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Housing Prices in British Columbia: Quantifying the Zoning Effect
Les prix des logements en Colombie-Britannique : quantifier l'effet du zonage

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Article abstract

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Housing Prices in British Columbia: Quantifying the Zoning Effect

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Abstract

British Columbia (B.C.)'s housing prices have increased dramatically in recent times, and one potential explanation is municipal zoning by-laws limiting housing supply. However, the effect of zoning on housing prices in aggregate has not yet been studied in B.C. In this study, I use a regression analysis, adapted from an Australian study, to estimate the "zoning effect": the extent to which zoning controls increase the sale prices of dwellings. I calculate this effect for detached homes in 30 of B.C.'s largest cities and towns, and for apartments in the Metro Vancouver region. I look at how home prices changed between 2016 and 2022, and the extent to which the zoning effect influenced this trend. Finally, I evaluate the potential of government initiatives aimed at decreasing the cost of housing through the lens of the zoning effect, and suggest possible future courses of action.

Résumé

Les prix des logements en Colombie-Britannique (C.-B.) ont augmenté de manière spectaculaire ces derniers temps, et une explication potentielle est que les règlements municipaux de zonage limitent l'offre de logements. Cependant, l'effet du zonage sur les prix des logements dans l'ensemble n'a pas encore été étudié en C.-B. Dans cette étude, j'utilise une analyse de régression, adaptée d'une étude australienne, pour estimer "l'effet du zonage": la mesure dans laquelle les contrôles de zonage augmentent les prix de vente des habitations. Je calcule cet effet pour les maisons individuelles dans 30 des plus grandes villes et villages de C.-B., et pour les appartements dans la région de Metro Vancouver. J'examine comment les prix des logements ont changé entre 2016 et 2022, et dans quelle mesure l'effet du zonage a influencé cette tendance. Enfin, j'évalue le potentiel des initiatives gouvernementales visant à réduire le coût du logement à travers le prisme de l'effet du zonage, et je suggère des actions possibles pour l'avenir.

Keywords:

Zoning; Housing prices; Housing affordability; British Columbia

Mots-clés:

Zonage; Prix des logements; Accessibilité au logement; Colombie-Britannique

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Introduction

For many years, housing prices and rents in British Columbia have been rising dramatically with no obvious singular explanation. This rise in prices has enriched long-time homeowners, but has made it difficult for young people and non-wealthy new arrivals to purchase their first home (Cyca, 2023). Rental prices have risen along with house prices, and this situation, which has been called a "housing crisis" (Hasegawa, 2022) aligns with a nationwide and even global trend of increasing prices (Rajagopal, 2023; Stokes, 2021).

Vancouver and Victoria are currently two of the world's most unaffordable cities (Lee-Young, 2022; Spalteholz, 2019), and even B.C.'s smaller cities are becoming overwhelmed by unmet housing demand (Femia, 2023; Metcalfe, 2023). With voters seeking urgent action, federal, provincial, and municipal governments have all prioritized quelling price increases (Aiello, 2023; Chan, 2023; Little, 2023). However, there is not yet consensus on the causes of, and potential solutions to, the crisis; experts disagree to an extent not seen for other serious problems like climate change. Discussion of the housing crisis variously points to foreign investment (Gordon, 2016; Ley, 2017), social housing divestment (Ivanova & Hemingway, 2023), regulations and taxes (Dachis & Thivierge, 2018; Sullivan, 2018), profit-seeking developers (Olsen, 2024), a lack of small and missing middle housing (Todd, 2023), and NIMBY resistance to apartment construction (Bozikovic, 2023; Zivo, 2023) as potential causes.

In this study, I isolated the effect of zoning on B.C.'s high cost of housing to add certainty to this unclear and occasionally contradictory set of explanations. I use the term "zoning" in this paper to refer to the suite of municipal by-laws that control the density, form, and character of buildings within different land use categories. Because zoning determines where and how housing developments can be built in B.C., it can impose an effective cap on housing supply, making dwellings more expensive because there are fewer available.

If any neighbourhoods in a city are zoned for a lower density than would otherwise be developed there in the absence of zoning (in other words, if zoning is binding), then zoning will increase the cost of dwelling units in that city. If the allowable density is vastly below what would be needed to accommodate all prospective residents in their desired neighbourhoods, this cost differential will be large. The amount that zoning increases housing prices by is referred to as the *zoning effect* (Kendall & Tulip, 2018). Through the lens of the zoning effect, I illustrate the impact of zoning on British Columbia's housing market, and discuss how policy changes can increase or decrease the zoning effect. Based on this, I then evaluate the potential impact of the B.C. government's response to the housing crisis, and what other interventions might help reduce housing prices.

What is the Zoning Effect?

The zoning effect, as previously defined by Kendall & Tulip (2018), is the amount that the average sale price of a detached home or apartment in a given area is increased due to the cumulative effect of zoning prohibiting, slowing down, or increasing the cost of subdivision, densification, and development over time. The policies that contribute to the zoning effect include height limits, minimum lot sizes, setbacks, and maximum floor area ratios, as well as supporting policies like building design guidelines, view cones, and minimum parking requirements. Delays that result from the administration of these policies also add to the zoning effect. The counterfactual to the zoning effect is not the amount house prices would be expected to fall were zoning to be immediately abolished; it is how much less we would expect house prices to be if zoning had never been a limiting factor on development, holding all

else constant. This partial equilibrium approach has several limitations, discussed below in the Simplifying Assumptions section.

Development cost charges do not increase the zoning effect (they instead increase construction costs, which are separate from the zoning effect), nor do community amenity contributions (CACs), amenity cost charges, or density bonusing. These latter three policies do not add to the total cost of the project, but instead tap into existing developer/landowner profits that were created by the zoning effect and transfer them to the municipality. Lastly, the scarcity effect of B.C.'s Agricultural Land Reserve is not counted as part of the zoning effect, since it is a provincial initiative that municipalities do not have direct control over. All policies included in the zoning effect are optional development controls that municipalities have chosen to implement.

The zoning effect is not the increase in the land value that happens when a low-density lot is rezoned to high-density. This is called *land lift*, and it results in a windfall gain for the owner of that particular lot. However, my research focuses not on these small releases of pent-up housing demand, but rather the build-up of demand that is created by zoning restrictions in the first place.

The zoning effect is also not the benefit that is presumed to accrue to homeowners from living in a strictly zoned neighbourhood where higher-density development is not allowed. The reasoning here is that development can cause negative externalities, and zoning can increase the welfare of existing homeowners by blocking these externalities. Crudely put, this is the "benefit of zoning" while the zoning effect, which I am quantifying, is the "cost of zoning". However, it would be more accurate to call this the localized or demand-side impact of zoning, while what I am calculating is the aggregate or supply-side impact.

While it would fall to a separate study to calculate the demand-side impact of zoning today, two outdated studies of the Vancouver area found it to be so small as to be statistically insignificant (Mark & Goldberg, 1981, 1986). It is unclear whether that is still the case today. Modern building design guidelines pay much more attention to "neighbourliness" features like building massing and shade effects than guidelines from the 1980s, mitigating some development externality effects. However, novel phenomena like short-term rentals and increased home deliveries from online shopping could be creating large negative externalities associated with densification.

Because the zoning effect is a supply-side effect, all demand-side occurrences are taken as exogenous in its calculation. Phenomena like increased immigration, interprovincial migration to B.C., and short-term rentals increase housing demand; insofar as the housing market is unable to accommodate this demand due to zoning, the zoning effect will thus increase (but so too will the physical value of land). Increased foreign direct investment in B.C. property is another demand-side effect, but it is also self-reinforcing because zoning restricts supply responses. This accelerates appreciation of property values, making property a more attractive investment. Therefore, zoning can create a feedback loop through the mechanism of foreign direct investment, and the zoning effect captures this. Nonetheless, this is not a runaway feedback loop (a "bubble"). If it were, housing sale prices would rapidly outstrip rental rates. Rental rates have also been rising precipitously, showing that there is real unmet demand for housing units in B.C. (Hudes, 2023).

