Investigating the Impact of Heritage Property Designation on Real Estate Value

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Executive Summary

A common concern amongst homeowners is whether heritage designations negatively impact the sale value of residential properties. Current evidence is inconclusive, which prompted the City of Hamilton to partner with the McMaster Research Shop for this study. The purpose of our investigation was to determine the extent to which, if at all, heritage designations impact residential property values in Hamilton.

To investigate this question, we reviewed previous literature investigating the relationship between heritage designations and property values. Then, using a large dataset provided by the Realtors Association of Hamilton-Burlington (RAHB) and the City of Hamilton's list of heritage properties, we quantitatively modelled the relationship between heritage designation and property values in Hamilton while controlling for other variables known or theorized to influence property values. In the first model, we controlled for the fixed effect of year, heritage status, the number of rooms, municipality, lot depth, lot front, and building materials. In the second model, we controlled for the individual property's address (rather than municipality) and otherwise adjusted for the same factors.

The nine studies in our literature review arrived at the consensus that heritage designations positively impact the sale price of residential properties. Important factors that were considered included zoning, how the land was planned to be developed, and the quality of life each neighbourhood had to offer. The results from our quantitative analysis aligned with the literature review findings by providing statistically significant evidence that property sale values in Hamilton appear to be higher after receiving a heritage designation, though we cannot accurately determine the magnitude of this association. While we did control for a variety of factors in our models, due to limitations in our dataset, we were unable to control for all factors suggested to be important by our literature review. Another limitation of our results is that the analysis was only able to show association and not causation. Future research could strive to estimate the effect of designation in current day value and/or use an experimental design to assess causality.

In conclusion, our study provides evidence that heritage designations are positively associated with sale prices of residential properties in Hamilton. Thought we cannot say that heritage designation *causes* the increase, nor estimate the magnitude of an increase, this study adds to the growing body of research refuting the claim that heritage designation has a negative impact on residential property values, in Hamilton and elsewhere.

Acknowledgement

Introduction

Background

The City of Hamilton consists of many diverse districts, communities, and neighborhoods, each with their own heritage character and form. The *Ontario Heritage Act, 1975,* was designed to enable local municipalities to protect and manage the province's cultural heritage resources (King's Printer for Ontario, 2012). Heritage designations are a formalized way to recognize and protect the value of historically significant properties that represent a community's shared history (City of Hamilton, 2022).

Part IV of the *Ontario Heritage Act, 1975*, entitled *Conservation of Property of Cultural Heritage Value or Interest*, allows municipalities to designate residential or commercial properties of cultural or heritage value (King's Printer for Ontario, 2012). Municipalities can designate properties as having cultural heritage value or interest if it exhibits two or more of the following characteristics:

1. The property has design or physical value (i.e., displays a rare and high degree of craftsmanship or an early, unique or rare example of a design);
2. The property has historical value or associative value; or
3. The property has contextual value (e.g., helps define the character of an area or is considered a landmark) (City of Hamilton, 2022).

Hamilton City Council, the Hamilton Municipal Heritage Committee, City staff, property owners, or a third party can initiate requests to designate a heritage property. Once a designation request is received, City staff evaluate the property using criteria outlined in *Ontario Regulation 9/06* (City of Hamilton, 2022). The Hamilton Municipal Heritage Committee reviews staff recommendations for designation before providing advice up to the City's Planning Committee and then to City Council for their consideration and approval. If the Council concurs that the property should be designated, the staff serves a Notice of Intent to Designate to the owner and publishes the Notice in the local newspaper and on the City's website and there is an opportunity to object to the proposed designation.

A common concern amongst homeowners is whether heritage designations negatively impact the market value of residential properties. This concern can lead homeowners to question or reject proposals to designate their property as a heritage site and may deter some buyers from purchasing heritage properties (Weisleder, 2012). In 2019, this led the City of Hamilton Planning Committee to commission Cultural Heritage Planning staff to investigate evidence that would support the claim that heritage status impacts the sale value of homes. Although staff were able to locate several studies, they were limited in scope. Moreover, they did not find any local studies. As a result, the current evidence is inconclusive as to whether heritage designation status impacts property values in Hamilton.

Purpose

The purpose of this investigation was to determine the extent to which, if at all, heritage designations impact residential property values in Hamilton. The McMaster Research Shop partnered with a representative of the City of Hamilton's Heritage and Urban Design (Planning and Economic Development) division to conduct this research using local sales figure data provided by the Realtors Association of Hamilton-Burlington (RAHB). The results of this investigation will be reported to the City of Hamilton's Planning and Economic Development Department and other municipal committees and departments. Findings have implications for community support of heritage property designation and transparency around the economic impacts of heritage designation.

Study Objectives

This was a quantitative modelling project structured by two objectives. First, we conducted a review of existing literature to identify variables that may affect the relationship between heritage designation and sale value. Second, we modelled the relationship between heritage designation and sale value, while controlling for variables identified in the first part of our investigation. We used a large dataset of sales data from RAHB joined with a dataset identifying heritage properties provided by the City of Hamilton.

Report Structure

We begin by describing the methods used to collect and analyze data, and then report the findings of our literature review and quantitative modelling. We present our results using conceptual diagrams, tables, and figures, where possible. Finally, we conclude with some key takeaways and opportunities to inform Hamilton residents, city planners, relators, and other stakeholders.

Methodology and Limitations

Overview

A team of researchers from the McMaster Research Shop started this project in September 2022. The group met regularly to develop the research questions, plan the methods, review literature, conduct the analysis, discuss findings, and write this report. We communicated regularly with the City representative to ensure alignment with the original research plan.

