Not In My Neighbor's Back Yard: External Effects of Density

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Abstract

In Vancouver, as in many "Superstar Cities," low density zoning in residential neighborhooods is both a sacred cow of amenity preservation and a scapegoat for unaffordability. In 2008, the City Council allowed homeowners to build small "laneway homes" behind the main residential structure on qualifying lots in all of the city's single family zones. We exploit this regulatory change to study the externalities that infill housing imposes on neighboring property values. Laneway homes are most commonly built when the main home is substantially rebuilt and generally reduce the size of rear garages. Neighbors who build laneway homes thus add little physical density but impose a household of renters on neighbors. Overall we find a small negative spillover that is not statistically different from zero, suggesting that the negative externalities of population density may be small. We do not find a stronger negative effect in more expensive neighborhoods or on fancier homes, but the negative spillover is statistically different from zero and larger in magnitude on properties with larger lots (-11.2%).

Key words: Real Estate Externalities, Real Estate Density

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1 Introduction

Neighbors' opposition to increasing density in existing residential neighborhoods has long been studied by urban economists (Hamilton 1975, Fischel 2001). Recently, this opposition has been seen as the root cause of rising prices in highly regulated metropolitan areas (Glaeser, Gyourko and Saks 2005) and has even been blamed for enormous macroeconomic damage Moretti (2017). Foregoing the right to add density on one's own lot can be costly, and highly sought after cities such as San Francisco, Vancouver, and New York tend to be highly regulated, suggesting that there are amenity benefits to restricting neighbors' rights to build.

While neighbors' opposition to density seems important, there is little evidence concerning either (a) the negative externalities that development really imposes on nearby residents or (b) the price benefits from increases in development potential. In this paper we examine the impact of the right to add a particular form of infill housing on property owners' property value and the impact on value when neighbors exercise this option. The contribution of the paper is in using highly detailed property data in combination with a policy change on allowed densities that allows us to separate out the effect of an increase in a property's redevelopment option value from the effect of increased density on an adjacent parcel.

Our analysis takes advantage of a policy change by the municipal government in Vancouver, Canada, that was applied to all areas of the city zoned for single family detached housing. The policy allowed property owners whose lots and existing units met certain criteria to construct a separate infill unit adjacent to the lane running at the rear of the property. These structures had to meet a variety of rigorous design and size criteria and could not be sold, but allowed for a stand-alone rental property. From 2010 to 2016, following the July 2008 zoning change, approximately 2,356 laneway units were built in single family areas, representing approximately 3.5 percent of the housing stock. In comparison, over the same period 5,448 new single family properties were built, almost all replacing existing properties. We both test the effect of the zoning change that allowed for the ability to build these laneway units, the effect on property sales price of adding a laneway structure to a property with a separate single family structure property, and critically for our test of the effect of density, the effect on a property's price if a neighbor constructs a laneway.

For the impact of the rezoning to allow laneway homes on own property value, we use a difference in differences approach, comparing prices of single family properties eligible for a laneway and those not satisfying the criteria before and after the regulatory change in 2008 that enabled some but not others to build. The key identifying assumption is that the criteria that allowed laneway homes was not correlated with demand for those homes except through the new rights. To estimate the impact of a neighbor exercising their post-2008 option to build a laneway on neighbors' value, identification comes from our assumed randomness of whether a new property built next to an existing property has a laneway built or not. Supporting that assumption, we show that while there are broad geographic differences in the propensity for newly built homes to add a laneway that are associated with prices, whether an adjacent new property has a laneway is independent of the existing unit's value or characteristics within neighborhoods. Thus the treatment effect (that a newly built adjacent unit has a laneway) is apparently a conditionally random treatment. This randomness provides us with a cleaner test of the effects of density than existing work, which looks at redevelopment at higher densities, which is unlikely to be random.

There are two critical assumptions underlying our analysis of laneway home construction's impact on neighbors' property value. First, we assume that conditional on neighborhood times year dummy variables, there are no systematic differences in unobserved value factors between properties adjacent to new homes with versus without laneway homes built. We show that there were no such differences in the pre-2008 period. Second, we assume that those who build new homes do not observe highly location-specific externalities associated with laneway homes: conceivably, one owner's choice not to build a laneway home on Alma Street and another owner's choice to build one on Blenheim Street might reflect a greater negative externality of a laneway home on one's own property (and hence presumably on neighbors' property) on Alma than on Blenheim. Ruling out the second possibility empirically is not possible, but we do show that characteristics of homes that might be expected to be associated with a more negative externality of laneway homes are not associated with a lower probability of a new home adding a new laneway. The effective assumption then is that unobserved characteristics that affect laneway externalities similarly do not affect laneway propensity (possibly because they are also associated with higher laneway home rental value).

The most important findings in this paper are about the magnitude and sign of density spillovers. In the full sample of homes, a neighbor with an infill unit lowers the value of the immediate neighbors by 1.8 percent, but the estimated effect is not statiscally different from zero. While this implies on average no notable spillovers, this may not apply to higher densities: if the effect is linear a ten unit adjacent structure would have a point estimate indicating a lowering of each neighboring house's value by 15 percent. The small magnitude and statistically insignificant result hides variation by property type. A natural conjecture is that willingness to pay to avoid living near renters might rise in logs with property value or with lot size. We do not find that higher-end homes suffer from a notably larger negative externality. However, for a property on a lot of above average size, the reduction in value associated with a new laneway on a neighboring property is over ten percent.

Section 2 of this paper reviews the extant research on density externalities and highlights the contribution of this study. Section 3 goes in depth into the data sources and identification strategy. The results are shown in Section 4 and we conclude with comments on policy implications in Section 5.

2 Literature

Economists generally look askance at zoning restrictions because they are seen to increase the cost of housing. Studies of housing markets in land-constrained environments (Saiz 2010) and those on land use regulation in general finger differences across communities in constraints on residential density though zoning as an important contributor to the variation in the price of housing (Gyourko and Glaeser, 2017). Models of urban size and structure include a treatment of the negative externalities of residential density, typically as a congestion externality assumed to apply to travel, which are offset against the benefits of density through agglomeration externalities (Ahlfeldt, et. al. 2015, Brinkmann 2016, Lucas and Rossi-Hansburg 2002).

In these models the effects of density are at a fairly aggregated level. This literature treats density as a feature of neighborhoods or the city as a whole and ignores its most immediate local effects. Our contribution is to instead look at the extent to which density can have more localized negative effects. These localized effects are important as they reflect the source of opposition by local residents to increased density, that while welfare increasing on the whole, may result in more immediate negative effects for themselves (Fischel 2001).

That density would have effects on neighboring property values is intuitive. Turner and Haughwout (2014) disaggreate the different ways zoning restrictions effect property values; own-lot, external, and supply effects. Our focus is on the second of these, which is sparse compared with the analysis of the larger supply question. Strange (1991), presents a theoretical model that categorizes the different ways density effects properties both within and across neighborhoods. Critically, he allows for direct effects on nearby properties and indirect effects as increases in density in one area can induce wholesale zoning changes in individual neighborhoods or across a city. One of the contributions of our work is that our empirical analysis is able to exclude the indirect effects he identifies that could bias estimates of the externality.