Previous studies of zoning have typically looked at its effect on individual properties or neighbourhoods (Murray & Limb, 2020; Pogodzinski & Sass, 1991), rather than its aggregate effect. However, those which have looked at the aggregate zoning effect have found

that it tends to be the primary cause of home price increases in cities with growing populations and tight land-use controls (Glaeser & Gyourko, 2002; Gyourko & Molloy, 2014; Hilber & Vermeulen, 2016; Kendall & Tulip, 2018; Lees, 2017). Since many B.C. cities fit this description, I felt the effect of zoning in B.C. was worth investigating.

Methods

I used two different methods to calculate the zoning effect: one for detached homes and one for apartments. For detached homes, I separated out home purchase prices into three components: physical land value, structure value, and zoning effect. The physical land value is the value that land holds as a useful commodity; it is calculated by measuring how much people are willing to pay for additional land at the margin (the marginal value of land) and multiplying this by lot size. Improvement value is the value of the building that exists on the lot, which is determined by property assessors. The difference between the sum of the physical land value and the improvement value, and the actual sale price, is the zoning effect. In the absence of zoning this difference would not exist; with lots being subdivided and densified freely, any premium that stems from owning a plot of land would be dissipated. However, zoning prevents such arbitrage opportunities, maintaining the zoning effect.

For apartments, the zoning effect is the difference between the marginal cost of building a new apartment unit and the average sale price of an apartment. Apartment sale prices have only two components instead of three, since constructing an additional apartment unit does not require any additional land. In the absence of zoning, developers could freely choose between adding land and adding structures, and would construct buildings upwards until the marginal cost of construction equalled the marginal cost of land. Therefore, in competitive and unconstrained markets, the purchase price of an apartment unit equals the marginal cost of its construction (Glaeser & Gyourko, 2002). The real-life gap between these two numbers is explained by the zoning effect.

For detached homes, I calculated a separate zoning effect for each of thirty B.C. municipalities, plus two regional districts as a whole (Metro Vancouver and Capital Regional District), and I calculated it for each year from 2016 to 2022 (Figure 1). In some municipalities I only calculated it for some of these years, either because data was not available or there were too few home sales for statistical significance. The primary sources I used were the Data Advice and Residential Inventory datasets from BC Assessment, and the Canadian Cost Guide from Altus Group (2015-2023). The latter is a yearly industry report that publishes average per-square-foot construction costs for different building types in large Canadian cities. The former is updated yearly and contains records of each property assessment and transaction in B.C., as well as attributes like lot size, floor area, year built, and number of bedrooms and bathrooms. Unfortunately, it is only made available for the most recent complete year, which in this case was 2022, but I was able to access an archive maintained by the University of British Columbia going back to 2016. Data in the archive included records from 2016-2022 for Metro Vancouver, and 2016-2021 outside of Metro Vancouver. I would have preferred to have access to a longer time period, especially since the COVID-19 pandemic may have impacted assessment values for the year 2020.

To calculate the physical value of land for detached houses, I used multiple linear regression analyses to determine the marginal value of land. I fit a separate generalized linear model (GLM) to each yearly record of home sales for each municipality

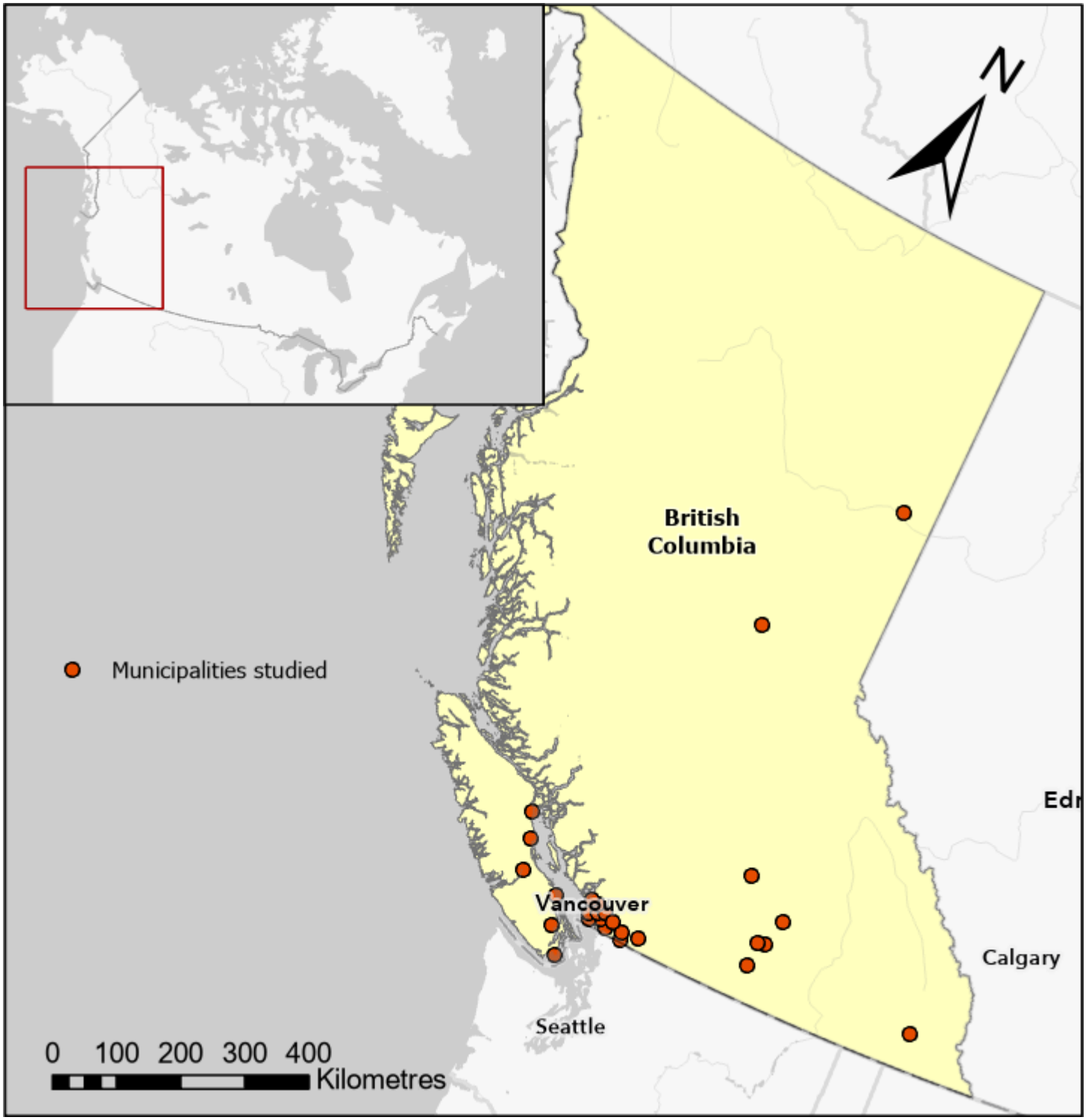

Figure 1. Map of study area.

and regional district; 198 GLMs in total. I formulated the GLM equation to predict sale price from a number of independent variables, including land area. Land area was the only important predictor variable, since its coefficient would give me the marginal value of land, which was the data point I sought; all other predictor variables were only included to increase the accuracy of the GLM. The form of the GLM equation was as follows:

$$\log(\textit{sale price}) = c + b\log(\textit{land area}) + aX + e.$$

In this equation, c represents a constant term, b is the marginal value of land, aX controls for all other home attributes used as predictor variables, and e is a normally distributed residual. The GLM is log-transformed because the marginal value of land is not a constant; physical land is more expensive at the margin in areas with higher overall prices (Kendall & Tulip, 2018). In addition to this theoretical basis for log-transformation, I found that log-transforming improved model fit.