We conducted this study in two phases, with the results of the first phase informing the second. First, we identified and reviewed existing studies estimating the impact of heritage designation on real estate property values to inform the quantitative analysis and gather methodological insights. The second phase involved statistical modeling of the relationship between property values and heritage property designation while controlling for multiple variables.

Phase 1: Literature Review

Search Strategy

We conducted a review of academic and grey literature with two distinct objectives. First, we aimed to identify factors that may impact the sale value of heritage properties. Second, we intended to gather methodological insights to inform our quantitative analysis. We used multiple strategies in our literature review to achieve each objective.

We began by scanning 15 academic articles and reports that were provided by the City representative. We applied our inclusion and exclusion criteria listed in Table 1, and deemed four references as meeting our inclusion criteria for our first objective. We identified six references that were relevant to our second objective. We then searched for any recent citations of these 10 references in Google Scholar, which did not yield any new publications. Additionally, we scanned the bibliographies of these references for any relevant titles. We applied our inclusion and exclusion criteria to 10 references, resulting in three additional references aligning with our first research objective. Therefore, we obtained 13 references from the City representative's literature.

We restricted our screening criteria to Ontario-based studies investigating the impacts of factors on sales prices. We did this because other jurisdictions may apply different legislation for heritage designations, which might impact the relationship with the property's sale value. However, we included a subset of American-based studies that provided insights about our statistical methodology.

Table 1. Inclusion and Exclusion Criteria

Literature Search Objective #1: Identify factors that may impact the sales values of heritage properties	
Inclusion Criteria	**Exclusion Criteria**
- Published between 2000 and 2022 - Conducted in Canada using a Canadian-based case/example - OR a Canadian case/example is discussed in a study published in the United States - Measures or discusses the effect of heritage designations on property sale values - Theorizes or tests for factors impacting sale values (i.e., cannot solely present a case study)	- Published outside of Canada - Published in a language other than English

Literature Search Objective #2: Gather methodological insights to inform our quantitative analysis	
Inclusion Criteria	**Exclusion Criteria**
- Published between 2000 and 2022 - Measures or discusses the effect of heritage designations on property sales values - Theorizes or tests for factors impacting sales values (i.e., cannot solely present a case study)	- Published outside of Canada or the United States - Published in a language other than English

Next, we developed a search strategy to conduct our own search for additional literature aligning with our first research objective. We inputted the following search phrase into Google Scholar, the McMaster library catalogue, and Google Search:

(Historic designation OR designated properties OR heritage propert* OR historic preservation OR Victorian home OR Victorian propert*) AND (property value* OR property sale* OR sale* value OR sale* price)

For time efficiency, we screened the first 10 search results per search engine. Four references met our inclusion and exclusion criteria.

Out of the 17 total references meeting our inclusion criteria, we identified eight as being duplicates. Therefore, nine references were eligible for full-text review and data extraction. Figure 1 illustrates our literature review process and search results.
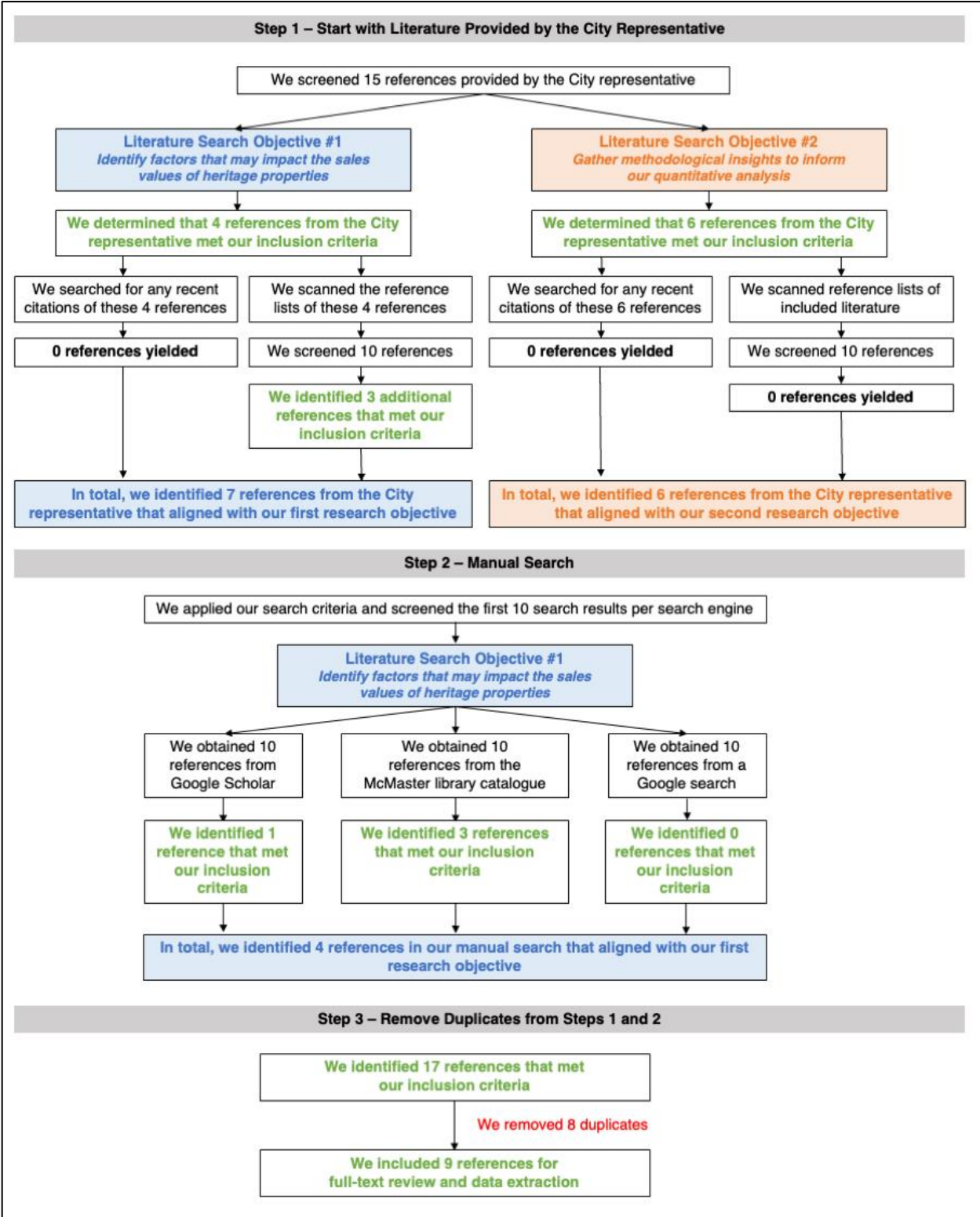
Figure 1. Literature Flow Diagram