An older empirical literature studies the effects of zoning and density changes on neighbors. Paper such as Sagelyn and Sternlieb (1972) and Stull (1975) find that multi-family properties in single family neighborhoods lower values of the nearby single family units. In contrast work by Crecine, et. al. (1967), Reuter (1973), Maser, et. al. (1977), and Mark and Goldberg (1986) do not find that proximity, from a sample of properties a given distance from the location of density, has an effect on house prices. The problems with these empirical studies are those identified by Strange: that higher density at one location is likely to affect the possible redevelopment opportunities of nearby units, essentially positive redevelopment spillovers. Alternatively, areas that are conducive to higher density may have other aspects that affect their prices: the presence of the higher density treatment buildings is non-random. Our contribution is to help separate the effects of density from increased population, to look at newly built properties, and to avoid some of the sample selection problems that effect these other works by looking at changes in density that occur within the existing zoning for newly built structures.

Our identification comes from the teardown of older single family homes and their replacement with newer larger single family homes, some of which include a separate "laneway" infill which can be rented out. Studying the teardown phenomenon is not unique to our work. Wheaton (1982) among others included redevelopment formally in their models of urban form and change. Helsley and Rosenthal (1994) were the first to explicitly study the phenomenon as an empirical event, using these units to extract estimates of urban land values. Menace (1996), Helms (2003), and Dye and McMillen (2007) all estimate models to predict which units are torn down, looking at both unit and neighborhood characteristics. This form of redevelopment option exercise is studied by Clapp and Salavi (2010), Clapp, et. al. (2012), and McMillen and O'Sulliven (2013), who attempt to estimate both the option exercise decision and the option value. Our work is different in that we do not attempt to model the redevelopment choice, but instead use these properties, taking advantage of the outcome where some look to what the redevelopment mean for the values of adjacent properties.

Density changes can also accompany changes in neighborhood composition, and it is possible that effects observed reflect not the density, but the occupants. For instance, a number of studies identify neighborhood effects of increased concentration of immigrant or low-income families in a neighborhood. For instance, Saiz and Wachter (2011) and Sa (2015) document a negative price impact from increased immigrant concentration. Diamond and McQuade (2016) find a negative price impact of low-income housing in high-priced neighborhoods. Our setting is distinct from this literature. The laneway houses in our sample are typically of very high quality and command high rents or are occupied by family members of the property owners. This allows us to investigate the direct effect of density rather than the combined effect of density and changing demographics.

3 Data and Identification

Our analysis focuses on the construction of laneway infill units in the backyards on single family detached properties. These units cannot be sold separately from the main property as they do not have a distinct property title. They were intended to provide rental housing in single family neighborhoods without dramatically changing the feel of the areas. By law laneway homes are either one- or two-bedroom units. Median size is 663 sq ft (61.6 sq m), with the range from the 10th to 90th percentile of 489 to 865 sq ft (45.4 to 80.4 sq m). There are strict rules on the design, spacing and layout of these units.[2] They are fairly high quality, with construction costs of $C200,000 to $C300,000, which excludes land costs. [3] High planning and building code requirements mean their per square foot cost is more than that for an actual house. Between the first approvals for this form in July 2008 and the end of 2016, 2,361 such units were built in the City of Vancouver, BC, Canada.

We wish to identify the effecs of a property having a lanewayunit on the values of the neighboring property. However, building a laneway for an existing property is likely to be a non-random event. The nature of the building code is that building a laneway commonly means foregoing a two-car garage. Figures 1 through 3 suggest that the clientele for homes in fancier neighborhoods (generally those in the western half of Vancouver) care relatively more about garages and is less tempted by rental income

[2] Details on rules and regulations can be found at http://vancouver.ca/home-property-development/building-your-laneway-house.aspx .

[3] The per square foot cost for the median size unit is roughly $C 350 per square foot or $US 260. This is at the high end of single family construction costs: https://www.vancouverhome.builders/how-much-cost-to-build-house/ .

or less inclined to tolerate neighbors in close quarters. We thus confine the sample of laneway homes in regressions to new units, comparing the price effects for new units with and without laneways. Given the greater propensity for laneway homes in East Vancouver, we include neighorhood times year dummy variables and rely on evidence that within neighborhoods, the choice of whether or not to build a laneway home is random.

Another reason to study new homes is that among older homes that have not yet built a laneway or been rebuilt, construction of a laneway in the near future may be a valuable option that is likely to be exercised in the not too distant (and not too heavily discounted) future. Thus the impact of exercising (versus retaining) that option may have a small impact on neighbors. By contrast, building a new two-car garage with a new home (by far the most common alternative to building a laneway among new homes), involves a significant reduction in the option value of building a laneway home.

Renovations are essentially the only source of new single family construction in Vancouver. With a few exceptions of subdivided lots, the overwhelming number of new single family properties in Vancouver are a replacement of an existing single family unit. Supply constraints and redevelopment in the city and metro area mean that the share of households in single family units has been dropping steadily since 1981, and that in the city and the metro area, the aggregate number of single detached houses dropped, despite a growing population. In this analysis we draw on data from nearly the whole city (the Housing and Data Book from Metro Vancouver shows a decline from 50% to 29% in the share of single detached homes of all private dwellings between 1991 and 2016).

We use transactions from 23 of the city's 30 neighborhoods, limiting inclusion to those with single family transactions on property zoned for single family use drops 7 neighborhoods that in aggregate have 138 properties zoned for single family. Of these 5 neighborhoods are in the downtown core and the single family units are unusual heritage preservation outliers. Our transaction count for older properties (three years and older) runs between 1,886 and 11,282 per neighborhood, with a median of 5,950. For new properties (two years and fewer), the count per neighborhood runs from 33 to 850, with a median of 266 (just one neighborhood with fewer than 115 and one with more than 626). The correlation between to these two counts is 0.66. So while the distribution is not perfectly uniform, the redevelopment phenomenon occurs throughout the city. Figure 1 shows the distribution of new units throughout the city. In Figure 2 we show the distribution of transactions of properties that have a laneway. These are primarily new houses, as most existing properties whose owners have invested in a laneway have not sold their property.

We combine transaction data from Vancouver for single family houses with property roll data that provides the standard set of property characteristics. Because we are combining the transactions set with the universe of all properties we are able to identify the characteristics of immediately adjacent properties, even if they do not transact. For the period of 2012-2016 from a full sample of single family transactions of 38,750, we get a reduced sample of 17,375 transactions of single family units, windsorized at the 0.5th percentile on price, floor area, and lot size, where we limit the properties to those in areas with single family zoning in 2017 and where the adjacent properties are all single family units. In total, 8.6 percent (1,494 transactions) have a neighbor that is less than three years old. The adjacent units have a median size of 1,987 square feet and a structure density (floor area or space ratio) of 0.39, compared to 1,803 and 0.35 for the transacting units.