My choice of which variables to include in the model as part of the aX term was based on which home attributes made for broadly significant predictor variables across the province. To determine which variables met this criteria, I started with a province-wide GLM only including land area as a predictor variable, added in other variables one at a time and keeping only the ones that increased R2, and once R2 was maximized, removing variables one at a time and seeing which removals increased AIC (Akaike Information Criterion, a statistical criterion for evaluating model parsimony). Once AIC was maximized, and R2 remained high at >0.75, I finalized the set of variables (Table 1).

I used the same set of variables for each of the 198 municipality-specific regressions, to provide continuity across jurisdictions and years while minimizing model overfitting. Although there were some instances where a variable was included that did not add significant predictive power to the model in that particular year or city, these cases of slight overfitting were necessary in order to analyze each city in the same way from year to year. Because my objective was to obtain a realistic value of b rather than a predictive model for sale prices, I prioritized model consistency over statistical parsimony.

Table 1. Predictor variables in the log-log regression.

Variable name	Data type	Role in analysis
Sale price	Continuous	Dependent variable
Log land area	Continuous	Key variable of interest
Log floor area	Continuous	Supporting
Log basement finished area	Continuous	Supporting
Log deck area	Continuous	Supporting
Number of bathrooms (not used outside of Metro Vancouver	Discrete	Supporting
Number of bedrooms	Discrete	Supporting
Pool (Y/N)	Binary	Supporting
Scenic view (Y/N)	Binary	Supporting
Dummy (quarter of sale)	Binary (dummy)	Supporting
Dummy (decade built)	Binary (dummy)	Supporting
Dummy (actual use description)	Binary (dummy)	Supporting
Dummy (conveyance type)	Binary (dummy)	Supporting
Dummy (neighbourhood)	Binary (dummy)	Supporting

Having calculated the marginal value of land, I then incorporated that value into the main equation for calculating the zoning effect. In order to summarize the zoning effect into a single value per year per municipality, I took the mean sale price of each municipality-year, subtracted the mean physical value of land (i.e., the mean marginal value of land times the mean lot size), and subtracted the mean structure value from that value. What remained was the zoning effect.

For structures, I generally pulled assessed improvement values directly from the BC Assessment dataset. However, due to a glitch in the dataset, I found that assessed values in this dataset became increasingly inaccurate in the years after 2014. Therefore, for houses built in 2015 and later (which never made up more than 20% of the sales in any given year), I calculated corrected mean structure values based on building dimensions from BC Assessment's data and construction cost estimates from the Canadian Cost Guide. Because these construction cost estimates were for Metro Vancouver, and other urban areas would presumably have different construction costs, I scaled the Canadian Cost Guide-derived values in proportion to the ratio between average per-square foot structure values for existing buildings in the locale in question and in Metro Vancouver. In doing so I assumed that relative construction costs between different B.C. communities remained roughly constant over the medium-term, which was likely since the construction sector is not locally autarkic.

Because the zoning effect is based on the mean home sale price, its value is higher than if it were instead based on the median or benchmark sale price. Generally, mean sale prices are higher than median or benchmark sale prices because the distribution of home sale prices is not symmetrical. It is skewed towards the upper end because there are more extreme high outliers than low outliers. However, despite the right-tailed skewness of home sale price distributions, the zoning effect is uniform, varying only gradually over large distances. It applies equally to inexpensive and expensive homes that are near each other; therefore, the mean is the appropriate measure to base the zoning effect on. Note that because the zoning effect is uniform in absolute terms, it makes up a higher percentage of the value of low-priced homes than of high-priced homes, because high-priced homes have more valuable structures or more physical land.

To calculate the zoning effect for apartments, I looked only at condominiums in Metro Vancouver. I used condominiums because the zoning effect is calculated from purchase prices rather than rental rates. Using rental rates would be more difficult because yearly rent increases are capped by provincial law and therefore do not always reflect market conditions; however, one could derive an approximation of zoning's effect on rent prices by calculating imputed rent from sale price, and extracting from this estimate an amount proportional to the zoning effect's percentage of the sale price. I looked only at Metro Vancouver because other jurisdictions did not have enough condominium sales for statistical significance.

Calculating the marginal cost of apartment construction was easier than the marginal cost of land because no regression was required. However, I did need to differentiate between different building heights, as marginal cost of construction increases with building height. I inferred heights by using apartment unit numbers to estimate the distribution of building heights in the city. For this process I used all but the final two digits of each apartment unit number: "412" would correspond to a 4th-storey apartment and "1601" a 16th-storey apartment. This admittedly rough method allowed me to model how many buildings of each height existed in the region, as a percentage of the total buildings. Construction

costs were provided by the Canadian Cost Guide (Altus Group, 2015-2023) by building height increment and were separated into wood and concrete construction for buildings below six storeys. Per the building codes for the Province of B.C. and the City of Vancouver, I assigned these buildings construction materials on a continuum ranging from 100% wood-frame at three storeys to 100% concrete at seven storeys. Although no such assumption could accurately capture the actual construction material of every building, this range was the best way to translate current practice in the B.C. construction industry into the Canadian Cost Guide archetypes.

Once I had finished estimating the distribution of building heights and construction materials, I grouped the data into the archetypes identified in the Canadian Cost Guide for multi-unit residential construction costs per square foot. These were: 3-4 Storey Wood-Framed Condo, 5-6 Storeys (average of 5-6 Storey Wood-Framed Condo and Up to 6 Storeys Hybrid Construction), 7-12 Storeys, 13-39 Storeys, 40-59 Storeys, and 60+ Storeys. Developers generally fill as much area per floor as possible with saleable units to maximize profits under height constraints. Therefore, constructing an additional unit at the margin typically would entail expanding upward and adding an additional floor, if zoning allowed. For this reason, I aggregated the data by building instead of by unit and placed each building into a construction cost category corresponding to one floor higher than its current height. I assumed that buildings of different heights still tend to have similarly sized building footprints, and therefore roughly the same average number of units per floor.

Having calculated the distribution of building heights and construction materials, I then calculated the marginal cost of construction. The Canadian Cost Guide reports a range of construction costs for each building height category, so I used the middle value of each category's price range. To summarize these values into a single average, I calculated a weighted mean of the values, weighted by each building height category's percentage of the total number of buildings. Finally, as I did with detached houses, I subtracted the marginal construction cost from the sale price to determine the zoning effect. I performed this entire process separately for each year from 2016-2022 to show the trend of how the zoning effect contributes to apartment sale prices over time.

Results

Of the 198 regressions I conducted to determine the zoning effect for detached homes, all but one had an R2 value greater than 0.50, and the mean R2 was 0.77 (standard deviation 0.0079). The coefficients for the log(*land area*) variable ranged from less than 0.1 to more than 0.5, with a mean of 0.20 (standard deviation 0.093). In all but four of the regressions, the P value for the log(*land area*) variable was less than 0.001. These results indicate that lot size is a reliable but weak predictor of sale price, and other predictor variables (primarily the neighbourhood that the property is located) are stronger determinants. I ran these regressions multiple times with slightly different sets of predictor variables, to ensure that my estimates of the marginal value of land were robust and not subject to large fluctuations due to minor changes in the GLM equation.