Data Extraction

The final step of our literature review involved extracting relevant information from the nine included references. We read each included text in full and extracted information aligning with each objective of our literature search. Specifically, we extracted factors in the included studies that may impact the sale values of heritage properties. We also noted methodological insights or approaches used in quantitative studies on this topic. We organized the extracted information in a Microsoft Excel spreadsheet.

Lastly, we compared factors identified in the first phase of our literature search with the list of variables available in the RAHB dataset. We needed to ensure the availability of factors from our literature review in the existing dataset.

Phase 2: Quantitative Analysis

Data Source

We examined sales property data provided by RAHB as our primary data source. This dataset spanned sales records from 1931 to 2023, and included hundreds of variables such as listing and closing prices, square footage, location, and number of bedrooms. The City representative provided a secondary dataset for this project that listed residential properties in Hamilton with heritage designations.

Data Extraction

We applied the following search criteria in the RAHB database to download our dataset:

1. Property type: residential
2. Transaction type: sale
3. Status: sold

As of December 31, 2022, this returned 408,165 property sales. For each sale, we downloaded the following pieces of information:

1. Close Price
2. Close Date
3. Number Rooms
4. Municipality
5. Address
6. Lot Depth
7. Lot Front
8. Lot Size Code
9. Number of Stories
10. Year Built
11. Exterior (Building Material)

Data Cleaning

The sale year was missing for 12,783 of the property sale records that we downloaded from RAHB. These were removed, leaving 395,381 sales.

The earliest sale was in 1931, and the next earliest was in 1983. This 1931 outlier was removed, leaving 395,380 sales.

Next, we restricted our sample to property sale records that occurred in the following municipalities:

- Ancaster
- Dundas
- Flamborough
- Glanbrook
- Hamilton Centre
- Hamilton East
- Hamilton Mountain
- Hamilton West
- Stoney Creek
- Waterdown

The RAHB dataset contained sales records for over 90 municipalities in Ontario. 182,772 sales took place outside of these municipalities and were removed from the dataset, leaving 212,608 sales.

34,573 of these records were found to be missing lot depth or lot front measurements and were also removed, leaving 178,035 sales. Where lot depth or front were measured in feet (i.e., where lot size code was "feet"), these measurements were converted into meters.

According to the dataset from the City representative, we had information on 634 heritage properties. We did not know the year of designation for six of these; the removal of which left 628 heritage properties. One of these properties had multiple designation dates listed and was removed, leaving 627 heritage properties.

Data Linkage
To identify which records were sales of heritage properties, the addresses in the sales records from RAHB and the table of heritage properties from the City were converted to a common format. In particular, the following short forms were used for street name suffixes:

- Road -> RD
- Court -> CRT
- Street -> ST
- Avenue -> AVE
- Boulevard -> BLVD
- Drive -> DR
- Place -> PL

With the addresses converted to a common format, it was possible to identify 379 sales of properties that are currently designated with a heritage status. Of these, 301 were sales of properties that were designated as heritage at the time of sale.

Data Processing
For each property, a list of exterior (building) materials was included. This list was converted into a set of binary variables, one for each possible material, such that "0" indicated the absence of this material and "1" indicated its presence. This allowed us to compute the most common materials used in properties sold:

- Brick: 77.86%
- "Other": 38.46%
- Stone: 30.15%
- Vinyl Siding: 28.49%
- Aluminum Siding: 28.1%
- Metal/Stone Siding: 27.63%

- Stucco (Plaster): 4.95%
- Wood: 1.67%
- Concrete: 0.52%
- Brick Front: 0.47%
- Board & Batten: 0.03%
- Shingle: 0.02%

The above percentages sum to more than 100 because the materials were not mutually exclusive (i.e., a property could have an exterior of both wood and brick).