3.1 Laneway Announcement

Over our period of analysis, there were no major citywide changes in zoning that changed the rules regarding the teardown and replacement of an existing single family home with a second single family home.[4] In addition our analysis will include neighborhood - year dummies along with a citywide set of year-month dummies to control for both

[4] There are some changes along major arterials, but we limit our analysis to properties that were in single family zones in 2017, thus excluding all previous sales of properties whose zoning subsequently changed.

high frequency general and moderate-frequency neighborhood variation in price levels. The decision to redevelop becomes an individual property owner or buyer's decision as function of unit characteristics and personal preferences. The identification comes from the difference between properties adjacent to those that are redeveloped versus those that are not. In the data we define new as any property less than three years old to allow for a large enough window to have transactions.

We exploit two announcements related to the ability of homeowners to add a laneway house to their property to identify the value of the option to build. The first announcement was in July, 2008, when properties in the primary single-family zoning, SR-1, became eligible for a laneway house, subject to certain restrictions discussed below. Four years later, in July, 2013, the City of Vancouver extended this eligibility to all remaining single-family zoning designations. In addition to being with the appropriate zoning designation, a property needs to satisfy the following conditions to be eligible for a laneway house:

(1) The property needs to back on a lane or another street. Properties that have no lane or street separating them from the property behind are not eligible to build a laneway house. This restriction applies even for corner lots, which in theory have the necessary access for fire and other services. For this reason, we identify all properties for which the lot polygon border is NOT within 4 meters of a laneway as ineligible.

(2) The requirements for cite coverage and access imply that properties with either of these characteristics are not eligible for a laneway house:
   - Lot is less than 110 ft deep OR narrower than 25 ft
   - Lot is BOTH less than 33 ft wide and less than 122 ft deep

(3) he total site coverage of the main house and the laneway cannot exceed 40% of the property area. This restriction is particularly binding for properties known as "Vancouver Special" because of their size and location within the lot. To identify these properties, we apply the following filters:

- Property built between 1963 and 1986, and
- One story with full basement, and
- Floor area exceeds 1500 sq. ft., and
- Floor area to lot size greater than .5, and
- Lot size is less than 9000 sq. ft.,
- But allow laneways for large lots which exceed 148 x 36 feet.

The above criteria for selecting properties eligible for laneway homes appears to be accurate. All laneway homes observed in our data are located on properties that satisfy the above criteria. There are no laneway homes on properties that our mechanism labels as ineligible. However, it is conceivable that properties labeled as eligible in our analysis are in fact not eligible. This could potentially bias down any impact of own laneway home eligibility that we find.

Our identification strategy is based on the difference in price appreciation for properties that are eligible and not eligible for a laneway house around each of the announcement dates. In efficient markets, this difference captures the option value to build a laneway and thus substantially increase the FSR of the property.

Specifically, we estimate the following difference-in-differences equation for all transactions subject to the zoning change:

$$\begin{aligned} p = \beta_0 + \beta_1 Characteristics + \beta_2 \sum I(\text{Property in neighborhood i at time t}) + \\ \beta_3 Eligible + \beta_4 postAnnouncement + \beta_5 Eligible * postAnnouncement \end{aligned} \tag{1}$$

where p is the log - transaction price of property, "Characteristics" captures available property characteristics, "Eligible" is an indicator variable whether the property meets the laneway requirements listed above, and "postAnnouncemnet" is an indicator variable that takes the value of one for transactions after the announcement date. We estimate Equation (1) for properties within the zoning that changed: SR-1 to SR-7.

This methodology has two main threats to identification. First, it is conceivable that some other event differentially affected properties that are eligible for a laneway house. For instance, the value of backing onto a lane may have changed for a different reason. However, such a change would have to be perfectly contemporaneous with the laneway announcements.

Second, the changes were not a total surprise, it is conceivable that they were anticipated and reflected in prices before the announcement. However, both changes were highly contested in passionate debates, and in our view the outcomes of the final votes were not at all certain. Moreover, if the price impact took effect before the announcement, then our results would be biased downward, below the true effect of the announcement, thus making it possible that we do not detect an effect that was real, but never detect an effect by random chance.

3.2 Laneway Option Exercise Effect

In this section we investigate the impact of actually building a laneway house on a property that is already eligible. This is the impact of exercising the option to build. Specifically, we estimate the following model:

$$\begin{split} p = \beta_0 + \beta_1 Characteristics + \beta_2 \sum I(\text{Property in neighborhood i at time t}) + \\ \beta_3(hasLaneway) \end{split} \tag{2}$$

where "has laneway" is an indicator variable if the property has a laneway at the time of transaction and all other variables are defined as above. We restrict this estimation only to properties eligible for a laneway house at that time. This includes all RS-1 properties up to 2013, and then properties in all RS zoning after 2013.

While the above equation is rather straightforward, its estimation presents a difficulty. About 55% of all laneway houses were build as part of re-developing the entire property.

Therefore, we need to carefully separate the effects of a laneway from the effects of property redevelopment. We do this by splitting the sample to new builds and existing houses.

3.3 Effect on Adjacent Property

Building a laneway house represent a significant increase in density both in terms of site coverage and in terms of additional residents and vehicles. With this in mind, we investigate the effect of building a laneway house on the neighbors. For each laneway built, we identify the immediate neighbors on each side. This identifies the properties most impacted by the newly built laneway house. To estimate the impact on the neighbors, we estimate the following model:

$$\begin{aligned} p = \beta_0 + \beta_1 \text{Characteristics } + \beta_2 \sum I(\text{Property in neighborhood i month t}) + \\ \beta_3(\text{Neighbour has laneway}) + \beta_4(\text{Neighbour characteristics}) \end{aligned} \tag{3}$$

The neighbor characteristics we consider are floor area and lot area. The parameter β_4 estimates the effects of a neighboring laneway above and beyond the total floor area and age of the neighbors.

3.4 Randomness Check: Laneway House Assignment

One potential concern with the estimation of the impact of own laneway or neighboring laneway (Equations (2) and (3) above) is that laneway houses are not located at random within neighborhoods but are systematically placed on more or less desirable lots. Such a possibility would undermine the identification assumptions of Equations (2) and (3) and potentially generate misleading results.

To address this possibilty, we first estimate the probability of having a laneway as a function of the predicted property price and as a function of all available property characteristis.

To further address the issue of random assignemt, we perform the following test for random assignment of laneway houses within neighborhoods. First, using data for the 2011 - 2016 period we compute the share of new houses out of all new houses by census tract and 5-digit postal code (the first five characters in the Canadian alpha numeric X0X 0X0 postal code):

$$\text{Share of New with Laneway} = \frac{\text{Number of New with Laneway}}{\text{Number of all New}} \tag{4}$$

We then use the share variable to explain transaction prices in the pre-2010 sample. Specifically, we estimate the following hedonic model:

$$\begin{aligned} p = \beta_0 + \beta_1 \text{Characteristics } + \beta_2 \sum I(\text{Property in neighborhood i month t}) + \\ \beta_3(\text{Share of New w Laneway}) \end{aligned} \tag{5}$$

A significantly positive (negative) coefficient β_3 would suggest that the 2011 - 2016 laneway houses were concentrated in more (less) desirable census tracts or 5-digit postal codes. Such a finding would undermine the identification of Equations (2) and (3).