My analysis found zoning effects in the six-to-seven figure range for nearly every city in B.C., meaning that zoning added hundreds of thousands to millions of dollars to the cost of purchasing a home or apartment in B.C. in 2021, the last year for which every locale had data (Table 2). In absolute terms, the zoning effect is highest in Vancouver and its suburbs, which have between them a mean zoning effect of approximately $1,000,000, which accounts

Table 2. Zoning effect in 2021 across British Columbia municipalities (upper bound).

City/Metro Subregion	Average home sale price in 2021	Zoning effect in 2021	Zoning effect % of sale price	Subject to provincial 5-year housing targets
Metro Vancouver				
Burnaby	$1,900,000	$1,100,000	58%	Yes
Coquitlam	$1,600,000	$970,000	60%	Yes
Delta	$1,300,000	$950,000	71%	Yes - original 10
Langley Township	$1,400,000	$640,000	47%	Yes
Maple Ridge	$1,100,000	$650,000	57%	Yes
North Vancouver District	$2,200,000	$1,500,000	68%	Yes - original 10
Richmond	$1,900,000	$1,100,000	56%	Yes
Surrey	$1,500,000	$880,000	59%	Yes
Vancouver	$2,600,000	$1,300,000	49%	Yes - original 10
West Vancouver	$3,600,000	$2,400,000	68%	Yes - original 10
Metro Vancouver Average	$1,700,000	$1,000,000	59%	
Greater Victoria				
Langford	$950,000	$380,000	40%	Yes
Oak Bay	$1,900,000	$1,200,000	64%	Yes - original 10
Saanich	$1,200,000	$820,000	70%	Yes - original 10
Victoria	$1,200,000	$820,000	70%	Yes - original 10
Greater Victoria Average	$1,400,000	$800,000	59%	
Rest of B.C.				
Abbotsford	$1,100,000	$720,000	67%	Yes - original 10
Campbell River	$640,000	$270,000	43%	Yes
Chilliwack	$840,000	$470,000	55%	Yes
Courtenay	$700,000	$280,000	39%	No
Cranbrook	$410,000	$110,000	28%	No
Fort St. John	$400,000	$59,000	15%	No
Kamloops	$650,000	$270,000	41%	Yes - original 10
Kelowna	$970,000	$420,000	44%	Yes
Mission	$960,000	$610,000	63%	Yes
Nanaimo	$740,000	$360,000	48%	Yes
North Cowichan	$730,000	$380,000	52%	Yes
Penticton	$690,000	$280,000	41%	No
Port Alberni	$440,000	$200,000	45%	No
Prince George	$440,000	$150,000	35%	Yes
Vernon	$700,000	$280,000	40%	No
West Kelowna	$910,000	$370,000	40%	Yes
Average of 30 jurisdictions	$1,200,000	$660,000	51%	

for up to 59% of the average detached home's purchase price. Greater Victoria has an average zoning effect of up to $800,000, which, relative to house prices, is the same as Metro Vancouver at 59%. Interior B.C. tends to have smaller zoning effects in both absolute and percentage terms, and across all the municipalities studied the zoning effect averages $660,000, just over half the average house price. The city with the highest zoning effect is West Vancouver, where zoning adds as much as $2,400,000 to the cost of a detached home, and the city with the lowest is Fort St. John, where only $59,000 of the cost of an average house is explained by zoning. The zoning effect for apartments in Metro Vancouver reached approximately $440,000 in 2021.

There is a dichotomy between Metro Vancouver and the rest of the province in this data, as can be seen by comparing Figures 2 and 3. In Metro Vancouver (Figure 2), the average detached home sale price is over one million dollars, and the zoning effect accounts for either the plurality or majority of this price. Elsewhere (Figure 3), home sale prices are generally below one million dollars, and structure values are often the largest component. Exceptions can be found in Greater Victoria and in the Fraser Valley (Abbotsford, Mission, Chilliwack), regions which exhibit patterns somewhere in between these two trends. Mapping out the zoning effect across Metro Vancouver and across the province as a whole, we can see how the zoning effect gradually decreases with distance from the largest urban centres (Figures 4 and 5).

Over time, most of the increase in B.C. housing prices is explained by the zoning effect. Detached home and apartment prices grew steadily throughout the study period (2016 to 2022 in Metro Vancouver and 2016 to 2021 elsewhere), with the average house price much higher at the end of the study period in every municipality except West Vancouver and the City of Vancouver (Figures 2 and 3). Of these 28 municipalities, in 24 of them over half of this increase was due to growth in the zoning effect; on average the zoning effect accounts for 74% of home price growth in these municipalities. Improvements and physical land represent 15% and 11% of the growth, respectively. The zoning effect also accounts for a higher percentage of home sale prices towards the end of the study period in all municipalities but one (the Township of Langley, where, despite decreasing from 54% to 52% of mean sale price, the zoning effect still nearly doubled in absolute terms).

The average Metro Vancouver apartment price has risen by over $250,000 since 2016, mostly due to the zoning effect (Table 3). Construction costs increased in Metro Vancouver from 2016 to 2022, but growth in the already large zoning effect explains the bulk of the rise in apartment sale prices; while construction costs have only increased $60,000, the

Table 3. Zoning effect for Metro Vancouver apartments from 2016 to 2022 (upper bound).

Year	Average sale price	Construction cost	Zoning effect	Zoning effect % of sale price
2016	$500,000	$170,000	$330,000	66%
2017	$560,000	$190,000	$370,000	66%
2018	$650,000	$210,000	$440,000	68%
2019	$620,000	$200,000	$420,000	68%
2020	$620,000	$220,000	$390,000	64%
2021	$670,000	$230,000	$440,000	66%
2022	$760,000	$230,000	$520,000	69%

