite imprecise - it is possible that a city could be in an economic slump while a boom elsewhere in the province results in a high provincial growth measure. Ideally a control for GDP growth specific to each city would be included, but no such data was available. Large increases in city population and changes in mortgage interest rates are only a few examples of factors which have potential economic relationships to changes in rental price and are not included in our model, potentially leading to omitted variable bias in our estimates of $\beta 1$ and $\beta 2$. Future research, which is beyond the scope of this paper, should investigate potential effects on urban rental markets independent of housing supply and attempt to include estimates of these effects as control variables, increasing the likelihood of accurately estimating β_1 and β_2.

V. Robustness

This interpretation of our results may be misleading depending on the underlying statistical patterns - in particular it may be that individual provinces show strong relationships between our explanatory and outcome variables, but that these occur in opposite directions, thus offsetting each other when aggregated as a nationwide model and incorrectly indicating that no relationship is present at all. To address this possibility, we test the robustness of our model by running a series of regressions replicating Specification 3 for individual provinces. These models take the form:

$$Y_{i,p} = \beta_{0,p} + \beta_{1,p}X_{1,p} + \beta_{2,p}X_{2i,p} + \beta_{3,p}X_{3i,p} + \epsilon_{i,p}$$

Where $p = 1$ represents British Columbia, $p = 2$ represents Alberta, $p = 3$ represents Ontario, and $p = 4$ represents Quebec. These are the four provinces for which our dataset contains at least two units of observation. We thus obtain 4 models, the variables and coefficients of each consisting of the provincial analogues for a given province of the variables and coefficients of Specification 3. Results for these models are presented in the table on the following page.

TABLE 3—

	Dependent variable:			
	change09to19	change09to19	change09to19	change09to19
	(1)	(2)	(3)	(4)
avgrowyearlycompletions99to09)	−0.0004			
	(0.001)			
avgdetachedyearlycompletions99to09)	0.001			
	(0.001)			
growthofprovincerelativetocanada				
avgrowyearlycompletions99to09)		−0.002		
		(0.004)		
avgdetachedyearlycompletions99to09)		0.001		
		(0.001)		
growthofprovincerelativetocanada				
avgrowyearlycompletions99to09)			−0.005	
			(0.003)	
avgdetachedyearlycompletions99to09)			0.001	
			(0.001)	
growthofprovincerelativetocanada				
avgrowyearlycompletions99to09)				0.025
avgdetachedyearlycompletions99to09)				−0.001
growthofprovincerelativetocanada				
Constant	0.332*	0.226	0.285***	0.268
	(0.104)	(0.192)	(0.063)	
Observations	5	4	8	3
R^2	0.300	0.213	0.333	1.000
Adjusted R^2	−0.400	−1.360	0.066	
Residual Std. Error	0.074 (df = 2)	0.084 (df = 1)	0.065 (df = 5)	
F Statistic	0.429 (df = 2; 2)	0.136 (df = 2; 1)	1.249 (df = 2; 5)	
Note:				*p<0.1; **p<0.05; ***p<0.01

These results show that no statistically significant relationship between our explanatory variables and our coefficients of interest could be found in three out of the four provinces. A perfect linear relationship (R2 = 1) between our explanatory variable and our outcome variable in Quebec are assumed to be statistical outliers due to a very low sample size (n=3). Aside from these, only one coefficient ($\beta_{1,3}$, the effect on average yearly rent change from 2009-2009 of a one-percent increase in average yearly row housing completions from 1999-2009 in Ontario) is not within standard error, and its p-value is well above 0.05, indicating a lack of statistical significance. This replicates the results of our primary model at the provincial level, finding no significant relationship between our measures of housing construction and rental price. These results further bolster our interpretation of our primary model results.

VI. Conclusion

In this paper, we have examined the impact of housing construction in the period 1999-2009 rental prices in 2009-19 in 24 small Canadian cities (population $<$ 110,000) . Using a nationwide dataset spanning the relevant years, we conducted several regression analyses and found no statistically significant relationship between our measures of housing construction and rental prices. We also performed robustness checks at the provincial level and found that our results hold even when considering individual provinces. Overall, our results suggest that increasing housing construction alone may not be sufficient to reduce rental prices in Canada. In conclusion, our study contributes to the ongoing discussion around affordable housing in Canada by providing evidence on the effectiveness of housing construction in addressing rental prices. Our findings imply that alternative policies and interventions may be necessary to achieve this goal. For example, policymakers could consider measures such as rent control or incentives for private developers to build affordable housing units. Our results also highlight the importance of carefully considering statistical patterns and conducting robustness checks to ensure the validity of regression analyses.

VII. References

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