4 Results

4.1 Announcement Effect

We offer summary statistics of the transaction data we use in Table 1. The average transaction price of over 1.1 million dollars over the entire period reflects Vancouver's issues with housing affordability, which prompted the introduction of laneway houses as discussed above. However, the uptake of laneway houses is relatively low, penetrating only 2.8 percent of the market. However, when considering only new construction, laneway houses are very popular, reaching nearly 50 percent in the first half of 2017.

Next we estimate the laneway announcement effect as given by Equation (1). Specifically, we use July, 2008 as the first announcement event. At that time, properties zoned in the primary single-family zoning, SR-1 and SR-5, became eligible for a laneway, provided that they met the minimum requirements described in Section 4 above.

Table 2 reports the estimation results for the July 2008 announcement for +/-6 and +/-9 - month estimation windows. The variable of interest is the interaction between the post-July, 2008 indicator and the indicator for property eligibility "laneOK." While this interaction is positive for the two event windows we consider, it is only marginally significant for +/- 6 months, and not significant for the longer +/- 9 months window. Significance aside, the estimated effects are very large. For the +/- 6-month window the estimated impact is 15 percent of property value. In other words, properties that became eligible in July, 2008 enjoyed a 15 percent increase in value relative to properties that were not eligible. The fact that such a large impact is only marginally significant is likely a reflection that the vast majority of properties became eligible for a laneway. In fact, over 80 percent of all properties met the requirements for a laneway.

Another consideration is the fact that the 2008 announcement was not a complete surprise. The City of Vancouver engaged in several community events and request for feedback before the formal announcement. While the feedback was largely mixed and the outcome was not easily predictable, it is possible that many homeowners started pricing in the potential laneway announcement ahead of July, 2008.

We also estimate Equation (1) for the 2013 announcement which made all remaining single-family zoning designations eligible for laneway houses. This estimation does not produce a significant announcement effect at either horizon. This could be because of a small sample issues or because the announcement was anticipated and already priced in.

4.2 Impact of Own Laneway House

Next we report the estimation of Equation (2) which considers the own property value impact of building a laneway house. The results reported in Table 3 split the sample by new/old house, big/small house, high/low price, and big/small lot. Houses built within 4 years of the transaction date are defined as new. The remaining splits are at the median values for the variable defining the split.

We further report the results for the full sample and a sample restricted to properties that meet the laneway requirements and have lot width between 25 and 48 feet and length less than 148 feet.

Building a laneway house increases property value for a new house by 10 to 14.5 percent, depending on whether we use the full or restricted samples. These estimates are highly significant and robust. This magnitude is not particularly surprising, as the cost of building a laneway house is likely has similar magnitude (15 percent of $2 million is $300,000, not far from the incremental cost of building a laneway home rather than a garagehome rather than a garage). Therefore, adding a laneway to a new project covers the costs, but does not appear to generate large value increases beyond that.

Adding a laneway to an existing house does not appear to increase its value. In fact, this coefficient, as reported in Model (3), is negative. This is likely because homeowners add laneway houses to existing properties mostly for personal reasons - the need to house in-laws or generate some rental revenue. Owners who do that are unlikely to sell their property. Therefore, the transactions for old houses with new laneways that we do see are likely highly unusual and do not capture the true value enhancement of a laneway house. Adding a laneway to an existing home may also indicate low redevelopment option value, as it would likely not make sense to build a laneway home soon before rebuilding a property.

The sub-samples for big lot or high price do not generate significant coefficients on the impact of own laneway. The coefficients are actually quite small for high-priced properties, between 0.3 and 1.7 percent, depending on the exact sample used. This finding suggests that high-valued properties do not benefit from a laneway house. Most likely, the owners of high-value properties prefer the open space or larger garage and would rather not share their property with other tenants.

4.3 Impact of Neighbouring Laneway House

Next we focus on the impact of a neighboring laneway house as specified by Equation (3). In order to isolate the impact of a neighboring laneway house from the impact of a newly built neighboring property we limit the sample to properties with a newly built neighbor. We also limit the sample to properties with neighbors on both sides, thus eliminating corner lots or other unusual locations. Tables 4 and 5 provide the summary statistics of the sample of properties with a new neighbor. Table 4 reports the summary for properties with a newly built neighbor who built a laneway house, and Table 5 for properties with a newly built neighbor who did not. The two samples are very similar the characteristics of the properties that transacted.

Before we estimate Equation (3), it is important to establish that laneway homes are constructed at random among all newly built houses that are eligible for a laneway home. If laneway houses are systematically built in superior or inferior areas, then the parameter on neighboring laneway house may potentially be capturing this systematic difference in neighborhood quality rather than the impact of a laneway. We verify random assignemnt of laneway homes in two ways.

First, we estimate a predicted price for all new properties. This prediction model uses all available characteristics listed in the summary statistics tables, except for the garage-related variables. Since a 2-car garage and a laneway home are mutually exclusive, the garage variables almost perfectly predict the existance of a laneway home. The age-related variables are also excluded because we are focusing only on newly constructed properties. The predictive regression also include neighborhood effects, montly effects, and an interaction between neighborhood and year effects.

The predicted price is then used in a probit model to estimate the probability of having a laneway home. The predicted property price has no effect on the probability of having a laneway home, as reported in Table 6. We further estimate the probability of a laneway as a direct funciton of all physical characteristics. All variables that have predictive power are related to density of the property - numebr of bedrooms, availabilty of a rental suite, and number of stories. None of the other variables are significant in predicting the probability of a lanway, including the lot size.

Second, using data for the 2011 - 2016 period, we calculate the share of properties with laneway houses out of all newly built properties by census tract and by 5-digit postal code. We then include this share of laneway houses variable in a standard hedonic regression on all transactions prior to 2008, when laneway houses were not even discussed. If laneway houses are more likely to be built in a superior or inferior neighborhoods, than the post-2010 concentration variable would influence pre-2008 prices. We focus on the post-2010 concentrations because most laneways in our sample were built after 2010, reflecting the time it takes for property owners to take advantage of the newly permitted use (proposal development, approval, construction, and sale).

Table 7 reports the result of this random assignemnt check. Specifically, the concentration of laneway houses is small and not significant in explaining pre-2008 transaction prices for any of the definitions or sub-samples we use. In fact, the sign switches between positive and negative between specifications, just as one might expect if the assignment is random.

Given the above two results, random assignemnt of laneway homes among all newly constructed houses appears to be very likely. With this in mind, we estimate the impact of a neigboring laneway as proposed in Equation (3). Table 8 reports this result. The variable of primary interest is "New neighbor has a laneway." It captures the impact of a laneway that is built as part of a newly re-developed neighboring property. For the full sample the effect of a neighboring laneway house is small (1.8%) and not significant. The magnitude of the coefficient is double in specification (2), where the sample is confined to homes with hedonically fitted values greater than the mean.[5] This difference is not significant, and with the smaller sample size, we cannot reject the null hypothesis that there is zero impact even on more desirable homes. We find in specification (4), that homes on large lots are highly negatively and significantly impacted (-.112) by laneway homes.