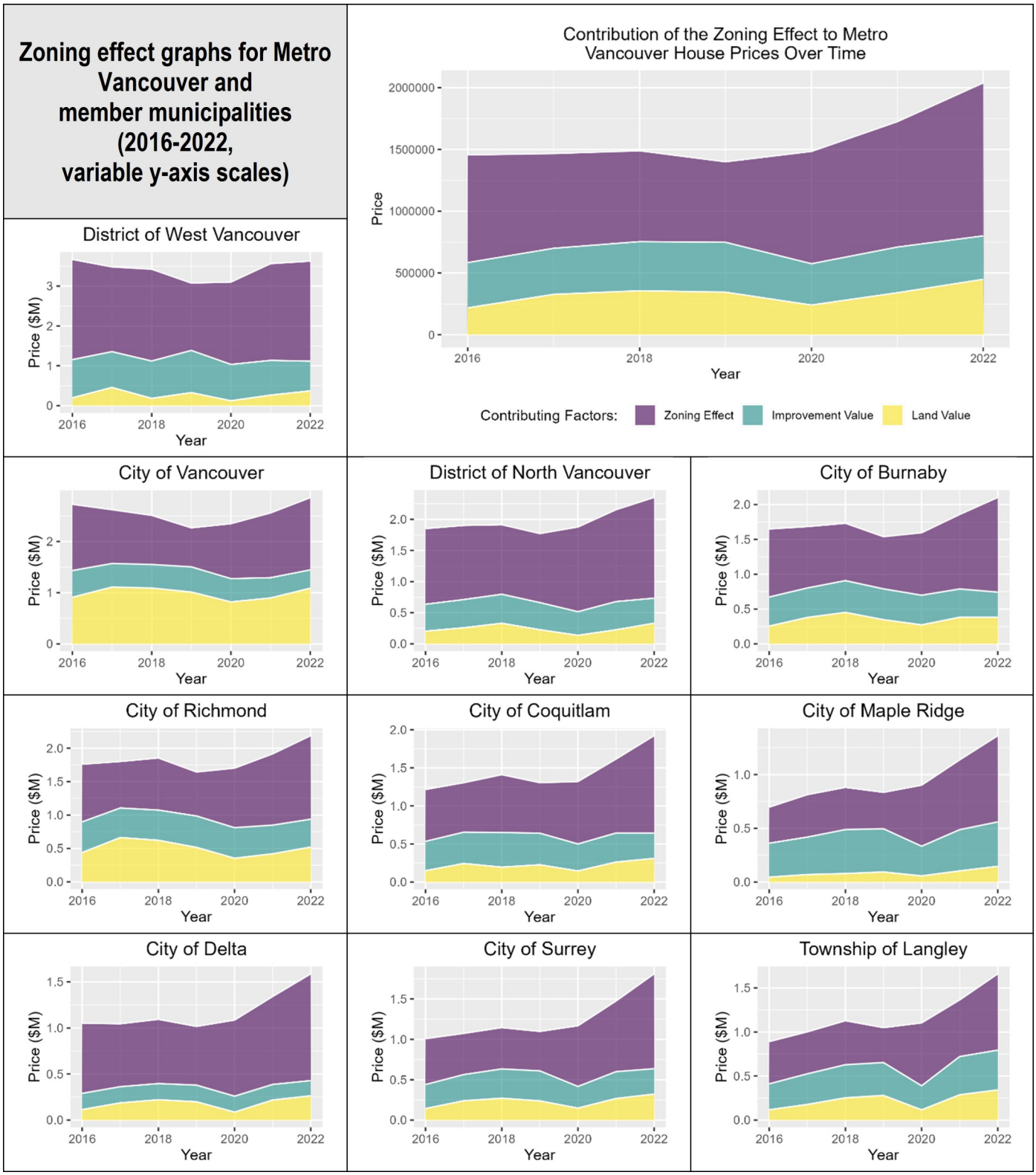

Figure 2. Zoning effect graphs for Metro Vancouver and member municipalities (2016-2022, variable y-axis scales).

Figure 3. Zoning effect graphs for jurisdictions outside of Metro Vancouver (2016-2021, variable y-axis scales).

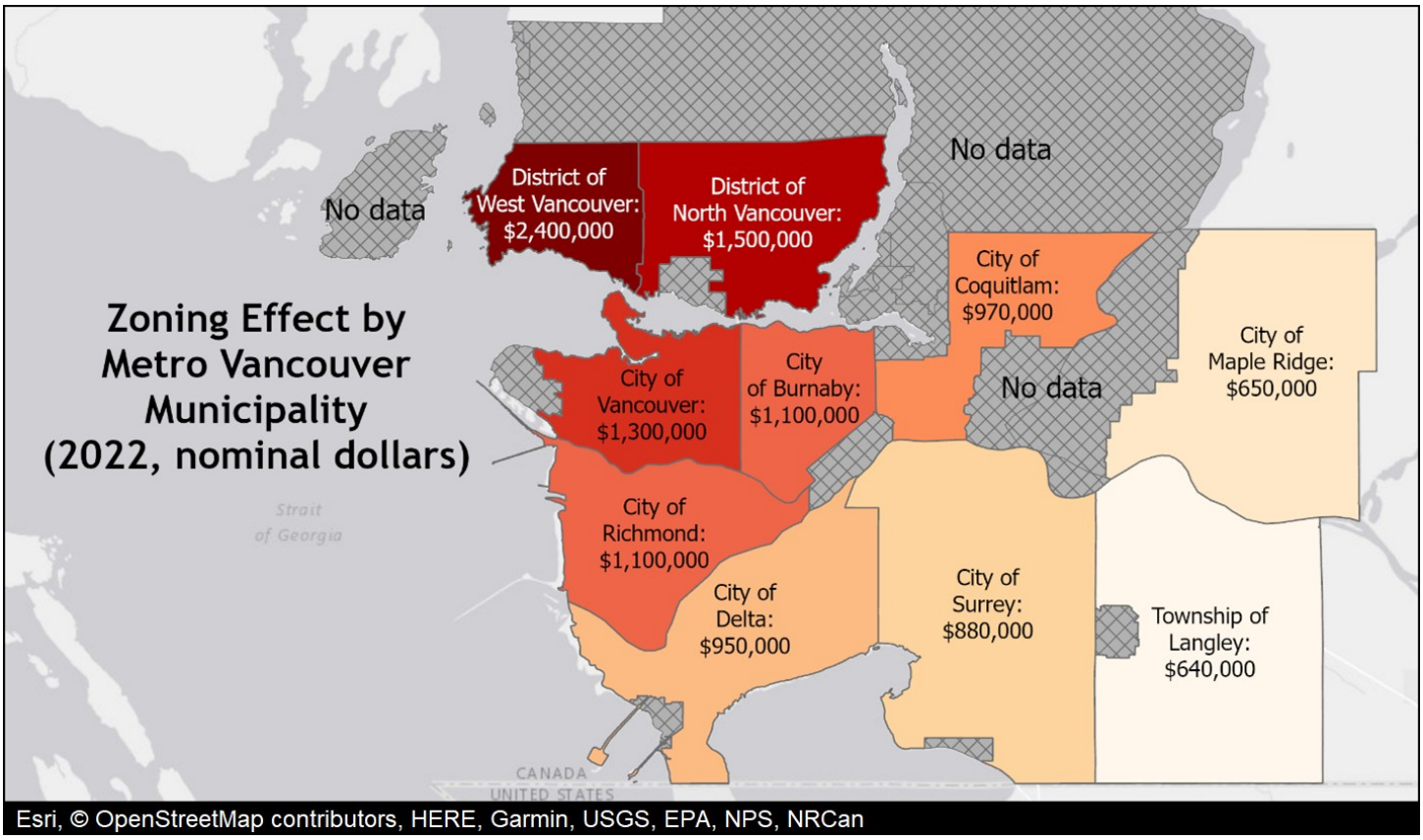

Figure 4. Zoning effect by Metro Vancouver municipality (2022, nominal dollars).

zoning effect has increased by nearly $200,000. Similarly, in the absence of the zoning effect, the average detached home price across all 30 municipalities would have grown by $100,000 from 2016 to 2021. However, because of the additional influence of zoning, prices actually grew by $300,000. This growth in the zoning effect demonstrates that zoning is actively constraining housing demand everywhere in this province, and the amount of demand that can not be met without increasing prices is growing with each passing year.

When I calculated apartment building heights in Metro Vancouver to estimate the zoning effect for apartments, I came across an interesting finding: despite the overall trend of increasing densification in Metro Vancouver, there appear to be roughly 150 fewer low-rise apartment buildings in 2022 than there were in 2016. Figure 6 shows that while most categories of apartment buildings have increased in number since 2016, apartment buildings of 4 or fewer storeys (in blue) have decreased. This is likely due to the pattern of "transit-oriented development" (TOD), a form of urban growth management that has been used by the Metro Vancouver Regional District and its member municipalities for decades. Under TOD, planners aim to concentrate population growth in the vicinity of rapid transit stations, in order to encourage people to take public transportation instead of driving. These "TOD areas" are often areas with existing low-rise apartment buildings, which are usually older and more affordable for low-income individuals. When TOD zones are redeveloped, the older, cheap

apartments are replaced with new, expensive ones, and the low-income residents are priced out.

Discussion

My analysis finds that zoning appears to account for between 40 and 60 percent of the average detached home sale price in most B.C. cities. While a lack of data availability limits my analysis to 2016 onwards, it is clear that the zoning effect has increased in recent years, and this increase accounts for much of the recent rise in B.C.'s housing prices. While the absolute size of the zoning effect is highest in the municipalities closest to downtown Vancouver, the zoning effect has grown at a faster rate in the suburbs. Structure values have also generally grown, for two potential reasons. One is that construction costs have increased, making new buildings more expensive. The other is that, as lots increase in price, the homes built on them tend to be larger and more luxurious as the additional construction costs involved become smaller relative to the land purchase cost (Pettit, 1993).