Therefore, our total sample size was 178,035 properties; 301 of which had heritage designations. An overview of our data extraction, cleaning, linkage, and processing procedures is illustrated in Figure 2.
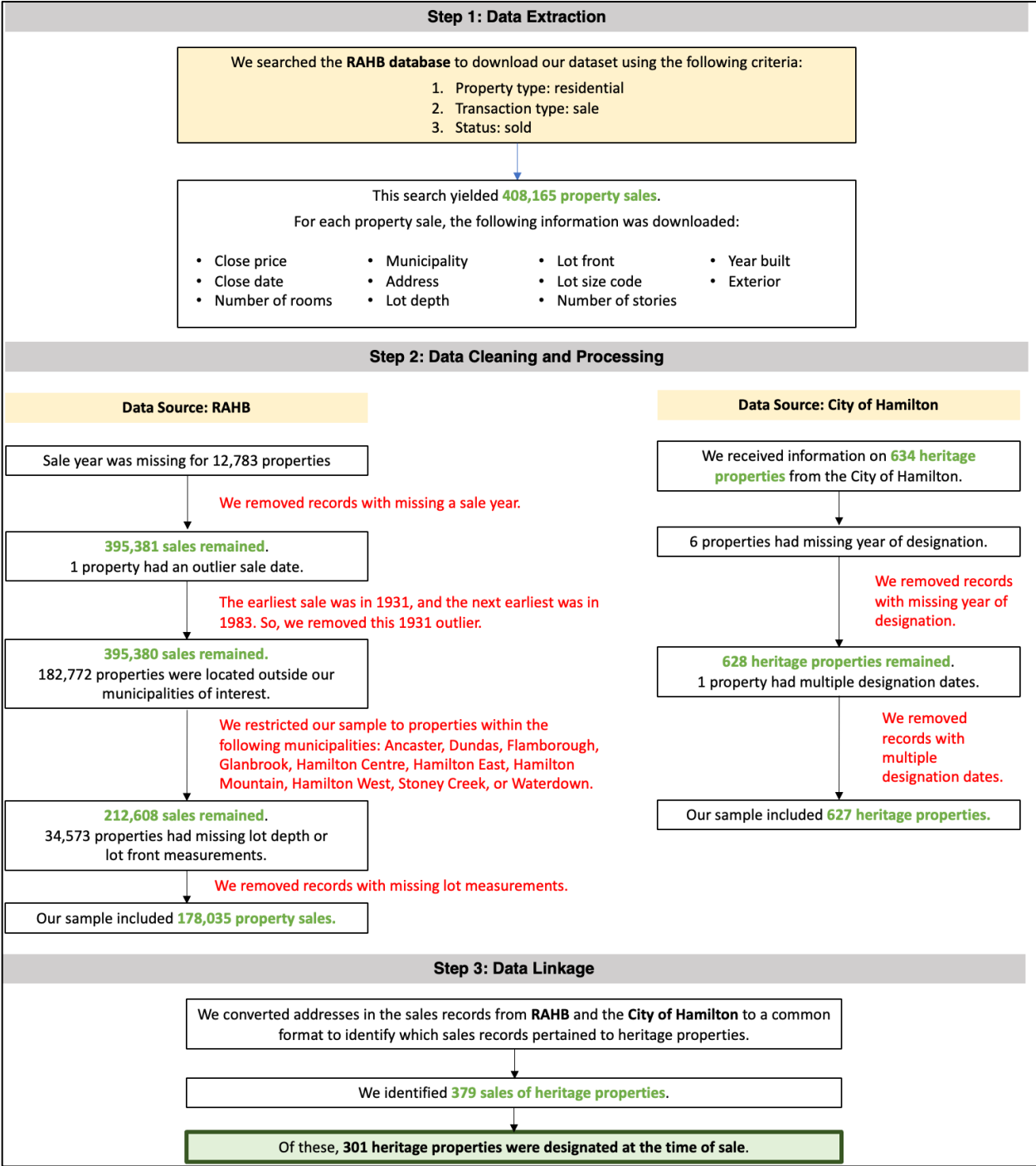
Step 1: Data Extraction

We searched the **RAHB database** to download our dataset using the following criteria:

1. Property type: residential
2. Transaction type: sale
3. Status: sold

This search yielded **408,165 property sales**.
For each property sale, the following information was downloaded:

- Close price
- Close date
- Number of rooms
- Municipality
- Address
- Lot depth
- Lot front
- Lot size code
- Number of stories
- Year built
- Exterior

Step 2: Data Cleaning and Processing

Data Source: RAHB

Sale year was missing for 12,783 properties

We removed records with missing a sale year.

395,381 sales remained.
1 property had an outlier sale date.

The earliest sale was in 1931, and the next earliest was in 1983. So, we removed this 1931 outlier.

395,380 sales remained.
182,772 properties were located outside our municipalities of interest.

We restricted our sample to properties within the following municipalities: Ancaster, Dundas, Flamborough, Glanbrook, Hamilton Centre, Hamilton East, Hamilton Mountain, Hamilton West, Stoney Creek, or Waterdown.

212,608 sales remained.
34,573 properties had missing lot depth or lot front measurements.

We removed records with missing lot measurements.

Our sample included **178,035 property sales**.

Data Source: City of Hamilton

We received information on **634 heritage properties** from the City of Hamilton.

6 properties had missing year of designation.

We removed records with missing year of designation.

628 heritage properties remained.
1 property had multiple designation dates.

We removed records with multiple designation dates.

Our sample included **627 heritage properties**.

Step 3: Data Linkage

We converted addresses in the sales records from **RAHB** and the **City of Hamilton** to a common format to identify which sales records pertained to heritage properties.

We identified **379 sales of heritage properties**.

Of these, **301 heritage properties were designated at the time of sale**.

Figure 2. Overview of Data Extraction, Cleaning, Linkage, and Processing

Analytic Approach

Studies examining the impact of heritage designations on property values have used several different methods. Regression is a commonly used statistical technique that estimates the relationship between a dependent variable to one or more independent (explanatory) variables

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(British Medical Journal, 2023). To any reader unfamiliar with linear regression, we will briefly review this analytical method.

Regression assumes that a certain equation describes the relationship between the dependent and independent variables, and then finds the parameters of the equation that provide the best fit for the data. For example, if there is only one dependent variable (y) and one explanatory variable (x), then a regression model would assume that the following equation describes the relationship between x and y:

$$y = mx + b$$

Finding the best-fitting values of m and b means finding the line of best fit. When there are multiple explanatory variables, we are no longer finding a single line of best fit, but it is useful to return to this two-dimensional example to understand what is going on.

