Joel Robitaille
B00200522
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Assignment #10 – Final Draft
The Effect of Proximity to Universities on Housing Prices in Peninsula Halifax
Prepared for
Christos Ntantamis
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Abstract

This paper examines the connection between proximity to universities and the value of dwellings in the Halifax peninsula. To assess this relationship data on physical and location characteristics of dwellings in the study area are collected, and a regression of dwelling values against these characteristics is conducted. The study finds that there is a significant and substantial positive relationship between proximity to universities and housing values in the study area.

Keywords: housing prices, location, university

JEL Numbers: R21, D12

1. Introduction

The theory of urban location, which predict higher demand and housing cost with respect to proximity to job centers as consumers attempt to minimize their total location costs is well established by Alonso (1960) and Evans (1973) and it has been studied in a number of settings. In most of these studies the central business district is taken as the job centre of choice. In spite of the fact that universities in many ways function in a similar manner, there is far less consideration given to how they act as economic focal points and their effect on property values of surrounding areas. This paper seeks to answer the question of what is the connection between proximity to universities and the value of dwellings by examining the Halifax peninsula. The results contribute to understanding the distribution of dwelling values in Halifax, and other communities with large universities. The results can also give clues as to how significant the factors that drive the importance of proximity to a university are to the determination of housing values. A large positive relationship between proximity and dwelling values may also be an indication of a supply imbalance in areas surrounding universities.

One approach to assess this relationship is to collect data on the average dwelling values of neighbourhoods for which statistical information is maintained, such as census tracts, and conduct a simple regression of these values against the estimated distances to the nearest university. The drawback of this approach is that it does not allow for control of variations in individual housing characteristics, such as dwelling size. Therefore, this type of analysis is of limited analytical use. To overcome this issue this research collects microdata on the values and characteristics of all individual dwellings in the study area. This research design allows for an examination of the effect of changes in the distance to the nearest university, while controlling for variation in other dwelling characteristics.

This paper will survey the existing literature on location based housing valuation, and describe in detail the conceptual framework of the factors at play in the housing market. The paper will then describe how the relationship between the key variables is observed and the sources of microdata that are used in the hedonic regression, and then present the findings. The conclusion will tie together the outcome of this analysis and present some suggestions for further study.

2. Background and related literature

The basic theory of housing valuation as summarized by Glaser (2007) states that the value of a dwelling like any other product is related to a series of characteristics that determine its desirability to a potential consumer. Since housing is often an investment product, a speculation premium is also added to its price (Sun, Zheng and Wang 2015). Glaser (2007) elaborates that, all other things being equal, including geographical features and housing size, the primary driver of housing demand is distance to the center of employment as potential residents attempt to minimize their total location costs as is also suggested by Alonso (1960) and Evans (1973).

A complete model of housing prices incorporates a large range of dwelling characteristics, which are split into the physical characteristics, such as, square feet of living space, number of bathrooms and connection to city services; and location based characteristics, such as proximity to parks or elementary schools, and distance to the economic activity center (Do-Yeun 2009).

Do-Yeun (2009) identifies a number of empirical studies that have been completed to assess the impact of proximity to location based amenities, such as elementary schools (Jud

1985), parks (Weicher 1973), and other assets on housing value. In almost all cases, a positive relation between proximity and price is identified which shows that the value that these amenities provide is reflected in prices.

A common approach used to assess the contributions of various characteristics to housing value is the hedonic model, which is described in detail in Rosen (1974). In a hedonic regression one gathers product price information for various versions of a product where the component characteristics differ and then regresses the values against the characteristics to isolate how each characteristic contributes to product value. In this research paper, distance to the nearest university is the product characteristic that is isolated through a hedonic regression

There have been several studies conducted on the relation of the proximity to the central business district and housing values, some of which used a hedonic model, which are surveyed by Glaeser (2007). The majority of these identified positive relationships between values and proximity but Glaesar (2007) notes that in some case the relationship was complicated by the existence of other factors determining value, and in some cases the studies were limited by methodological constraints.