While this extra spending on housing is not a net cost to society, since it is recouped by land sellers, there is still an economic loss from forgone housing stock in a given locality. In addition, these higher housing costs mean each new household gets a lower level of housing quality than what they could otherwise afford. Existing households who make profits cannot capitalize on them without leaving for another region or downsizing to an apartment (to trade the large zoning effect on houses for the slightly smaller zoning effect on apartments). In addition, higher land prices reverberate through all sectors of the economy, not just housing. When land becomes more expensive, rent for commercial and office

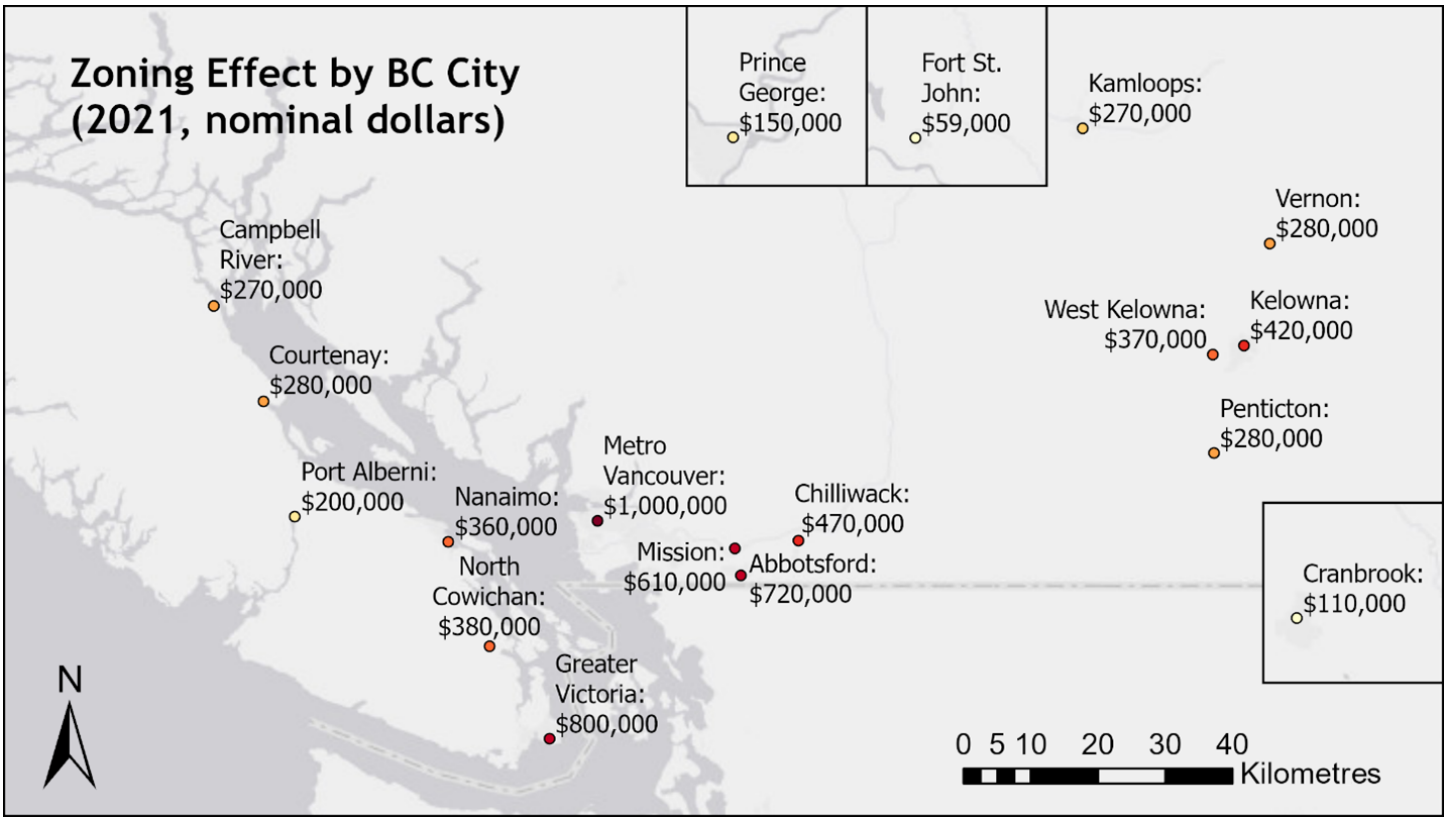

Figure 5. Zoning effect by B.C. city (2021, nominal dollars).

spaces increases, which translates into higher prices for goods and services.

The zoning effect is lower in absolute terms for apartments than houses, but still high in percentage terms, accounting for as much as 69% of the average apartment sale price in 2022. This reflects that zoning not only reduces the number of apartments on the market, but also makes those that are approved more expensive to build. Higher apartment sale prices are capitalized into higher apartment rents. Although rents are slower to adjust due to provincial rent controls, they rise as the rental stock is renewed and as lease agreements are terminated and reset.

It must be stated that *the zoning effect is not the amount that home prices would fall were zoning to be immediately abolished*. There are several reasons for this. For one, zoning restrictions have been in place for many decades, and it would take a long time for those decades' worth of forgone housing stock to be built. Developers today also have to contend with higher construction costs than decades ago when zoning first became a binding cap on housing supply. But more importantly, the marginal cost of construction is an endogenous variable which rises when more housing is allowed to be built. The zoning effect acts as a wedge between construction costs and home sale prices, keeping the housing market in a state of suspended animation, but were it to be removed, sale prices would not fall to the current marginal construction cost. Rather, the two values would converge to a price point somewhere between the two. The demand-side impact of zoning, not quantified in this study, would also change in an unknown way.

Because zoning accounts for such a high percentage of B.C.'s high housing costs, substantive reforms that reduce the barriers posed by zoning may be effective at reducing prices. This lends a theoretical basis to three pieces of provincial housing legislation, which each address different factors contributing to the high zoning effect. Bill 44 (Housing Statutes (Residential Development) Amendment Act, 2023) ends single-family zoning in urban areas and allows multiplexes as-of-right on most urban lots. As many neighbourhoods have a higher latent demand for housing than single-family homes can accommodate, this bill will bring allowable density closer in line with market conditions in these areas, reducing the zoning effect by a moderate amount. Bill 47 (Housing Statutes (Transit-Oriented Areas) Amendment Act, 2023) raises height limits significantly higher in areas near rapid transit, which, if such areas are also where most people want to live, will substantially reduce the zoning effect. Bills 44 and 47 together increase allowance for multiplexes and high-rises, but not the low- to mid-rise wood-frame apartment buildings that are currently the "sweet spot" for cost-effective construction (Connolly, 2019; Herriges, 2024). Because these kinds of buildings will still be prohibited on most urban lots, the zoning effect will likely be reduced but remain relatively high for the foreseeable future.