After finding the line of best fit, we usually want to know whether there is a significant relationship between x and y. Mathematically, this means asking whether the line of best fit has a non-zero slope (i.e., asking whether the best-fitting value of m is different from 0). How do we know what value of m is high enough to infer a significant relationship? We will use an example to explain this process.

Suppose we want to know whether a coin is fair (i.e., whether it has a 50-50 chance of landing heads or tails). To find out, we flip the coin 1,000 times. Suppose we get "heads" 510 times. Even though we did not get exactly 50% heads, we do not infer that the coin is unfair – even a fair coin does not always give exactly 50% heads. However, if we got heads 900 times, we would be much more justified in inferring that the coin is not fair (a fair coin has less than a 1-in-1-trillion chance of giving such an extreme number of heads). In science, a cut-off of 5% is usually used: if an outcome has less than a 5% probability of happening by chance, we reject the "null hypothesis" that it happened by chance. This is what the concept of "statistical significance" refers to. In the case of regression, we infer that there is a significant relationship between x and y when, if there were no relationship between x and y, there would be less than a 5% chance of the best-fitting value of m being at least as far from 0 as we found.

In our analysis, a property's sale value (closing price) is the dependent variable. Heritage designation status is our primary independent variable of interest. We are primarily interested in whether heritage designation impacts a property's sale value. However, we are also interested in controlling for other factors that may affect the closing price, including property size (square footage), number of bedrooms, building age, and others (Figure 3).
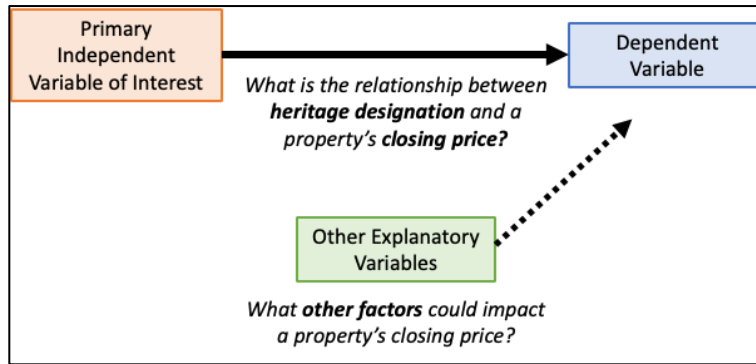
Primary Independent Variable of Interest

What is the relationship between **heritage designation** and a property's **closing price**?

Dependent Variable

Other Explanatory Variables

What **other factors** could impact a property's closing price?

Figure 3. Conceptual Framework for Regression

There are many different types of regression analysis techniques, and selecting the most appropriate method depends on factors such as dependent variable type, the shape of the regression line, and the number of independent variables. We chose to conduct hedonic regression as it intends to estimate the influence of various factors on price. Hedonic regression comes from the field of economics (de Haan & Diewert, 2013).

We computed two regression models. The first was based on the following regression equation:

$$Sale\ price_i = \gamma Designated_i + \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_N X_{Ni} + \varepsilon_i$$

where $Sale\ price_i$ was the sale price of property i, modelled as being dependent on a series of explanatory variables, as well as an "intercept" or baseline variable β_0 which is equivalent to b in the $y = mx + b$ equation above. The most important of these for our research question was $Designated_i$, which was "1" if property i was designated heritage at the time of sale and "0" otherwise. Thus, the value of γ that best fit our data would quantify the average change in sale price between designated and undesignated properties. Sale price was also modelled as being dependent on a series of control variables X. Each control variable X_n had a different parameter β_n quantifying its effect on the sale price. For example, if X_1 were the number of bedrooms, then the best-fitting value of β_1 would be the average increase in price for each additional bedroom (controlling for all other factors).

Some control variables, such as municipality, were categorical rather than ordinal. In this case, each possible category had a different β parameter that quantified the average price (controlling for all other factors) of houses that fell into that category. Importantly, the year of sale was treated as a categorical variable in this way because of the nonlinear change in sale price over time. Finally, ε_i was the difference between the expected sale price or property i according to the model and its actual sale price. By examining how large the values of ε are, we can make inferences about how well our model fits the data.

In the second model, we also controlled for location by considering the individual property's address. We removed the municipality control since the effect of a property's individual

address already contained the effect of the neighbourhood. This second regression equation was:

$$Sale\ price_i = \gamma_1 Designated_i + \gamma_2 Address_i + \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_N X_{Ni} + \varepsilon_i$$

Our quantitative analysis was conducted using the statistical software R (Function: lmfe, Version number: 4.1.1).

Assessing model fit
We assessed the goodness of fit of our models by examining three statistics. R-squared (the "coefficient of determination") is a statistical measure of the proportion of variance in the dependent variable that can be explained by the independent variables. This statistic tells us how well the data fit the regression model; R-squared can take on values between 0 to 1, and a higher r-squared indicates that more variability is explained by the model (i.e., a higher R-squared suggests better fit). The adjusted R-squared is a corrected goodness-of-fit statistic that attempts to correct for the overestimation of R-squared that comes with overfitting (i.e., adding an excessive number of covariates into the model). The adjusted R-squared is always less than or equal to R-squared; its value decreases relative to R-squared if a specific effect does not improve the model. Lastly, we assessed the F-statistic to identify the model that best fits the population from which the data were sampled.

We also assessed for multicollinearity in our models. Multicollinearity occurs when several independent variables in the model are correlated, which results in less reliable inferences. Two variables are considered perfectly collinear if their correlation coefficient is +/- 1.0.

Ethical Considerations

McMaster University established a data-sharing agreement with RAHB in November 2022 to allow for our access and analysis of the sales data. The research team abided by the terms in the agreement to ensure appropriate security measures to protect the data.