To my knowledge, literature regarding the impact of proximity to a university as an economic focal point, is very limited. De-Yeun (2009), who examines the effects of proximity to Purdue University on apartment rents, is one of the primary authors to have studied this. In the result of his regression analysis he shows a significant and substantial relationship between proximity and apartment rents. This paper differs from De-Yeun's study in that I wish to study the effect on housing prices as opposed to rents. In general, I hope to find whether the pattern identified by De-Yeun repeats itself in housing prices in the neighbourhoods surrounding the universities in peninsula Halifax.

3. Conceptual framework

The justification for including proximity to a university as a characteristic that is expected to drive value is based on a model that supposes four things. The first is that housing demand increases as one moves closer to an economic focal point. The second is that due to the finite quantity of land at a given location, increasing per unit costs of construction on a fixed parcel of land (Evans 1973), and planning regulation, the supply of housing at a fixed location is inelastic to price in both the short-run and the long-run. This means that the presence of elevated demand translates in the market mostly through higher prices for housing services. The third is that in addition to impacting the market directly through higher dwelling prices, higher demand also impacts prices indirectly through higher rents, which increase the income a property can earn and increases the asset value of any dwelling which can be converted into an income property. The fourth is that the universities in Halifax's south end act as economics focal points, and that the population who attend them generate increased demand for housing at proximity to the universities. The first three suppositions are well supported by established economic theory and evidence. The fourth is a permutation of the economic theory urban location, where the economic focal is a university rather than a central business district.

The first point is related to the economic theory of urban location, as described by Evans (1977), which states that the determination of a consumer's location preference is based on minimizing his total location costs. Total location costs consist of two parts: actual housing cost - the rent, or mortgage for a given dwelling - and the travel to an individual's daily activity centre. Travel costs are further split into direct travel costs, such as gas and car ownership, and time travel costs of the amount of time spent commuting. Although a large part of the population being considered here are students, for students making their own accommodations decisions and

attending school full time, proximity to the university campus occupies a similar importance in the cost minimization decision as it does for the employed in relation to their place of work. It is a location that the individual must commute to on a daily basis. In some regards it could be argued that the importance of commuting for a student is higher because the structure of many students' class schedule make it optimal to commute back and forth multiple times per day. Because of this commuting costs are at least as significant a consideration to the university population in assessing total location cost.

In its simplest form the location preference model developed by Alonso (1960) presupposes that all individuals in a city work in one central location and that direct and indirect transportation costs increase as one moves away from this location. While the extreme assumption of a monocentric distribution of employment is not representative of reality, it is a good jumping off point for a model since concentrations employment continue to exist at the downtown core. In the literature Alonso (1960) and later Evans (1973) acknowledge the possibility of multiple centres of employment affecting the distribution of demand, and incorporating these into the model, the main requirement being that each centre included has an employment population of a certain size. Although they are often not regarded as economic centres when one looks into the populations in many ways universities fit the bill. Based on official number published by the Association of Atlantic Universities there were 23,134 full time students enrolled in 2016-17 at Dalhousie University's Halifax campuses and Saint Mary's

	Dal	Saint Mary's	Total
Full-time students	16,761	6,373	23,134
Staff	6,698	1,039	7,737
Total	23,459	7,412	30,871

Figure 1: Full–time student in 2016-17 and staff for Dalhousie University's Halifax campuses and Saint Mary's University

University. Info from the websites of Dalhousie and Saint Mary's states that there are also 7,737

current staff members between the two institutions. These student and staff populations represent a substantial concentration of people commuting to these destination in the south end on a daily basis compared to the total population of the peninsula of around 65,000.

The next question is how important is it for university students and staff to live close to campus or how much does rental demand increase for this population as one moves closer to the university. There are a number of reasons why the advantages to being close to campus may greater for students than the advantages for the average person on being close to their place of work. One is that students attending urban universities are generally considered to have lower car ownership rates than the general population, making their commuting more expensive in terms of time. In a 2014 study of 'Travel Behaviour of Dalhousie Commuters' DalTRAC (2015) found that of the 709 student respondents only 11.9% drove to school as their primary mode of transportation. The same study showed that 34% of all respondents and 51.3% of students walked to school as their primary form of transit. This is a commuting pattern that relies much more heavily on short distance transportation methods than the average for metropolitan areas. Another reason why proximity may be of particular value to student is that there are social and academic environmental benefits to being on or near to the campus community. A large amounts of student social, extracurricular and after-class studying activities are focused on campus, in a way that a working person's after work activities are not focused in the areas around their job site. There are increased costs in terms of time or forgoing these activities for students living farther away from campus. Kuh et al (2001) find that students living on or near campus score higher on a host of success indicators including engagement compared to those who commute from long distances. It is my contention that many students realize this and that it is another factor that drives demand for being closer to the university campus. There are several reason why