These results suggest that in most cases building a laneway house does not generate a significant negative externality for the neighbors. However, it does generate significant and substantial negative externalities for properties located on bigger lots. We cannot reject sizeable negative effects, particularly for higher quality homes.

5 Conclusion

We explore the impact of the right to build a laneway home, and the impact of exercising that right on one's own property and one's immediate neighbors. Exercising the right in a newly built home generally means reducing the size of the garage. The announced right to build a laneway home appears to have had a briefly positive impact on prices around the announcement date in 2008. The extension of that right in 2013, however did not have a positive impact. The small impact of the right to build a laneway home matches two features of the data documented here. First, there has not been a rush to build laneway homes – fewer than 5% of homeowners granted this option have exercised. Second, building a laneway home appears to add roughly the same value to properties as it costs to build.

We find only a small and insignficant effect of building a laneway on neighboring property values. For neighbors with larger yards, perhaps more impacted by the unpleasantness of more people nearby, there is a significantly negative impact on price.

Given that the magnitude of our estimated effects is small, the results may be interpreted as casting doubt on the common "NIMBY" concern that neighbors will reduce

[5] We predict home value based on characteristics and split the sample on predicted value.

property values. On the other hand, laneways only introduce a small amount of density. Multiplying our point estimate of 1.3% by 10, we would find an economically meaningful impact of building a multiunit property adjacent to a given home.

6 References

Ahlfeldt, Gabriel M., Redding, Stephen J., Strum, Daniel M., and Nikolaus Wolf, 2015. The Economics Of Density: Evidence From The Berlin Wall. Econometrica. 83 (6), 21272189.

Brinkman, Jeffery C., 2016. Congestion, Agglomeration, and the Structure of Cities. Journal of Urban Economics. 94, 1331.

Clapp, J.M., Salavi, K., 2010. Hedonic pricing with redevelopment options: a new approach to estimating depreciation effects. Journal of Urban Economics 67, 362377.

Clapp, J.M., Bardos, K.S., Wong, S.K., 2012. Empirical estimation of the option premium for residential redevelopment. Regional Science and Urban Economics 42, 240256.

Crecine, Paul, Davis, A. and J. E. Jackson, 1967. Urban property markets: Some empirical results and their implication for municipal zoning. Journal of Law and Economics. 10, 79-99.

Diamond, R. and T. McQuade. 2016. Who Wants Affordable Housing in Their Backyard? An Equilibrium Analysis of Low- Income Property Development. Working Paper.

Dye, Richard F. and Daniel P. McMillen, 2007. Teardowns and Land Values in the Chicago Metropolitan Area. Journal of Urban Economics. 61 (1), 45-64.

Fischel, William A., 2001. The Homevoter Hypothesis: How Home Values Influence Local Government (Cambridge, MA: Harvard University Press.

Glaeser, Edward, and Joseph Gyourko, 2017. Economic Implications of Housing Supply. Wharton Zell/Lurie Working Paper #802.

Glaeser, Edward, Joseph Gyourko, and Raven Saks. 2005. Why is Manhattan so expensive?: Regulation and the rise in house prices. Journal of Law and Economics, 48(2):331370.

Grether, D. M. and P. Mieszkowski, 1980.. The Effects of Nonresidential Land Uses on the Prices of Adjacent Housing: Some Estimates of Proximity Effects. Journal of Urban Economics. 8, 1-15.

Hamilton, Bruce W. 1975. Zoning and property taxation in a system of local governments. Urban Studies, 12(2):205211.

Lucas, Robert E. and Enrico Rossi-Hansberg, 2002. On the internal structure of cities. Econometrica, 70 (4), 14451476.

Mark, Jonathan H. and Michael A. Goldberg, 1986. A Study of the Impacts of Zoning on Housing Values Over Time. Journal of Urban Economics. 20, 257-273.

Maser, S.M., Riker, W. H. and R. N. Rosett, 1977. The Effects of Zoning and Externalities on the Price of Land: An Empirical Analysis of Monroe County, New York. Journal of Law and Economics. 20, 111-132.

McMillen, Daniel, P. and Arthur OSullivan, 2013. Option Value and the Price of Teardown Properties. Journal of Urban Economics. 74, 107-129.

Moretti, Enricoand and Chang-Tai Hsei. 2017. Housing constraints and spatial misallocation chang-tai hsieh. Working paper, University of Chicago and NBER.

Rueter, F. H., 1973. Externalities in Urban Property Markets: An Empirical Test of the Zoning Ordinance of Pittsburgh. Journal of Law and Economics. 16, 315-350.

Sa, F. (2015). Immigration and House Prices in the UK. The Economic Journal, 125 (September), 1393-1424.

Sagalyn, Lynn B. and G. Stemlieb, 1972. Zoning and Housing Costs: The Impact of Land Use Controls on Housing Price. Center for Urban Policy Research, New Brunswick, NJ

Saiz, Albert, 2010. The Geographic Determinants of Housing Supply. Quarterly Journal of Economics. 1253-1296.

Saiz, A. and S. Wachter. (2011). Immigration and the neighborhood. American Economic Journal: Economic Policy, 3(2), 169-88.

Strange, William C., 1992. Overlapping neighborhoods and Housing Externalities. Journal of Urban Economics. 32, 17-39.

Stull, W.J., 1975. Community Environment, Zoning, and the Market Value of Single Family Homes. Journal of Law and Economics. 18, 535-557.

Turner, Matthew A., Andrew Haughwout, Wilbert van der Klaauw, 2014. Land Use Regulation and Welfare. Econometrica. 82 (4) 1341- 1403.

Wheaton, W.C., 1982. Urban residential growth under perfect foresight. Journal of Urban Economics 12, 121.