Limitations

When planning our analysis, we considered using the difference-in-difference method rather than hedonic regression. Difference-in-difference was commonly used in the literature we identified in Phase 1. This method is a quasi-experimental statistical approach that compares changes in outcomes (like sale price) over time before and after the properties receive their heritage designation. Therefore, a key limitation of this approach is that it is typically executed when all treatment is assigned on the same time, which would have required designated houses to be designated on the same date. Since this was not true of heritage properties in Hamilton, the approach of difference-in-difference cannot be applied in this study.

Since we did use hedonic regression (a non-experimental method), we are unable to obtain an estimate of causal effect. Therefore, confounding variables, other than those we controlled for,

may have affected the outcome. We mitigated this risk by controlling for multiple factors in our models.

Lastly, using hedonic regression, we controlled for the sales year, which in turn controlled for the sale price level of that year. Therefore, we did not adjust the housing price for inflation in our hedonic regression; thus, the effect estimate obtained in our models is not interpretable in current (2023) dollars. This can be solved by taking logarithms on the housing prices or using the housing price index to adjust the past prices to the current level.

Findings

Phase 1 (Literature Review) Findings

The objectives of our literature review were two-fold. In this section, we present (1) the factors identified in previous studies that may impact property sales values of heritage properties, and (2) methodological insights from existing quantitative studies on this topic.

Overview of Included Literature

We identified 9 studies that met our inclusion criteria. Most studies were based in Ontario (n=3) or elsewhere in Canada (1 in British Columbia, 1 in Quebec, 1 in Newfoundland and Labrador). We also examined three internationally based studies occurring in the United States, United Kingdom, and Australia. Some studies estimated the impact of heritage designations on the sale values of individual properties, whereas others examined the sales of entire heritage districts. We summarize these included studies in Table 2.

Table 2. Summary of Included Literature

Title (Year)	Author	Setting	Objective / Research Question	Methodology	Limitations
Heritage Designation and Property Values: Is there an Effect? (2000)	Robert Shipley	Canada	Do heritage designations of properties, under the heritage legislation in Canada's largest province, have a negative impact on the values of those properties?	Hypothesis testing	Small sample size; Examined community average sales prices (rather than an individual property's sales price)
Study of the Comparative Value of Heritage and Non-heritage Houses in Vancouver (2005)	Kelsey Singbeil	Canada	Explore the trends in property assessment values of heritage homes in four distinct Vancouver	Evaluated average percentage change in price across	Small sample size as it only included 45 houses. The factors assessed only included lot size and visual

			neighbourhoods within the years of 1998-2004	three categories	observation of building size and condition
Heritage Conservation Districts Work: Evidence from the Province of Ontario, Canada (2011)	Robert Shipley, Kayla Jonas, Jason F. Kovacs	Canada	To address the concerns of those opposed to having their property receive a heritage designation	Compared the change in house price to the regional average home price	Excluded many explanatory factors
Assessing the success of Heritage Conservation Districts: Insights from Ontario, Canada (2015)	Jason F. Kovacs	Canada	To address the concerns of those opposed to having their property receive a heritage designation	Compared the change in house price to the regional average home price	Excluded many explanatory factors
Economic Impact of a Heritage Policy on Residential Property Values in a Historic District Context: The Case of the Old City of Quebec (2018)	Nicolas Devaux, Etienne Berthol, Jean Dube	Canada	To determine the value of designating a district as a heritage district and how this impacts the price of homes within and surrounding the heritage district	Hedonic repeated sales approach	Considers the impact of designating heritage districts and not specific/ individual heritage properties
Historic Preservation: Preserving Value? (2013)	Martin D. Heintzelman & Jason J. Altieri	United States	To determine the impact of heritage designation of a district on the prices of homes within. This study also takes into consideration that homes of a higher value are more likely to already be in an area that will receive a heritage designation	Repeat-sales fixed effects (difference-in-difference)	Conducted in the United States, where policies for heritage designation are different. Methodically relevant, but contextually different
House Prices in a Heritage Area: The Case of St John's, Newfoundland (2006)	Chris. A. Sharpe	Canada	To determine if a heritage designation has a significant impact on the value of a home	Hedonic regression and difference-in-difference	The setting (St. John's, Newfoundland) does not have clearly defined or rigorously enforced heritage conservation

					regulations. As such, it was difficult to compare property value of designated versus non-designated propertie
An Assessment of the Effects of Conservation Areas on Value (2012)	Gabriel M. Ahlfeldt, Nancy Holman, Nicolai Wendland	United Kingdom	To determine the cost and benefit associated with a property located in a conservation area in England. The study attempts to assess the value of a heritage designation on a property	Spatial hedonic analysis of property transaction prices	Only concerned with conservation areas in England (international contextual differences)
Does the Housing Market Value Heritage? Some Empirical Evidence (2004)	Vinita Deodhar	Australia	To determine the market price difference between heritage-listed and regular properties	Hedonic price technique	The study occurs in Sydney, Australia (international contextual differences)

Shipley (2000) has conducted the largest study of its kind in North America on this topic, analyzing over 3,000 residential properties. He concluded that heritage designations did not negatively impact the sale price of these properties. Similarly, Singbeil's (2005) analysis in Vancouver concluded that the sale values of visually comparable designated heritage homes, non-designated heritage homes, and non-heritage homes all increased at the same rates. Shipley et al. (2018) found that people who live and own property in heritage districts are satisfied, and property values perform better in the marketplace than those in surrounding areas. Kovacs et al. (2015) obtained similar results for properties in Ontario, Canada.