there would be higher housing demand near universities for Dalhousie and St. Mary's approximately 30,800 students, staff and faculty. In particular, for students because of the concentration of after-school activities on or near campus there are reasons to believe that the value of being close to campus is elevated compared to the standard situation of a commuter wanting to be near their job.

There is some concrete evidence that students and staff do have a tendency to live closer to campus in support of these prediction. The following map showing the locations of student and staff respondents to DalTRAC's 2010 Dalhousie Commuter Survey shows a concentration of respondent living in the 2km buffer surrounding the university, with elevated concentration in

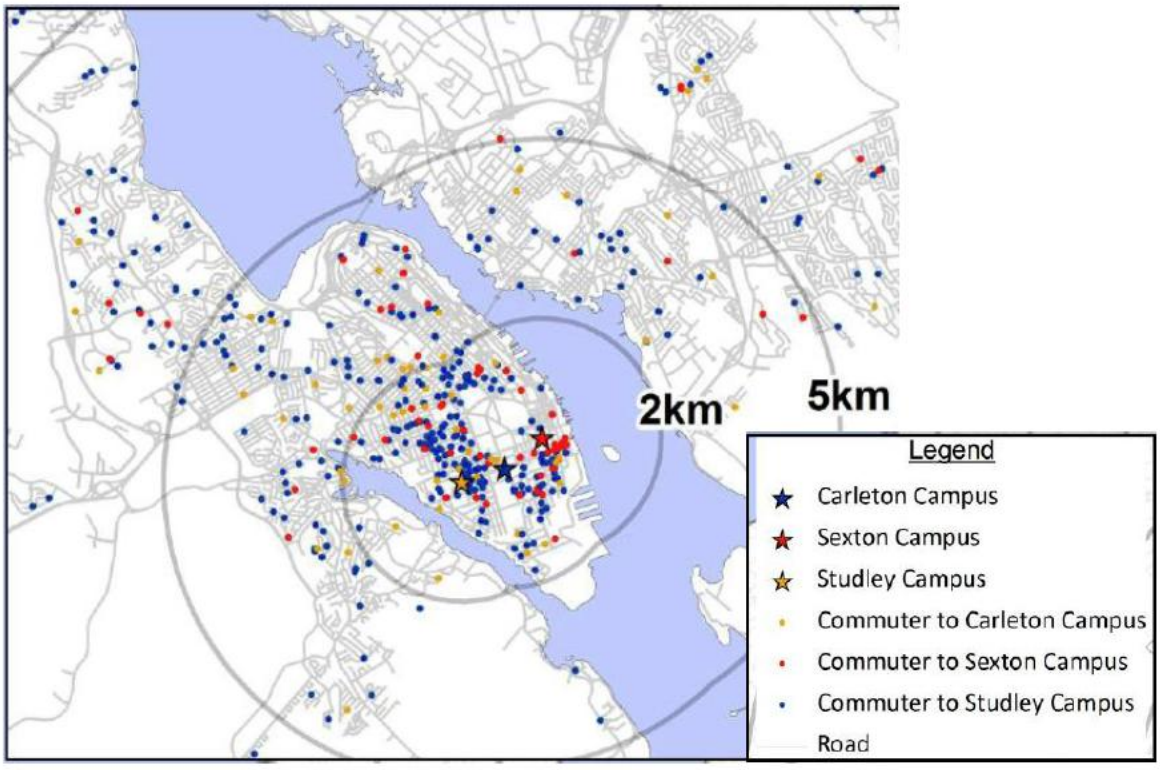

Figure 2. Source: 2012 Dalhousie Transportation Demand Management Plan

specific neighbourhoods near the universities. The more current 2014 Dalhousie Commuter Survey (DalTRAC, 2014) reports that 47.1% of 719 student respondents lived within 2km of

their campus. It also reports that 71.5% of students, 46.9% of faculty but only 23.7% of staff lived within 5km of their campus. This both shows that a high proportion of students and faculty choose to live close to campus and highlights the idea that there is an increased propensity to live near campus for students and faculty who have extracurricular activities on campus compared to staff.