7 Figures and Tables

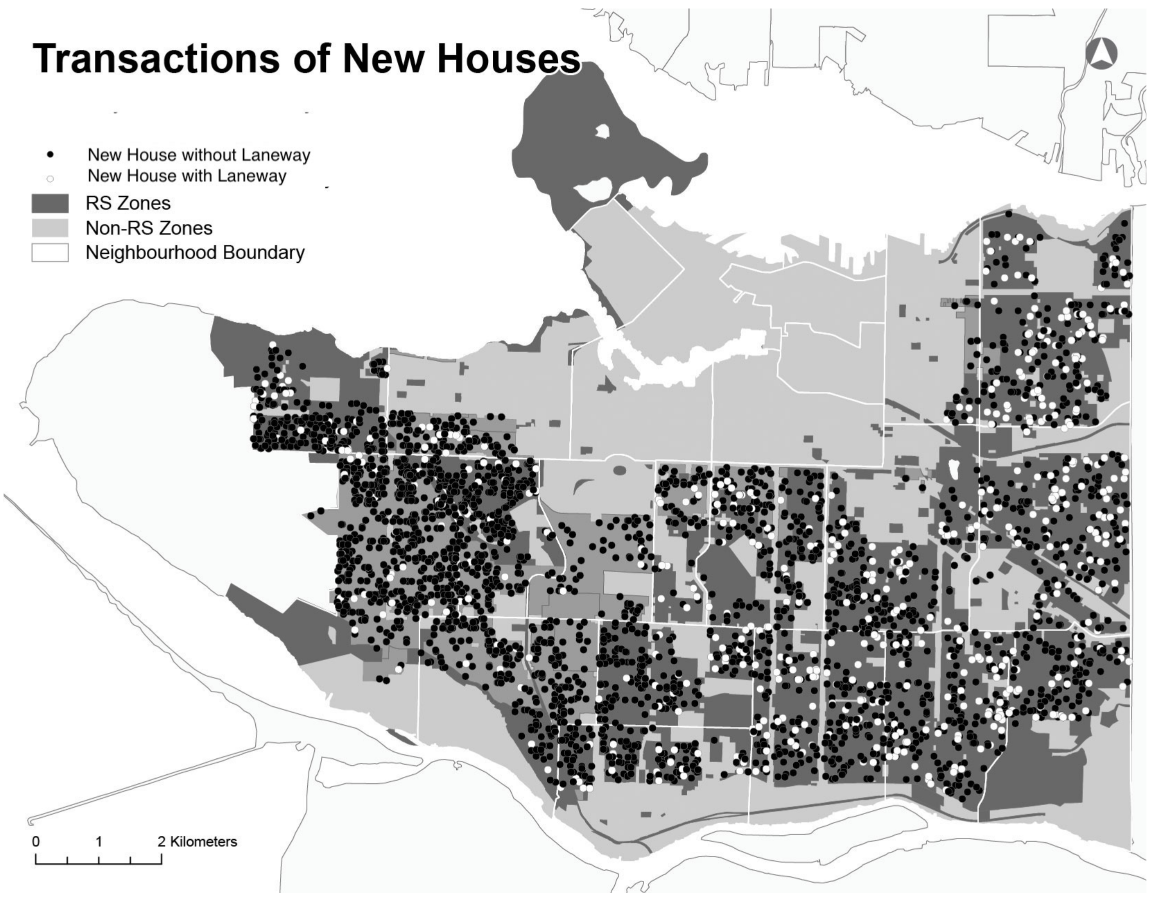

Fig. 1. Location of newly constructed houses.

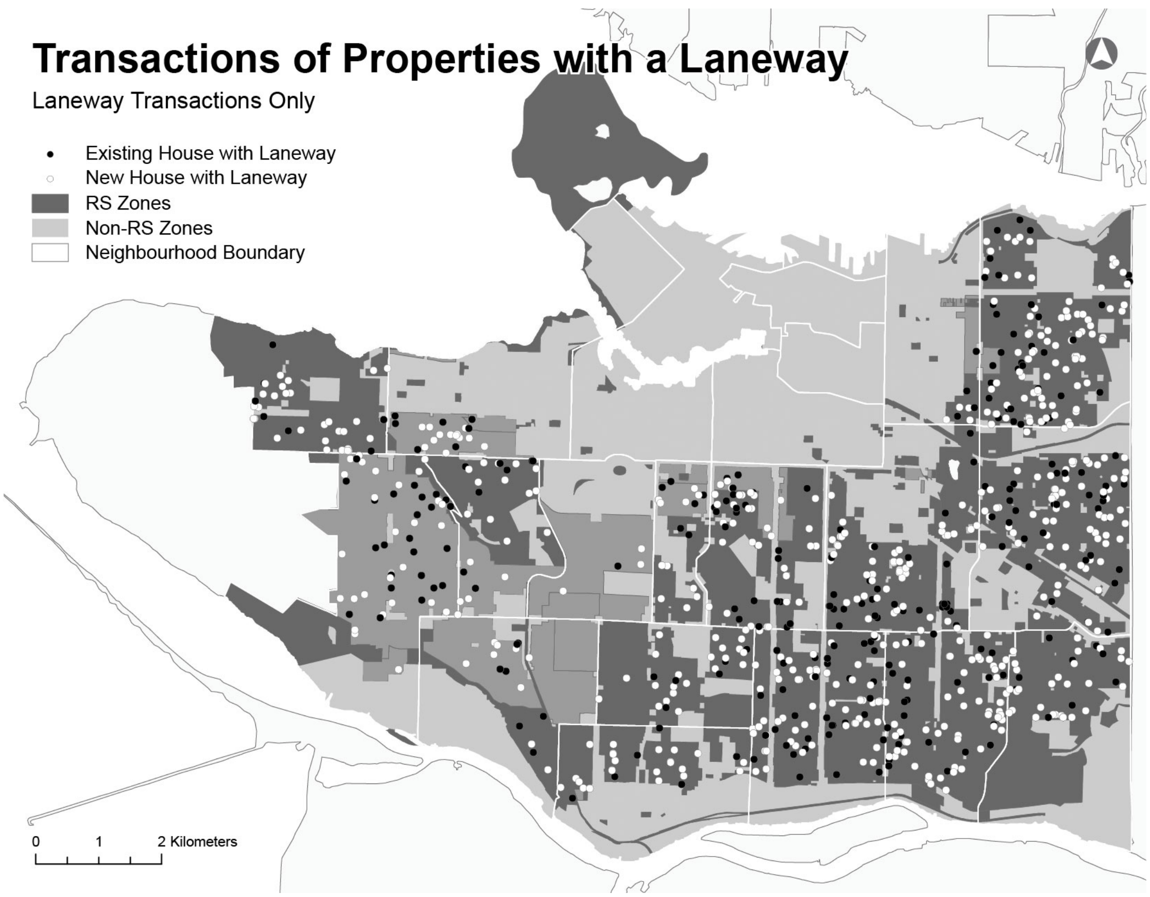

Fig. 2. Location of transactions that include a laneway.

