UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Rapid Transit: Housing Affordability

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ECON 492E

Themes: Transportation, Finance

December 2018

ECON 492E – Rapid Transit: Housing affordability

Assignment 4

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To analyze the impact of the Canada Line on housing prices in Greater Vancouver, we will use data collected by the British Columbia Assessment Authority ("BC Assessment"), one of the primary sources for real property assessments and information in BC. The data will be obtained through an existing use agreement between BC Assessment and the UBC Centre for Urban Economics and Real Estate. Under the use agreement, UBC faculty and students have access to roll data from 2014 to 2018 in BC's Lower Mainland, as well as real property transaction data from 2005 to 2018.

British Columbia Assessment Authority

BC Assessment is a British Columbian Crown Corporation with a mandate to "establish and maintain uniform real property assessments", as outlined in the *Assessment Act*[1]. Whereas BC Assessment's primary function is to enable reliable real property taxation, this function can only be served by maintaining an extensive database on all properties in BC. Beyond informing tax jurisdictions throughout the province, this data is often used for research purposes; select datasets are also made available online for public access.

1 More information about BC Assessment is available on their website at: https://info.bcassessment.ca/about-us/about-BC-Assessment

2 For most properties, the roll number is a unique number which identifies a single property. However, there are special cases in which one property has multiple roll numbers or in which one roll number refers to multiple properties.

BC Assessment provides residential property assessments as of July 1 each year, based on market value. To determine the value of a property, appraisers analyze physical features of each property (e.g. lot size, building size, age, location, renovations), past transactions, and market trends. All properties are assessed to their "highest and best use", which estimates a value based on the property's potential uses. To determine the highest and best use, appraisers seek to understand the legal permissibility (i.e. permitting), physical possibility (i.e. geographic constraints), financial feasibility (i.e. ability for developers to finance a potential use scenario), and maximum profitability of each property. According to BC Assessment, this methodology provides an accurate estimate for the market value for properties.

[1] More information about BC Assessment is available on their website at: https://info.bcassessment.ca/about-us/about-BC-Assessment

Data

Through the use agreement between BC Assessment and the UBC Centre of Urban Economics and Real Estate, we have access to raw roll data from 2014 to 2018 and raw transaction data from 2005 to 2018 in the Lower Mainland. The roll data are the annual assessments which BC Assessment provides, as described above, which includes information on the land/building size, land/building value, building features, etc. for individual properties throughout the Lower Mainland. Whereas the transaction data does not contain information on the physical features of the property, it provides the sale price and assessment values for every transaction. All observations are identified by a roll number which is a unique identifier for each property[2].

Methodology

Our primary dataset will be the raw transaction data from 2005 to 2018. We select this dataset because the available roll data does not cover property information from 2009, the year in which the Canada Line was implemented. To uncover our key parameters of interest, the data will be analyzed through a regression analysis using a difference-in-differences model, the baseline of which is outlined below.

$$lnHP_{i,N,t} = \alpha + \beta_1 Transit_{i,N} \times POST_t \times CLD_i + \beta_2 Transit_{i,N} \times POST_t + \beta_3 Transit_{i,N} + \delta_t + \delta_N + \varepsilon_{i,N,t}$$

$HP_{i,N,t}$ refers to the total value of a piece of property, i, in a particular neighborhood in Greater Vancouver (as represented by the subscript N) and a particular year (as represented by the subscript t). We take the natural logarithm of this term to allow us to interpret our βs as a percentage change. $Transit_{i,N}$ is a variable which captures the distance of a property to a rapid transit station (or where a station would be, in the case of Canada Line locations pre-construction). The data for this variable can be obtained by geocoding addresses from the BC Assessment datasets and calculating the Euclidean distance to the nearest station. CLD_i is a dummy variable which takes a value of 1 if the $Transit_{i,N}$ variable refers to a distance to the nearest Canada Line station (otherwise, CLD_i equals zero). $POST_t$ is a dummy variable which takes a value of 1 after the Canada Line has been opened, allowing us to capture the effect of the policy shock. Since housing prices can change prior to the opening of the Canada Line as a result of speculation, we can conduct a sensitivity analysis with varied point in time for which

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$POST_t$ takes a value of 1 (e.g. when the Canada Line station locations were announced). The terms δ_N and δ_t are neighborhood and year fixed effects, respectively. Finally, $\varepsilon_{i,N,t}$ is the error term.

Beta 1 captures the percentage change in housing prices for as a result of opening the Canada Line for those who are closest to the Canada Line. The coefficient on $Transit_{i,N} \times POST_t$ (Beta 2) captures the change in housing prices as a result of the opening of a new transit line. The coefficient on $Transit_{i,N}$ (Beta 3) is the percentage change on housing prices caused by proximity to a transit station. To enhance our results, we can consider adding further effects for specific household characteristics.

In order to uncover the effect of the Canada Line on housing prices in different neighborhoods, we can expand on the baseline regression described above. First, the baseline regression assumes that housing prices in each neighborhood have parallel trends. That is, housing prices in each neighborhood are changing at similar rates before and after the Canada Line is implemented. If this assumption does not hold true, we must account for neighborhood-specific time trends by including another term which interacts the neighborhood dummy variables with a linear time trend. Alternatively, we can account for area characteristics such as employment density, crime rates, or income in each neighborhood.

Second, we can augment the baseline regression by including an interaction between our covariate of interest, $Transit_{i,N} \times POST_t$, and each neighborhood. Adding this term to our regression could allow us to estimate a separate causal effect of transit on housing prices in each neighborhood. This is important to capture because the effect of being close to rapid transit on housing prices may be different in the Central Business District (CBD) than in a suburban neighborhood.

By estimating separate effects, we can potentially support the case of extending the Millennium Line to UBC, using the Canada Line as a proxy. Assume a scenario in which housing prices near the CBD far exceed the prices of those that are further removed – a relatively accurate albeit simplified

representation of housing prices in Greater Vancouver. An ideal scenario is if we find that effect of transit on housing prices is negative in neighborhoods close the CBD and positive in neighborhoods which are further removed. Such a result would signify that implementing the Canada Line improved housing affordability by decreasing the disparity between housing prices based on distance from the CBD. Residents close to the CBD now enjoy lower housing prices, residents further away now enjoy lower transportation costs. Furthermore, residents can also choose to move closer or further from the CBD, based on their preference for housing consumption and transportation costs.