One thing that could influence this relationship would be if there were location based factors correlated with proximity to the economic focal point which were also negatively (or positively) correlated with housing desirability. A classic example is a concentration of industrial activity, where its presence makes neighbourhoods less desirable to many potential residents. In the study area there are not many areas for which this would be a factor. One possible exception is the small pocket in the eastern portion of the south end where some vestiges of the port based industrial activity remain.

Another important factor and potential serious omission from this study is the consideration of proximity to positive amenities, in particular large parks, and possibly primary through grade twelve schools. Upon reflection I have noticed that there is a concentration of high value dwellings in the areas surrounding Point Pleasant Park on the southern tip of the peninsula. Because this is close enough to universities, in particular Saint Mary's, it could be that for some houses proximity to the park is a factor driving values and that this upwardly biases the estimate of the effect of proximity to a university. Weicher (1973) found evidence that parks do drive housing values, so in further studies it would be beneficial to include a variable for proximity to major parks. Finally, some may suggest that proximity to the waterfront is an important variable to include in a model of housing prices especially in a study area like the peninsula of Halifax where a large amount of properties are on, or near to, the waterfront. While there is good reason

to believe that proximity to the shoreline increases dwelling values I believe that failing to include it in the model is not a critical omission for this study. The reason is that none of the peninsula universities are located on the coast – they are all in-land - and therefor exclusion of proximity to the waterfront should not upwardly bias estimates of the effect of proximity to universities on dwelling values.

In summary there are a number of location based characteristics other than proximity to a university or proximity to the central business district that are expected to influence dwelling value and whose inclusion could improve the model. However, since none of these location features are completely collinear with proximity to universities and the direction of the effects are not all the same it is believed that dis-including them should not affect the general valiadity of the findings in respect to the effect of proximity to universities on dwelling values. I would also propose that such neighbourhood characteristics are not as important to the student population as proximity to the university and therefor have a limited effect on the housing demand of the population who commute to the unviersity.

The second major assumption of the model relates to the translation of the predicted higher demand into higher housing prices. There are two mechanisms through which higher prices could attain. The first obvious method is that in the market for home owners buyers with a desire to be closer to the university would have higher bids for houses and drive up prices with respect to proximity to universities. This would most likely take the form of faculty members, and possibly some staff member, who would like to be close to the university. The second, less obvious but probably more important way in which this demand drives prices is through student rental demand for apartments near universities. Higher demand would bid up rent prices near universities, which is exactly what Do-Yeun (2009a) found in his study of rent prices in Layfette

with respect to proximity to Purdue University. In so far as they are an income stream, higher rent prices should increases the assets value of homes that are rented or have been converted into multiple rental units. In spite of hesitancy among some writers, there has been a broad consensus among those studying the connection between rents and housing prices, including Campbell (2009), Clark (1995) and Meese and Wallace (1994), that in the long run housing prices reconcile to rents based on a dynamic Gordon growth model, which assess housing value as the present value of future rents, including expected rental growth and allowing for changes in the discount rate. A short walk through the Halifax's south-end will show you that once private dwellings that have been converted in income rental apartments are ubiquitous. In theory elevated rents should lead to elevated values for income properties but they should also have an upward influence on the value of private dwellings. This is because the markets are not separate in that any private dwelling can theoretically be converted into an income property. In this regard the asset values of income properties minus conversion costs set a floor for the value of private dwellings in the same area.

One of the final supposition of the model, and an important one, is that supply is restricted due to a finite amount of land available at any given distance from the universities, increasing per unit development costs on fixed amount of land and in particular restrictions on adding supply in the form of municipal planning regulations, which can prohibit certain scales of development in certain residential neighbourhoods. What this means is that increased prices does not yet a full scale supply response and therefor evaluated demand translates through in the form of increased prices by bidding up the existing housing stock.