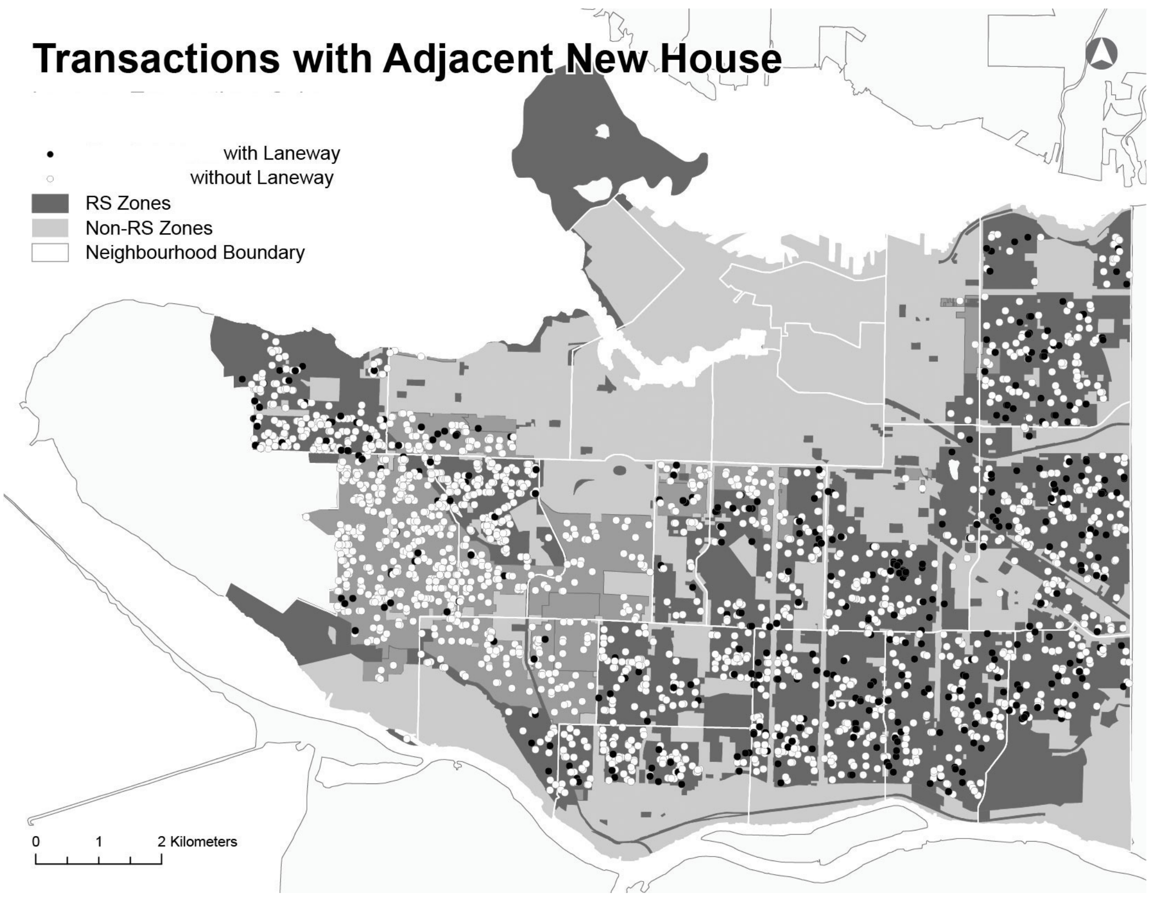

Fig. 3. Location of transactions that are adjecent to a new house.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
lnP	39,318.000	13.929	0.686	11.513	16.118
Dummy, =1 if parcel re-zoned for laneway July 28 2008	39,318.000	0.945	0.229	0.000	1.000
Dummy, =1 if parcel newly re-zoned for laneway July 2013	39,318.000	0.055	0.229	0.000	1.000
Property has a Laneway unit	39,318.000	0.030	0.171	0.000	1.000
Lot size 000sf	39,318.000	5.220	2.248	1.920	36.339
Lot size squared	39,318.000	32.302	44.773	3.686	1,320.523
Finished area 000sf	39,318.000	1.738	0.775	0.588	6.539
Finished area squared	39,318.000	3.620	3.546	0.346	42.759
Number of bedrooms	39,305.000	4.544	1.373	0.000	12.000
Number of bathrooms (full+half)	39,305.000	3.458	1.635	0.000	12.000
Dummy, =1 if land use is single family w/ suite	39,318.000	0.504	0.500	0.000	1.000
Number of stories	39,318.000	1.496	0.492	1.000	3.000
Dummy, =1 if has full basement	39,318.000	0.664	0.472	0.000	1.000
Less than 5 years old	39,318.000	0.148	0.355	0.000	1.000
Age - renovation adjusted	39,318.000	27.372	19.325	0.000	106.000
Age Squared	39,318.000	1,122.676	1,280.742	0.000	11,236.000
Had major renovation	39,318.000	0.466	0.499	0.000	1.000
Years since major renovation	39,037.000	28.340	19.762	0.000	106.000
Years since major renovation - Squared	39,037.000	1,193.693	1,333.053	0.000	11,236.000
Dummy, =1 if has single car garage	39,318.000	0.266	0.442	0.000	1.000
Dummy, =1 if has multi-car garage	39,318.000	0.553	0.497	0.000	1.000

Table 1
The table reports summary statistics of the full sample, including all controls used in all regressions.

VARIABLES	(1) 2007 falsification +/- 6 mos	(2) 2007 falsification +/- 12 mos	(3) 2008 rezoning +/- 6 mos	(4) 2008 rezoning +/- 12 mos	(5) 2013 rezoning +/- 6 mos	(6) 2013 rezoning +/- 12 mos
1.postJuly20071.laneAllow1_1	-0.007	-0.009				
	(-0.30)	(-0.48)				
1.postJuly20081.laneAllow1_1			0.058*	0.015		
			(1.80)	(0.80)		
1.postJuly20131.laneAllow2_1					0.025	0.028
					(0.56)	(0.70)
Observations	4,436	6,797	3,247	7,583	3,793	7,458
R-squared	0.614	0.609	0.592	0.623	0.717	0.719
Neighborhood/time effects + controls	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2

The table reports the estimation of Equation (1) for the 2008 and 2013 announcements based on zone classification as well as a falsification test for July, 2007. The coefficient on the on the interaction term post-July 2008 X laneAllow1 and post-July 2013 X laneAllow2 report the announcement effect on properties with zoning that allowed laneway houses as of July, 2008 and July, 2013, respectivelly. The interaction term is large and marginally significant at +/- 6 months of the 2008 announcement, but becomes smaller and not significant for longer estimation windows or for the 2013 annoucement.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Full Sample	Restricted Sample	Full Sample	Restricted Sample	Full Sample	Restricted Sample
	Full Sample	Restricted Sample		New	New	New	New	New	New
VARIABLES	New House	New House	Old House	Big House	Big House	High Price	High Price	Big Lot	Big Lot
1.haslaneway	0.110***	0.144***	-0.030	0.137**	0.112	0.031	-0.018	0.094	-0.055
	(2.92)	(2.74)	(-0.97)	(2.28)	(1.53)	(0.34)	(-0.19)	(1.04)	(-0.46)
Observations	4,549	2,746	26,398	3,583	1,989	2,241	933	2,231	688
R-squared	0.822	0.797	0.714	0.804	0.797	0.635	0.624	0.804	0.849
Neighborhood/time effects + controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3

The table reports the impact of having a laneway unit using Equation (2) We report the estimates for the full sample and a sample restricted to properties that meet the laneway requirements and have lot width between 25 and 48 feet and length less than 148 feet. We further break down the sample by age and by house size, lot size, and transaction price (above and below median). The presence of a laneway unit is positive and significant for all new houses, and for big new houses. However, it is NOT significant for expensive houses or houses on big lots.