The third piece of legislation does not directly target any aspect of the zoning effect. Bill 46 (Housing Statutes (Development Financing) Amendment Act, 2023) aims to reform Community Amenity Contributions (CACs), and as mentioned earlier, CACs do not increase the final cost of housing if administered correctly. However, the developer profits that CACs aim to capture come from the zoning effect. If the zoning effect is reduced, the maximum CAC rate that can be charged without making projects nonviable will also fall. Bill 46 anticipates this shift and requires municipalities to standardize their fees in advance using a new tool called an Amenity Cost Charge (ACC). This may reduce the incentive for municipalities to under-zone properties to extract higher fees, but not by much. However, it will reduce

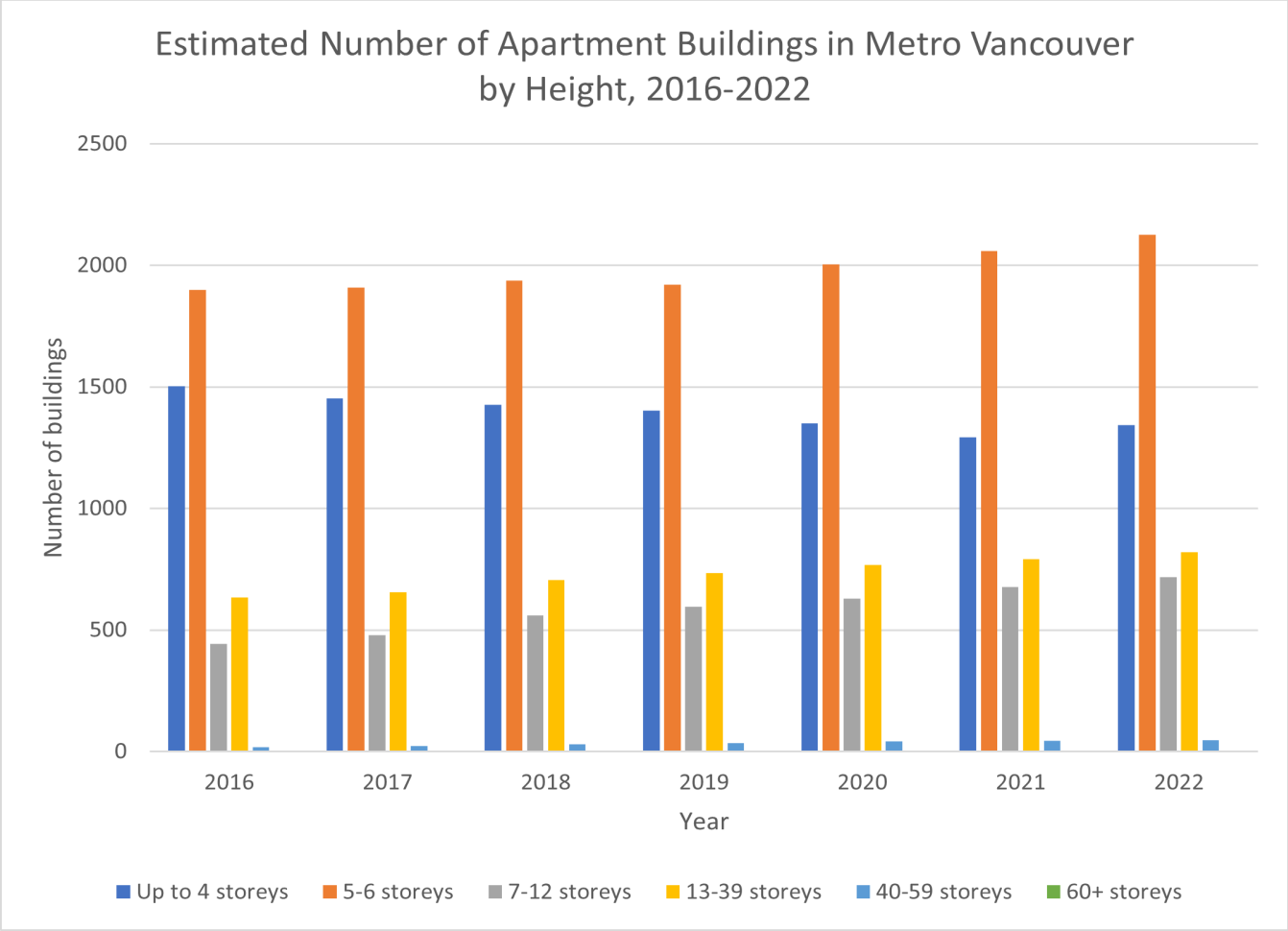

Figure 6. Estimated number of apartment buildings in Metro Vancouver by height, 2016-2022.

the delays involved in the rezoning process by eliminating CAC negotiations, and this could result in a lower zoning effect. Bill 44 also aims to reduce delays by phasing out public engagements for site-by-site rezonings, to similar predicted effect.

The observation that low-rise apartments are being lost in Metro Vancouver lends support to the concept of "transit-induced gentrification". Transit-induced gentrification is a term coined by social geographers to describe a process through which low-income renters are evicted from older apartments to make room for new transit-oriented development projects (Jones & Ley, 2016). Although the term "transit-induced gentrification" is evocative, it is also misleading, since it is not the transit infrastructure itself that leads to evictions, but the way that zoning is used around it. The construction of new rapid transit is simply a trigger that regional and municipal planners use to justify their zoning decisions. Furthermore, the up-zoning of TOD neighbourhoods is not the root cause of displacement; it is just the salient phenomenon that is most obvious to residents and observers. The real problem is the restrictive zoning of surrounding single-family neighbourhoods. Because single-family-zoned neighbourhoods have been kept off-limits for years, not enough low-rise apartments have been built to replace those that are demolished in the TOD area. In addition, even if developers wanted to

spare low-rent dwellings, they are denied that option because the only sites where new towers are allowed are the sites of old apartment buildings in TOD zones. The drop in low-rise apartments is a telling illustration of the impacts of TOD on the region.

Since TOD is a regional government initiative, the provincial government has the ability to overrule it. The provincial Bill 44, allowing duplexes in single-family neighbourhoods, may have an effect contrary to the aims of TOD, as it opens up more development possibilities outside of rapid transit-adjacent neighbourhoods. However, Bill 47 reinforces the goals of TOD by mandating high-density zoning specifically near rapid transit stations. It is unclear what combined effect these two measures will have on the rate of "transit-induced gentrification".

Other Considerations

In this study I have generally refrained from discussing demand-side interventions, since the zoning effect is a supply-side effect. However, some demand-side interventions, like a restriction on short-term rentals, can help to contain the highest price spikes. While they do not directly decrease the zoning effect, they can indirectly decrease it by reducing the amount of unmet housing demand. While these interventions are often effective in the short term, they can have negative consequences in the long term, such as adverse effects on B.C.'s tourism sector (Shen, 2023). The danger is that governments become too reliant on these demand-side quick fixes and fail to implement the necessary supply-side interventions. In the long term, a healthy B.C. housing market would have enough of a surplus of housing that these demand management measures would become unnecessary.

This study refutes the claim that zoning reforms will be ineffective because the construction sector is already working at capacity (Penner, 2023). While construction is more expensive in B.C. than elsewhere in Canada (Altus Group, 2023), my research shows that reducing the zoning effect would reduce house prices by hundreds of thousands of dollars before hitting the minimum price allowed by construction costs. It is true that supply-side zoning reforms will result in increased construction demand, and this will drive up the costs of contracts in the short term. However, this will in turn provide a signal for more construction firms to enter into the market, tempering this effect.

Finally, municipalities should remember that new supply does not need to be itself inexpensive to reduce prices overall. In fact, by requiring developers to include below-market housing that is cross-subsidized by charging more for the market units, municipalities are exacerbating the problem. This strategy would work well if most people had more than enough money to afford market rents, and could collectively afford to provide rental assistance to a few exceptionally poor people who needed it. However, with housing price-to-income ratios in the "severely unaffordable" range throughout B.C., those in need of rental assistance outnumber those capable of providing it (Gougeon & Moussouni, 2021). Under these circumstances, privately supplied below-market units will never be enough to meet demand, and allocating them via lottery is not an equitable long-term solution to housing deprivation (Bertaud, 2018; Cseke, 2015). It is more effective for municipalities to allow as many privately built units as possible to drive down the market price, and bring older units back into an affordable range. By decreasing the cost of land, this also makes it possible for nonprofits and the public sector to build more below-market housing using the same amount of revenue.