To summarise the conceptual framework: proximity to universities is expected to be related to higher dwelling values based on a model in which students and employees generate

increased demand related to proximity to universities. Coupled with inelastic supply of housing in the fixed areas that are close to universities this is expected to increase housing prices directly through the owner-occupier market and indirectly though elevated rents in the areas surrounding universities, which is in turn expected to increase the asset value of such dwellings. These elevated asset values are expected to drive both the income and owner-occupier markets by setting a base-line for valuation of similar properties. This process will not be observed directly, but the expected outcome of higher prices can be observed by recovering the implicit price of proximity to a university through conducting a hedonic regression of prices against dwelling characteristics.

3.1 Empirical Method

The relationship between the distance a university and dwelling value will be estimated by comparing the prices of like dwellings while varying the distance to the university and holding other characteristics constant. This will be done by conducting a hedonic regression of housing prices on the network distance to the nearest university and other dwelling characteristics. For this to be effective it will be important to be able to compare dwelling that are alike in almost all regards except their distance to a university. In order to allow for this the research design includes variables for number of bedrooms, number of washrooms, square footage of total dwelling / number of bedrooms, which is intended to be a measure of spaciousness, dummy variables for construction quality, the inclusion of a garage and the inclusion of a finished basement, and a second location variable for distance to the city center. The inclusion of these additional regressor should allow this research to isolate the effect of proximity to universities on housing values while controlling for other factors.

The study will separate and exclude large apartment buildings. The reason for this is that there cannot be an effective comparison between large apartment buildings owned by real-estate corporation and individual dwellings that can be owned by individuals.

4. Data Sources

Microdata on the value of individual dwellings in the study area comes from Property Value Services Corporation (PSVC), the official property assessment organisation for Nova Scotia.[1] The data is for the 2016 assessed value of dwellings which is meant to be a representation of market value arrived at by taking an average recent sales prices in the neighbouring area and adjusting for dwelling specific characteristics. It is important to distinguish this from the "capped assessment value", which is what tax bills are based on, and is not necessarily based on market value. To determine the fidelity of the assessed values as a representation of market values a preliminary assessment of 2016 assessed value compared to the actual sales values, using 2016 sales data from PVSC, found that on average assessments were relatively close to sales values, at approximately $18,000 above.

In addition to assessed values, the PVSC also has data on a number of dwelling characteristics including number of bedrooms, number of bathrooms, square feet of living space, construction quality, and the existence of a garage or a finished basement. These data on physical housing characteristics were collected and windowed to the study area and are matched to predictor variables that are expected to contribute to the dwelling value.

[1] PVSC recently released the records for all residential dwellings in Nova Scotia to the public as part of an open data initiative. The data can be accessed at www.datazone.ca.

For the location variables, data of the network distance of each dwelling in the study area to the nearest major university were calculated in ARCGIS using the geographic location of each civic address, a road-network layer and the network analyst tool. This gives the distance in metres to the nearest campus. Distances were calculated to center point of the campus, while applying a reduced cost layer to the campus border whereby after crossing the campus border distances were added at 10% of the their actual amount. This has the effect of making all dwellings on campus at close to zero distance from the university. A similar calculation was done for the distance to the central business district, where distance where calculated to city hall with a reduced cost layer surrounding the downtown core and 30% cost for distances within the core.

4.2. Research Design

To answer the research question of whether there is a statistically significant positive relationship between the proximity of dwellings to a university and their value, this study gathers the above mentioned micro-data for all residential dwellings in the study area of the peninsula of Halifax and maps them to variables that are expected to contribute to a dwelling's value. The analysis regresses the assessed value of the dwellings against the predictor of interest, the distance to a university, and the other physical and location characteristic of the dwellings.

The full regression model is:

$$\log(V \quad o \quad D \quad _i) = \beta_0 + \beta_1 D \quad t_i \; N \quad U \quad _i + \beta_2 D \quad t_i \; C \quad _i + \beta_3 \frac{S \; . F \; . D \quad S_i}{N \quad B_i} + \beta_4 N \quad o \; B \; d_i \quad _i + \beta_5 N \quad o \; B \; hr_i \quad _i + \beta_6 F \quad Q \quad D_i + \beta_7 G \quad Q \quad D_i \quad _i + \beta_8 V \quad G \quad Q \quad D_i \quad _i + \beta_1 \; G \quad D_i \quad _i + u_i$$

Where, i = 1,…,n and consists of residential properties in the study area.

