



Authors

David Worden
William Gillam
Riaz Razvi
Helen Hambly

MAKING THE CONNECTION BETWEEN BROADBAND AND PROPERTY VALUES

SUMMARY

A case study from Durham Region, Ontario evaluates the impact of wireline broadband connections on property values. Despite access to two advantageous datasets, matching broadband and property value data proved to be challenging. We use a small dataset of 282 premises to empirically measure the impact of wireline connections (75% of the premises) on property values. We find that wireline broadband connections contribute a similar amount of value as a 1% increase in total square footage or slightly more than an additional full bathroom. However, we urge caution in the interpretation of these results and call for further systematic study of this issue across Canada.

Motivation

The COVID-19 pandemic highlighted the dependency of the global economy on internet and communication technology infrastructure. With emergency stay-at-home orders and the closure of non-essential businesses, a significant portion of the economy moved online. For those with careers suited to remote working, access to a reliable high-speed internet (broadband) connection at home was no longer just necessary to enjoy streaming services or social media. In some ways, broadband infrastructure during stay/work-at-home measures became the equivalent of roadway infrastructure for commuting to work. However, in rural communities a lack of sufficient broadband created significant hurdles for work and learning from home during this period.

While the positive impact of broadband on the economy has reached a consensus (see Gómez-Barroso and Flores, 2020; Vu et al., 2020), fewer studies have examined the way that broadband impacts communities. In particular, the focus of this research was to assess the value of broadband connections on property values in Ontario, Canada. While our research uses data prior to the COVID-19 pandemic, the results help to shed light on the value to households from improved broadband infrastructure. Given the increasing dependency of households on broadband, we anticipate this value to increase in the future.

Weak signals from previous literature

Over the past decade a limited number of studies have attempted to determine to what extent broadband connections influence property values in the United States. The first well-documented study by Molar, Savage, and Sicker in 2013 found a positive impact from fibre connections on house prices in New York state. A subsequent study by the same authors in 2019 examined the relationship between fibre connections and house prices across all 50 states and found that fibre connections were associated with an additional value of 3.1% which is roughly equivalent to the value of a fireplace or half the value of an additional bathroom in their sample.

Deller and Whitacre (2019) found positive valuations from connectivity that are marginally decreasing as connection speeds increase (i.e., some form of internet connection is relatively more valuable than the best possible connection). Conley and Whitacre (2020) examined two rural counties in Oklahoma and found no premium from a broadband connection which has helped to motivate the need for further research on this issue. More recently, the Urban Land Institute (2021) documented the ways in which broadband has changed the real estate market both through the way properties are marketed and sold as well as the way in which residents and owners maintain and monitor their properties. The role of broadband in property values has garnered recent attention but the literature is still limited and inconclusive.

Our data

For this analysis we use two separate datasets which we combine in order to examine the relationship between broadband connections and property values. The first dataset is a voluntary survey that residents in Durham Region, Ontario completed between January 2020 to February 2021. This voluntary survey was designed and distributed as part of a collaborative research project with the Region of Durham which is a regional municipality located to the east of Toronto, in Southern Ontario. This survey collected a range of variables but the critical variable of interest for our analysis was the stated connection type for the home internet subscription.

We then use the address field from the broadband survey data to merge our broadband connection data with property sales data for Durham Region which was collected for sales between 2017 and March 2020. This data is collected and maintained by the Municipal Property Assessment Corporation (MPAC) and provided to the Region of Durham for planning purposes. A key challenge of this analysis was being able to match enough addresses between recent sales and completion of the optional broadband survey. Over 3,000 unique broadband surveys were completed and sales records during the time period exceeded 50,000 yet finding a sufficient number of matches for statistical analysis was a persistent challenge.

To address this concern and improve the sample size we assume that all units within a multi-residential premise have the same connection type and that an address has had the same connection type over the entire sample time frame. This assumption is necessary because we only collect broadband data over a 13-month period whereas we use sales data from a period of more than three years. In the final sample we use for analysis, we match 282 addresses that both completed the optional broadband survey and had a recent property sale.

The sample has an average property sale amount of \$349,460 which reflects that 99% of the sample is multi-residential apartment units. Similarly, 99% of the sample is urban which limits our ability to speak to the effect of broadband connections on rural property values. Wireline broadband connections were used at 75% of the sample addresses.

Our empirical approach

Using a standard hedonic valuation approach, we estimate the value of wireline connections while controlling for a range of typical property value assessment variables with a sample of 282 observations. In this way we can assess what additional value broadband connections add while controlling for key factors such as multi-residential properties, urban versus rural, the square footage of the dwelling, the age of the dwelling, construction quality, the year of sale, as well as the number of full storeys of the building, bathrooms, bedrooms and garage spaces.

The hedonic valuation approach is a common theoretical framework for assessing the value of assets. The hedonic valuation approach is the standard approach in the property valuation literature and the same approach used in recent literature examining the relationship between broadband and property values (see Conley & Whitacre, 2020). Generally, the value of a property is the sum of several individual characteristics such as the size of the parcel of land, the square footage of the dwelling, the age of the dwelling, where it is located, and so forth. Using this simple theoretical framework, we are able to use linear regression techniques to account for the marginal contribution of any relevant characteristic to the overall price of the property. For example, each additional bedroom may add an extra 6% to the value of a property on average.