Factors Impacting Property Values
Factors that were considered in the models of relevant literature include: zoning of the area, factors related to quality of life in the area (e.g., pedestrian friendliness, safety), signage, cleanliness, maintenance, planting, quality of new developments, conservation work, crowding and noise, location of properties, tourism potential, urban greenspaces, parking opportunities, and maintenance and upgrades of the neighbourhood. The most frequently included factor was zoning, how the land in the area was planned to be developed, and the quality of life each zone offers (e.g., outdoor spaces, cleanliness). None of the variables mentioned in these studies were available in the RAHB dataset, so we were unable to control for these factors in our analysis. Zoning was the only variable listed in the RAHB server, but this field was empty for all properties included in our sample.

In addition, the City representative suggested that the following variables be examined in our models: municipality, neighbourhood, lot depth, lot front size, number of rooms, number of

stories, square foot range, approximate age, and exterior (building material). We were able to extract data for most of these variables from RAHB (i.e., municipality, neighbourhood, lot depth, lot front size, number of rooms, and exterior). However, we observed a high proportion of missing data for three of the suggested variables (i.e., approximate age, number of stories, and square foot range) and, thereby, did not consider them in our models.

Methodological Insights

Devaux (2018) and Heintzelman (2013) applied the difference-in-difference approach in their studies. Devaux used a difference-in-differences estimator, based on a hedonic repeated sales approach, to isolate the effects of proximity to the property under study. Heintzelman used repeat-sales fixed effects to look at homes before and after the creation of districts in the Boston-Cambridge-Quincy area to control for endogeneity bias. This type of bias occurs when independent variables and dependent variables simultaneously cause each other, and causal effects run reciprocally. We were unable to identify any studies that used the difference-in-difference approach using Ontario-based sales data.

Singbeil (2005) and Kovacs (2015) both used the method of comparing price trends of properties and the average price trend that the house is located within. Kovacs' study also included a variety of research methods to assess the overall success of the districts, including townscape surveys, stakeholder interviews, residential surveys, property sales history evaluation, and plan and document analysis.

Phase 2 (Quantitative Analysis) Findings

Our sample included 208,112 property sale records that occurred between 1983 and 2022. Of these, 222 were sale records for heritage properties. Figure 4 illustrates the distribution of closing prices for designated and undesignated properties. Based on this figure, designated properties appear to have higher sale prices compared to undesignated ones. However, we cannot conclude from this that designation *per se* explains the higher sale prices. For example, the sales of designated properties may have occurred more recently on average, at a time when house prices have been on the rise, or heritage properties may tend be larger and located in more desirable neighbourhoods.
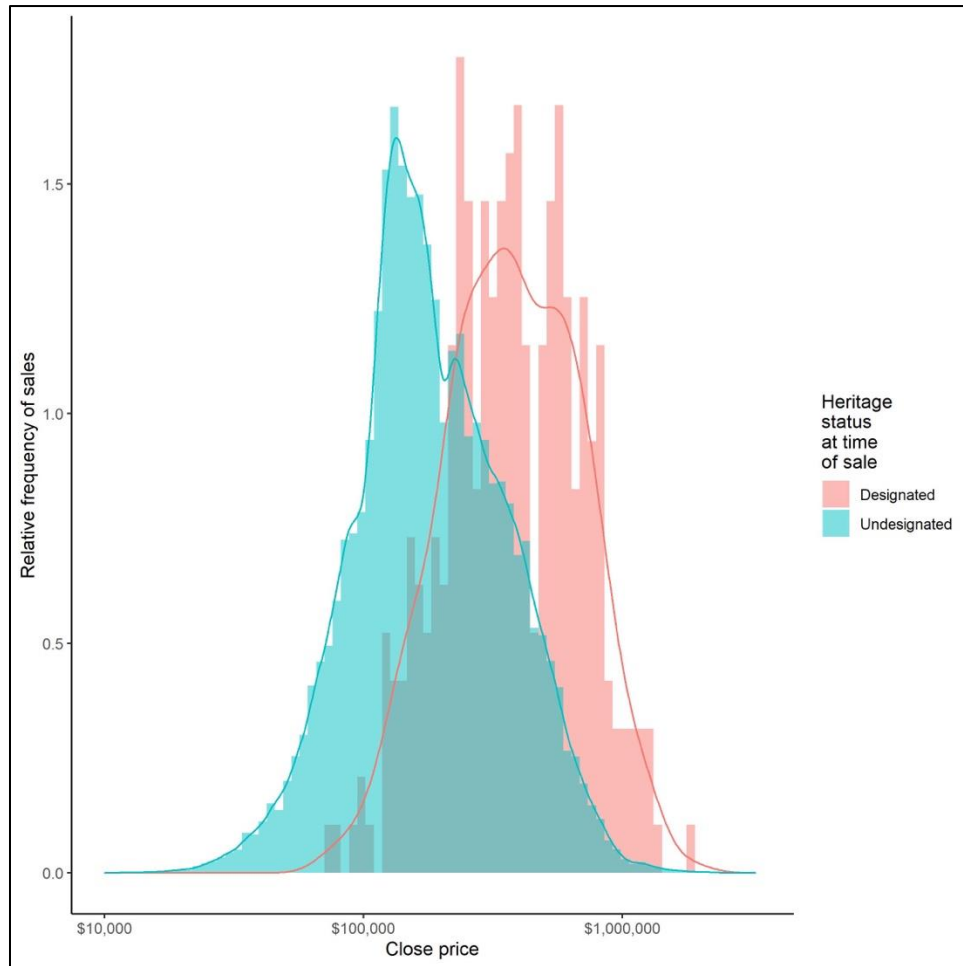
Figure 4. Histogram of Sale Prices

(*Figure 4 Note*: The x-axis is on a logarithmic scale and sales below $10,000 are not shown so that all the data fits on the figure)