The physical characteristics used are: number of bedrooms, number of bathrooms, a measure of spaciousness created by dividing square feet of living space by the number of bedrooms, dummy variables for the professional assessment of construction quality, a dummy variable for whether the dwelling includes a garage and a dummy variable for the presence of a finished basement. Location characteristic variables included are: the network distance to the nearest university campus, and the network distance to the central business district in metres. Summary statistics of these variable are presented in Table 1.

At the core this is a hedonic regression, which seeks to isolate the market value of various characteristics of a product – in this case housing - by regressing the price of versions of the product against variation in its characteristics.

5. Preliminary Results

In all iterations of the regression *Distance to Nearest University* is significant at the 99% confidence level and appears to be one of the primary drivers of housing values. In the basic univariate regression the estimated average change in housing value related to being 1km closer to a university is $64,840. It should be noted that the co-efficients for *Distance to University* in the regression results in Table 2 are negative, which is the opposite of the way they are being discussed here. The regression results table co-efficient has the literal interpretation of being the decrease in value as one moves away from the nearest university, but for the sake of day-to-day interpretation I present the results as the increase in value as one moves closer.

Because proximity to the downtown core is predicted to be positively related to housing values and in Halifax the distance to the downtown core is fairly collinear with distance to

universities urban location theory suggests that the first step in adding detail to model should be to add a regressor for the distance to the central business district. In a surprising result, in the bivariate regression in Model 2 the estimated effect of being closer to downtown core is negative for the Halifax peninsula. Average values decrease by $73,490 for every 1 km one moves closer to the core. It turns out, the initial exclusion of the distance to the central business district actually negatively biased the estimate for the effect of proximity to universities. In Model 2 average dwelling values increases by $109,770 for every 1 km meters closer to the nearest university. The negative relationship between price and proximity to the central business district has some valid economic interpretation if we consider the size of the study area. For a study area as small as the peninsula of Halifax, which has a maximum distance from the central business district of 5.2km, it could be said that for the purposes commuting to work once a day or going to the downtown core occasionally for amenities, all locations in the peninsula are effectively "close" to the downtown core. Thus it could be the case that while there is a value to being within a certain proximity of the downtown for the average peninsula resident, people also prefer to be in neighbourhoods slightly removed from the business of the downtown core. A previous study of average housing values for census tracts in Halifax Regional Municipality (Robitaille, 2016) finds this to be true. For locations greater than two kilometres from the downtown core the gradient of housing prices increases with proximity, for locations less than 2 kilometres away the relationship is less clear and essentially reversed.

To further refine the validity of the estimate, data for other physical characteristics that are expected to be crucial to determining the value of a dwelling a added to the regression. Model 3 includes variables for number of bedroom, number of bathrooms, spaciousness, and dummy variables for construction quality, and whether the property has a garage or a finished

basement. In Model 3 average housing values increase by $81,980 for every 1 km closer to a university. As expected the estimate of the effect of proximity to universities on dwelling values was slightly lower when controlling for physical characteristics. It was expected to be lower because of the elevated concertation of larger size dwelling in the south end neighbourhoods surrounding universities as compared to the rest of the peninsula. What is surprising is that after controlling for these factors the estimate remains so large in magnitude. After controlling for physical attributes of the dwelling and the distance to the downtown there remains a large magnitude, statistically significant relationship between proximity to unviersities and dwelling values. This finding is significant at the 99% level, with a standard error of only $920 per km.

Other determinants:

Many of the other characteristic variables are also shown to be strong predictors of dwelling values. Increasing the number of bedrooms by one increases average dwelling value by $26,580 (Model 3) or approximately 6.1% (Model 4). Similarly, an increase in the number of bathrooms by one is related to an increase in average values of $28,840. Compared to the effect of moving 1 km closer to a university these are surprisingly small effects. To add value equivalent to the average increase related to being 1 km closer to a university one would have to add three bedrooms or three bathrooms. This shows that, on average, housing consumers on the peninsula value location amenities much more than increases number of bedrooms.