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Lot size 000sf	339.000	4.747	1.657	2.750	27.080
Finished area 000sf	339.000	1.554	0.608	0.648	4.041
Number of bedrooms	338.000	4.701	1.559	2.000	10.000
Number of stories	339.000	1.462	0.473	1.000	2.000
Dummy, =1 if has full basement	339.000	0.743	0.437	0.000	1.000
Dummy, =1 if has multi-car garage	339.000	0.454	0.499	0.000	1.000
Dummy, =1 if has single car garage	339.000	0.327	0.470	0.000	1.000
Dummy, =1 if land use is single family w/ suite	339.000	0.596	0.491	0.000	1.000
Property has a Laneway unit	339.000	0.112	0.316	0.000	1.000
Dummy, =1 if parcel re-zoned for laneway July 28 2008	339.000	0.979	0.142	0.000	1.000
Dummy, =1 if parcel newly re-zoned for laneway July 2013	339.000	0.021	0.142	0.000	1.000
lnP	339.000	14.087	0.541	12.182	15.409
Number of bathrooms (full+half)	338.000	3.444	1.720	1.000	12.000
Age - renovation adjusted	339.000	31.112	22.399	0.000	77.000
Years since major renovation	334.000	33.404	22.928	0.000	84.000
Age Squared	339.000	1,468.192	1,535.708	0.000	5,929.000
Less than 5 years old	339.000	0.192	0.394	0.000	1.000
Lot size squared	339.000	25.271	40.617	7.562	733.326
Finished area squared	339.000	2.782	2.250	0.420	16.330
Had major renovation	339.000	0.383	0.487	0.000	1.000
Years since major renovation - Squared	334.000	1,639.973	1,643.883	0.000	7,056.000

Table 4
The table reports the summary statistics for transactions with a newly built neighbor with a laneway.

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Lot size 000sf	1,157.000	5.361	2.284	2.011	36.339
Finished area 000sf	1,157.000	1.902	0.747	0.663	6.198
Number of bedrooms	1,156.000	4.614	1.416	1.000	10.000
Number of stories	1,157.000	1.670	0.464	1.000	3.000
Dummy, =1 if has full basement	1,157.000	0.659	0.474	0.000	1.000
Dummy, =1 if has multi-car garage	1,157.000	0.603	0.489	0.000	1.000
Dummy, =1 if has single car garage	1,157.000	0.241	0.428	0.000	1.000
Dummy, =1 if land use is single family w/ suite	1,157.000	0.456	0.498	0.000	1.000
Property has a Laneway unit	1,157.000	0.041	0.199	0.000	1.000
Dummy, =1 if parcel re-zoned for laneway July 28 2008	1,157.000	0.941	0.235	0.000	1.000
Dummy, =1 if parcel newly re-zoned for laneway July 2013	1,157.000	0.059	0.235	0.000	1.000
lnP	1,157.000	14.378	0.646	12.206	15.999
Number of bathrooms (full+half)	1,156.000	3.983	1.815	1.000	9.000
Age - renovation adjusted	1,157.000	24.529	21.699	0.000	100.000
Years since major renovation	1,150.000	26.346	22.668	0.000	100.000
Age Squared	1,157.000	1,072.126	1,407.415	0.000	10,000.000
Less than 5 years old	1,157.000	0.296	0.457	0.000	1.000
Lot size squared	1,157.000	33.953	54.043	4.044	1,320.523
Finished area squared	1,157.000	4.175	3.446	0.440	38.415
Had major renovation	1,157.000	0.449	0.498	0.000	1.000
Years since major renovation - Squared	1,150.000	1,207.503	1,521.489	0.000	10,000.000

Table 5
The table reports the summary statistics for transactions with a newly built neighbor without a laneway.

VARIABLES	LABELS	(1) Has Laneway	(2) Has Laneway
lotsize	Lot size 000sf		0.219
			(1.29)
lotsize2	Lot size squared		-0.013
			(-1.23)
floorarea	Finished area 000sf		-0.532
			(-0.85)
floorarea2	Finished area squared		0.059
			(0.44)
bedrooms	Number of bedrooms		0.135***
			(3.89)
baths	Number of bathrooms (full+half)		0.090*
			(1.88)
suite	Dummy, =1 if land use is single family w/ suite		0.462***
			(3.12)
stories	Number of stories		0.956***
			(4.87)
base_full	Dummy, =1 if has full basement		0.145
			(1.16)
lnPhat	Predicted log-Price	0.061	
		(0.27)	
Observations		2,912	2,912
Neighborhood/time effects		Yes	Yes

Robust z-statistics in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6

The table reports the probability of having a laneway as a function of the predicted transaction price as estimated by a probit regression. The sample is restricted to new houses (less than 4 years old) that are eligible for a laneway house. The predicted transaction price is based on a model that includes all controls listed in the summary statistics tables except the age-related and garage-related variables. The age-related variables are not included because the sample is restricted to new houses, and the garage-related variables are not included because they are direclty correlated with a laneway house. The predicted transaction price is not a significant predictor of the probability of having a laneway in any of the samples we report.

VARIABLES	(1) Tract	(2) Tract	(3) 5-digit code	(4) 5-digit code	(5) High Price	(6) Big House	(7) Big Lot	(8) New House
Share of new w laneway out of all new	0.055	0.050						
	(0.83)	(0.98)						
Share of new w laneway out of all new			0.035	0.022	-0.018	0.043	0.030	0.004
			(1.15)	(1.16)	(-0.57)	(1.29)	(1.06)	(0.07)
Observations	8,585	8,548	8,450	8,414	919	3,562	4,484	1,383
R-squared	0.495	0.613	0.496	0.618	0.538	0.537	0.627	0.708
Neighborhood/time effects	Yes		Yes					
Neighborhood/time effects + controls		Yes		Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7

This table verifires the random assignemnt of laneway houses among all newly built properties. We first compute the share of new houses with laneways out of all new houses built in the 2011 - 2016 period by census tract and by 5-digit postal code. We then include these shares in hedonic regressions for all single family transactions prior to 2010. If laneways are systematically built on superior or inferior properties, the share of laneway houses would have a significnat impact on pre-2010 transaciton prices. Instead, the share of new houses with laneways out of all post 2010 new houses has no explanatory power in any of the model specifications we considered. We interpret this result as evidence that laneway houses are randomly assigned among all new houses.

VARIABLES	(1) Full sample	(2) High predicted price	(3) Very High predicted price	(4) Big house	(5) Big lot	(6) New house
New neighbor has laneway	-0.018	-0.065	-0.143**	-0.009	-0.112**	-0.002
	(-0.70)	(-1.53)	(-2.46)	(-0.21)	(-2.28)	(-0.04)
Observations	1,483	743	487	753	730	401
R-squared	0.788	0.621	0.598	0.755	0.780	0.878
Neighborhood/time effects + controls	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8
The table reports the estimation of Equation (3) only for transactions with a newly built neighbor. We break down the sample by predicted price, house size, lot size, and age of house. The results in the full sample indicate no singificnat negative ipact of a neighboring laneway house. The coefficient is negative but small and relatively precisely estimted, allowing us to rule out a large negative effect. The coefficient for higher-priced properties is much more negative and not precisely estimated, indicating that we cannot rule out large negative impact on higher-valued properties. The coefficient for big lots is highly negative and significant, indicating that large properties suffer a significnat negative impact form a neighboring laneway.