Our findings

We find that wireline broadband connections add a statistically significant premium to property values in our sample. In contrast, wireless connections correspond to a decrease in property values. The analysis presented above regresses sale amounts on several explanatory variables as well as the variable of interest which is wireline broadband connections. Statistically significant results are as follows: a wireline broadband connection is associated with a 23% increase in the sale amount; being located in an urban area

corresponds to a 10% increase in the sale amount; a 1% increase in floor area above average is associated with a 24% increase in the sale amount; a 1% increase in the age of the premise is associated with a 4% decrease in value; each additional storey is associated with a 40% decrease in value; each additional bathroom is associated with a 19% increase in value; each additional bedroom is associated with a 6% increase; and, sales taking place in 2019 and 2020 were associated with an average increase of 7% and 19% in sale amounts, respectively.

Our key finding is that wireline broadband connections are both a statistically and economically significant factor in property valuation. To make a more tangible comparison, wireline broadband connections contribute a similar amount of value as a 1% increase in total square footage or slightly more than an additional full bathroom.

Table of Regression Findings

	N = 282
	Prob > F = 0.0000
	R-sqr = 0.5780
Ln(Sale Amount (\$))	
Variable	Coefficient
Wireline Connection	0.229592***
Urban	0.096329***
Multi-residential	NS
Ln(Floor Area)	0.235518***
Ln(Age)	-0.04108***
Building Quality	NS
No. Storeys Building	-0.39944***
No. Full Baths	0.186937***
No. Bedrooms	0.059976**
No. Garage Spaces	NS
Year (2018)	NS
Year (2019)	0.074892*
Year (2020)	0.194444***
Constant	11.23321***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, NS indicates not statistically significant.

Key considerations

While the results presented above suggest that wireline broadband connections have a positive causal relationship with property values, we wish to highlight some key considerations and limitations in our results and the need for more research on this issue. The most significant challenge for our analysis is due to our small sample size of only 282 property sales for which we also have broadband connection information. The small number of matched addresses introduces concerns about whether we are correctly identifying the effect of wireline broadband connections on property values or if there is another variable or combination of variables which are actually making up the effect.

Considering these limitations we would like to stress caution in interpreting the results presented here and call for more thorough research on the topic of broadband connections and property values in Canada.

Strategies for future research

Given the lack of literature on this issue in Canada and the difficulty in being able to perform this analysis even with the relatively good data access we were granted, we recommend a systematic approach to collecting data on broadband connections and property values on a broader level.

Similar to the way in which data exists for the square footage or the number of bedrooms in a dwelling, we would recommend that the connection type and quality of broadband available also be recorded.

We would also recommend that this data be collected and verified with the use of multiple data sources. For example, data could be collected and maintained by MPAC on a per-premise basis at the time of listing and sale. Data could also be used from the National Broadband Availability Map to validate or create discussion at a street/road segment level although the data and its sources have recognized limitations.

Conclusion

With sufficient data collection at a regional, provincial, or national level the method discussed above could be replicated to achieve more accurate and robust results. These results would not only serve to clarify the importance of broadband deployments in both urban and rural communities but would also improve our understanding of affordable housing, work-from-home policies, and property tax assessments. While we find an increase in property values from wireline connections, the need for further research is clear.

References

- Conley, K. L., & Whitacre, B. E. (2020). Home is where the internet is? High-speed internet's impact on rural housing values. *International Regional Science Review*, 43(5), 501-530. <https://doi.org/10.1177%2F0160017620918652>
- Deller, S., & Whitacre, B. (2019). Broadband's relationship to rural housing values. *Papers in Regional Science*, 98(5), 2135–2156. <https://doi.org/10.1111/pirs.12450>
- Gomez-Barroso, J. L., & Marban-Flores, R. (2020). Telecommunications and economic development—The 21st century: Making the evidence stronger. *Telecommunications Policy*, 44(2), 101905. <https://doi.org/10.1016/j.telpol.2019.101905>
- Molnar, G., Savage, S. J., & Sicker, D. C. (2013). The impact of high-speed broadband availability on real estate values: Evidence from United States property markets. *TPRC* 41. <http://dx.doi.org/10.2139/ssrn.2241926>
- Molnar, G., Savage, S. J., & Sicker, D. C. (2019). High-speed Internet access and housing values. *Applied Economics*, 51(55), 5923–5936. <https://doi.org/10.1080/00036846.2019.1631443>
- Urban Land Institute. (2021). *Broadband and real estate: Understanding the opportunity*. <https://knowledge.uli.org/en/reports/research-reports/2021/broadband-and-real-estate>
- Vu, K., Hanafizadeh, P., & Bohlin, E. (2020). ICT as a driver of economic growth: A survey of the literature and directions for future research. *Telecommunications Policy*, 44(2), 101922. <https://doi.org/10.1016/j.telpol.2020.101922>