The measure of spaciousness, defined as square feet / number of bedrooms is also substantial driver of dwelling values, with an increase in spaciousness of 100 square feet per bedroom being related to a $19,067 increase in average dwelling values. This estimate, as well as those for number of bedrooms and number of bathrooms, are all significant at the 99%

confidence level. These show that the basic variables relating to housing size play an important role in determining housing value in addition to other factors.

The R squared for the regression in Model 3 is 0.759, which shows the model explains a large amount of the variation in housing values across the peninsula. The magnitude and significance of the estimate for the effect of proximity to the nearest university establishes that this is a significant relationship in the peninsula of Halifax.

Model 4 converts the response variable into the natural logarithm of itself, which is done because this better models the way changes in characteristics relate to housing values. This gives the coefficients the interpretation of being percentage changes in assessed value for unit changes in the characteristic variables. The result in this model is that being 1 km closer to a university has an estimated average effect of a 20% increase in a dwelling's value. The coefficients for all the predictor variables including construction quality dummy variable are significant at the 95% level or higher in this model. This model achieves a slightly higher fit than Model 3 (R squared of 0.776).

6. Conclusion

The observed strength of the relationship between the distance from a university and housing values, when compared to some other commonly used predictors of value, suggests that it is an important determinant of housing values. It may be beneficial to include it as variable in modeling of housing values in communities with large universities. Halifax, is a town which has a large university population it is not the dominant population. It would be interesting the to see how the property value dynamic observed in this study applies in towns small university towns where the university claims an even larger portion of the community's population.000

Appendix

Table 1: Descriptive statistics of regression variables

Variable	N	Mean	St. Dev.	Min	Max
Assessed Value (2016)	13,282	$414,755	$237,088	$46,600	$3,599,900
Number of Living Units	13,282	1.3	0.7	1	15
Age	10,461	64.1	32.3	1	201
Square Feet of Living Area	10,223	1,937.9	904.6	399	11,467
Sq. ft. / # Bedrooms	9,630	549.9	237.2	123.8	5,760.0
Bedrooms	12,450	3.2	1.5	1	24
Bathrooms	13,097	2.0	1.0	1	17
Average Quality Dummy	10,224	0.5	0.5	0	1
Good Quality Dummy	10,224	0.4	0.5	0	1
Very Good to Excellent Quality Dummy	10,224	0.0	0.1	0	1
Finished Basement Dummy	13,282	0.3	0.5	0	1
Garage Dummy	13,282	0.2	0.4	0	1
Distance to Nearest University (m)	13,282	1,828	1,362	2	5,353
Distance to Central Business District (m)	13,282	2,366	1,053	316	5,189
Total number of observations	13,282				

Table 2b: Regression Results Sensitivity Analysis

	Dependent Variable			
	Assessed Value			log(Assessed Value)
	(1)	(2)	(3)	(4)
Distance to University (m)	-64.839***	-109.771***	-81.978***	-0.0002***
	(0.922)	(1.408)	(1.084)	(0.00000)
Number of Bedrooms			26,580.560***	0.061***
			(830.072)	(0.002)
Number of Bathrooms			28,836.090***	0.061***
			(1,176.433)	(0.003)
Sqft Living Area/Bedrooms			190.664***	0.0004***
			(4.850)	(0.00001)
Fair-Average Quality Dummy			18,794.930	0.386**
			(80,810.480)	(0.172)
Good Quality Dummy			92,017.070	0.547***
			(80,831.790)	(0.172)
Very Good-Excellent Quality Dummy			199,949.400**	0.657***
			(81,388.390)	(0.173)
Garage Dummy			36,347.120***	0.082***
			(1,865.358)	(0.004)
Distance to CBD (m)		73.490***	50.671***	0.0001***
		(1.811)	(1.448)	(0.00000)
Constant	512,443.000***	422,069.200***	134,909.700*	11.956***
	(2,119.735)	(2,991.979)	(80,894.310)	(0.172)
Observations	13,056	13,056	9,404	9,404
R2	0.275	0.356	0.759	0.776
Adjusted R2	0.275	0.356	0.758	0.776
Residual Std. Error	143,816.500 (df = 13054)	135,529.700 (df = 13053)	80,781.060 (df = 9394)	0.172 (df = 9394)
F Statistic	4,944.651*** (df = 1; 13054)	3,606.972*** (df = 2; 13053)	3,280.701*** (df = 9; 9394)	3,624.252*** (df = 9; 9394)