Simplifying Assumptions

Like any study, my project includes several simplifying assumptions. The first is that I do not incorporate subdivision or infrastructure costs in my analysis. The primary reason is that liberalization of zoning does not increase the land footprint of a city. Because infill development can take advantage of existing built infrastructure, average infrastructure costs would decrease if zoning liberalization were pursued as an alternative to sprawl (Kendall & Tulip, 2018). While major overhauls are occasionally needed in addition to the incremental upgrades, these are increasingly funded through charges levied on developers. Zoning creates the developer profits that allow cities to charge these fees, thus these charges are largely included in the zoning effect already.

Because this study does not include a general equilibrium analysis, there are several pertinent variables whose counterfactuals in the absence of zoning remain unaddressed. One such variable is the marginal cost of construction, which would almost certainly rise due to increased demand for scarce construction materials and labour. The type of housing built would also change. New apartments would be built over a more widespread area, and without as much economic pressure to build expensive high-rises, the marginal cost of apartment construction could fall even as construction costs rise in general. New single-family homes would likely be built on smaller, freely subdivided lots, and these smaller units could feature more or fewer fixtures per square foot, altering amenification costs. The resulting changes in neighbourhood composition and character would also alter the neighbourhood dummy variables in an unknown way. Without these values, there is no way to tell what the final sale prices of detached homes and apartments would be in the absence of zoning, so I emphasize that the zoning effect is a static measure and *does not represent the amount prices would fall* in the wake of sweeping zoning reforms.

I also assumed competitive development markets, obviating the possibility that development firms can exercise market power and thus earn supernormal profits. This assumption is verified by previous studies (Glaeser et al., 2005; Lees, 2017; Minifie et al., 2017). In unconstrained development markets, the sale price of an apartment unit approaches almost exactly the marginal cost of its construction (Glaeser & Gyourko, 2018). Development firms do earn profits in B.C., as evidenced by the effectiveness of community amenity contributions; however, this is because zoning effectively places a limit or "quota" on housing supply. Similar to agricultural quotas, this limit enables substantial profits for the developers who are allowed to produce, since supply opportunities are limited. However, there is no basis to assume any development firms earn additional profits through monopolistic influence.

One concern is the possibility that homeowners would challenge high estimates of their property value, but not low estimates. This would result in a systematic underestimation of structure values, which would in turn lead to an overestimation of the zoning effect. Mitigating this concern is the fact that BC Assessment's estimates are generally very accurate, deviating less than 3% from what properties are actually sold for (Bishop, 2022). In addition, every property is reassessed every year, limiting the persistence of underestimations (BC Assessment, 2024).

I declined to address two other potentially complicating factors, which would serve to further inflate the zoning premium if quantified. Kendall and Tulip (2018) also omitted these factors, and thus like theirs, my estimates of the zoning effect are likely on the conservative side. One of these factors is the

scarcity effect of industrial and agricultural zoning, which make land unavailable for residential use. The physical value of land is taken as exogenous by the model, but in fact is influenced by the additional administrative scarcity caused by industrial and agricultural zoning, which I don't consider as part of the zoning effect. Another factor is the time delay between increasing housing demand and new housing supply coming online. Insofar as such delays are the result of inherent market processes, this concern is mitigated by considering the zoning effect over a multi-year time span, as I do. However, delays resulting from regulatory obstacles should be considered part of the zoning effect, and calculating the cost of these delays would increase my estimates of it.

My estimates of the zoning effect for apartments are less precise than those for detached houses because they are based on construction cost estimates, which are more vague than assessed structure values. This is because structure values are assessed individually for each house, whereas construction costs are estimated for Metro Vancouver as a whole, making them less specific. Notwithstanding any locational imprecision, these construction cost estimates still allow me to provide an accurate picture of the overall magnitude of the zoning effect for apartments.

Policy Options for Governments

Until recently, governments have generally endeavoured to increase property values and have viewed rising house prices as an unqualified benefit of zoning. Nowadays, there is a tension between those who seek to make housing more affordable and those who are interested in maintaining high property values. This conflict can be resolved by differentiating between high physical land value and a high zoning effect. I suggest that high physical land values are still a good thing, since they reflect the inherent desirability of the land, and a high zoning effect is a bad thing, since it indicates a severe artificial scarcity of housing.

Assuming that abolishing density-based zoning entirely is too politically difficult for municipal governments, there are other strategies for reducing the zoning effect without alienating homeowners. Allowing widespread incremental increases in density, rather than concentrated sudden increases, would substantially decrease the zoning effect over time by emulating pre-zoning cities' organic growth, while providing consistency and predictability for longtime residents. This would also help to mitigate concerns around evictions and "transit-induced gentrification", as new developments would no longer be concentrated in older apartment districts primarily inhabited by low-income renters.

Another option would be to change the approval of certain housing types from discretionary to as-of-right in areas of the Official Community Plan that have already been established as suitable for these housing types. This would ease workloads for owner-developers and municipal staff alike. Changing approvals from discretionary to as-of-right curtails the opportunity for municipalities to generate revenue from CAC bargaining. However, I suggest that municipal governments' ability to charge substantial development fees should be curtailed anyway, since the developer profits from which these fees are extracted are created by the zoning effect. Reliance on fees creates a perverse incentive for municipalities to "under-zone" some properties in order to keep the zoning effect high.

Conclusion

In this study, I set out to estimate the extent to which zoning influences B.C. home prices. I found that in some cities the zoning effect is relatively small, and in

other cities it is the dominant contributor to the average home sale price. The zoning effect is strongest close to high-demand, large cities like Vancouver and Victoria. It is not caused just by building height limitations, but by a mix of related policies that make it more difficult to supply new housing at a rate matching how much of it people desire. Because the zoning effect is entirely caused by municipal government policies, it follows that municipal governments are responsible for much of the recent rise in B.C. housing prices. In some municipalities, zoning has caused housing to be more than three times as expensive as it would have been otherwise.

The zoning effect is preventable. It is created by policies enacted by municipalities, and municipalities can repeal or rework all of these policies. This study indicates that zoning reform has the potential to substantially lower housing prices, and that the provincial government can take measures to enable more supply when municipal governments choose not to act. It demonstrates that demand-side factors like immigration are not the main cause of price increases, that that construction sector is not working at capacity, and that land use regulations are not costless. It contradicts the fallacy, which prevails even in high-level forums like Vancouver City Council meetings, that building new housing will increase prices (Chan, 2022). That being said, it also cautions against concentrating development in areas of older apartments, which causes undue immediate hardship for low-income renters despite reducing prices overall in the long term. It suggests that B.C. municipalities can improve housing affordability by auditing their land use by-laws and removing outdated or excessively rigid requirements. Finally, it points out that well-designed demand-side interventions can be effective at containing the highest price spikes.

While there is room for nuance regarding what kind of housing supply is most badly needed in B.C. cities, unlocking more supply by removing zoning barriers would be in any case a step in the right direction. If zoning continues to substantially limit housing supply, prices will continue to rise faster than necessary in growing cities. Fortunately, the range of possible reforms is broad, and there are many different angles to approach this problem from. This study adds to a growing body of literature suggesting important steps planners and politicians can take to improve affordability in their jurisdictions.

Adjustments to urban built form have never been instantaneous, but zoning further impairs cities' flexibility. The long lead times and lifespans of constructed buildings inherently reduce the ability of cities to adapt to new economic realities, a fact that is costly for residents. Zoning reinforces this innate inflexibility by adding additional layers of unresponsiveness to urban real estate markets. As B.C. cities try to make housing less expensive for their citizens, it is important for them to recognize the role that their own by-laws play in driving up housing prices. In its current form, zoning is a major barrier preventing cities from achieving their affordability goals, but substantial zoning reform is achievable, and all levels of government have policy options available to them for reducing the zoning effect.

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