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*p<0.1; **p<0.05; ***p<0.01

Table 2: Regression Results

	Dependent variable:			
	Assessed Value			ln(Assessed Value)
	Model 1	Model 2	Model 3	Model 4
Distance to University (m)	-76.832***	-142.421***	-94.629***	-0.0002***
	-1.355	-2.03	-1.837	0
Distance to Central Business District (m)		109.005***	78.161***	0.0001***
		-2.626	-2.515	0
Number of Bedrooms			29,648.100***	0.058***
			-1,370.19	-0.002
Number of Bathrooms			37,182.990***	0.062***
			-1,941.74	-0.003
Sqft Living Area/Bedrooms			263.632***	0.0004***
			-7.933	-0.00001
Average Quality Dummy			66,701.210***	0.206***
			-6,385.08	-0.009
Good Quality Dummy			138,795.700***	0.358***
			-6,769.79	-0.009
Very Good to Excellent Quality Dummy			592,682.900***	0.693***
			-12,544.20	-0.017
Garage Dummy			39,896.950***	0.081***
			-3,112.35	-0.004
Finished Basement Dummy			-14,094.670***	-0.005
			-3,182.51	-0.004
Constant	555,190.600***	417,185.400***	-9,237.50	12.112***
	-3,089.28	-4,415.91	-10,401.46	-0.014
Observations	13,282	13,282	9,630	9,630
R^2	0.195	0.287	0.684	0.799
Adjusted R^2	0.195	0.287	0.684	0.799
Residual Std. Error	212,745.300 (df = 13280)	200,161.800 (df = 13279)	136,461.100 (df = 9619)	0.185 (df = 9619)
F Statistic	3,214.200*** (df = 1; 13280)	2,677.128*** (df = 2; 13279)	2,086.825*** (df = 10; 9619)	3,817.678*** (df = 10; 9619)
Note:				*p<0.1; **p<0.05; ***p<0.01

Bibliography

Alonso, William. 1960. *Location and Land Use: Towards a General Theory of Land Rent.* Cambridge, Mass: Harvard University Press.

Campbell, Sean D., Morris A. Davis, Joshua Gallin, and Robert F. Martin. 2009. "What Moves Housing Markets: A Variance Decomposition of the Rent-Price Ratio." *Journal Of Urban Economics* 66 (2): 90-102.

Clark, Todd E. 1995. "Rents and Prices of Housing across Areas of the United States: A Cross-Section Examination of the Present Value Model." *Regional Science And Urban Economics* 25 (2): 237-247.

Do-Yeun, Park. 2009a. "Determinants of Market Rents in a Local Rental Housing Market." *Doctoral Dissertation, Purdue University* 1-20.

Do-Yeun, Park. 2009b. "Neighbourhood Effects of Rental Properties on Owner Occupied Housing." *Doctoral Dissertation, Purdue University* 45-69.

Evans, Alan W. 1973. *The Economics of Residential Location.* London: The MacMillan Press.

Glaeser, Edward L. 200 7. "The Economic Approach to Cities." *The National Bureau of Economic Research.* doi:10.3386/w13696.

Meese, Richard, and Nancy E. Wallace. 1994. "Testing the Present Value Relation for Housing Prices: Should I Leave My House in San Francisco?." *Journal Of Urban Economics* 35 (3): 245-266. *EconLit*, EBSCO*host* (accessed November 16, 2016).

Robitaille, Joel. 2016. "Examining the effects of distance from the city centre on housing values: an analysis of housing prices in the Halifax Census Agglomeration." Term paper for Econometrics 3338. Dalhousie University.

Rosen, Sherwin. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *The Journal of Political Economy* 82 (1): 34-55.

Sun, Weizeng, Siqi Zheng, and Rui Wang. 2015. "The Capitalization of Subway Access in Home Value: A Repeat-Rentals Model with Supply Constraints in Beijing." *Transportation Research: Part A: Policy and Practice* 80: 104-115.