Figure 5 illustrates the sale prices of properties over time. Each translucent gray point in the background represents the log of average sale price on a given day. The logarithm of price was taken to accommodate for significant scaling differences that exist in housing prices and makes percentage interpretation for changes in price more readily apparent. In the foreground, each coloured point represents a sale of a property that is designated heritage as of 2023. The colour of each point reflects whether the property was designated heritage *at the time of sale* (i.e., whether the sale took place before or after the property received designation). Sales of the same property over time are connected by black lines. Based on this figure, the sale price of properties appears to be higher after receiving heritage designation, and designated properties appear to be over-represented on the high end of the overall sale price distribution. However, this still does not tell us whether heritage designation *per se* explains the higher sale prices. For example, heritage properties may tend to be in more desirable neighbourhoods, and this may

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explain their higher prices. Therefore, we need to perform a regression analysis to measure the influence of heritage designation on property values, while controlling for other factors.
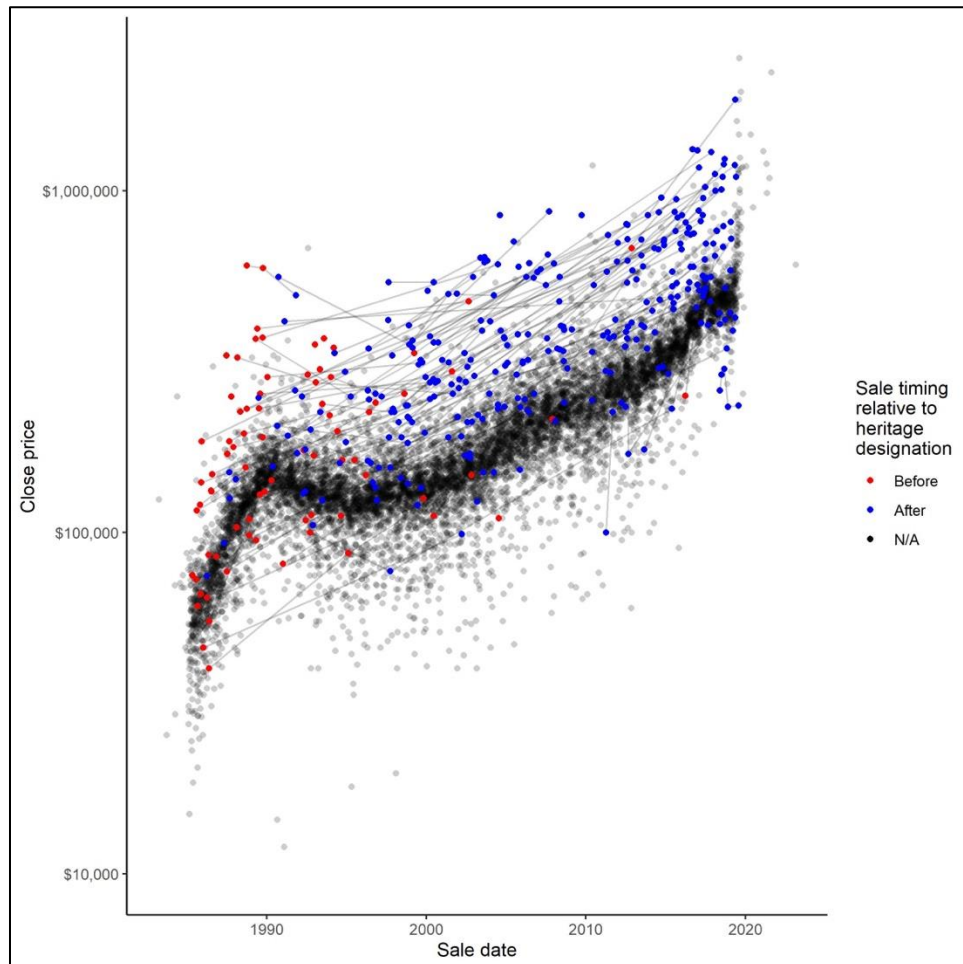

Figure 5. Scatterplot of Sale Prices Relative to the Time of Heritage Designation

(Figure 5 Note: The y-axis is on a logarithmic scale and sales below $10,000 are not shown so that all the data fits on the figure. Grey lines connect sales of the same property over time. Points labelled "N/A" are median sale prices computed for a given day)

For our first regression model, the factors of interest, effect estimates, and level of significance are listed in Table 3. The factors of interest in this model were:

- Year (fixed effect)
- Designation Status
- Number of Rooms
- Municipality

- Lot Depth
- Lot Front
- Building Material

Table 3. Regression Results for Model #1

Factors of Interest	Effect Estimate on Sale Price ($ CAD)	Significance
Designation Status	104,675.00	<0.0001 *
Number of Rooms	21,032.58	<0.0001 *
Lot Depth	<0.00	0.4037
Lot Front	-0.04	0.2428
Building Material #		
Brick	24,016.50	<0.0001 *
Aluminum Siding	-64,188.92	<0.0001 *
Vinyl Siding	-39,984.08	<0.0001 *
Wood	30,408.85	<0.0001 *
Stucco (Plaster)	62,422.48	<0.0001 *
Stone	102,768.61	<0.0001 *
Concrete	-7,912.90	0.0039 *
Brick (Front)	-10,777.50	0.0002 *
Board & Batten	102,204.50	<0.0001 *
Shingle	-17,166.83	0.2072
Municipality +		
Dundas	-68,734.64	<0.0001 *
Flamborough	106,650.45	<0.0001 *
Glanbrook	-70,734.72	<0.0001 *
Hamilton Centre	-189,960.56	<0.0001 *
Hamilton East	-153,445.19	<0.0001 *
Hamilton Mountain	-127,310.59	<0.0001 *
Hamilton West	-113,173.72	<0.0001 *
Stoney Creek	-95,531.37	<0.0001 *
Waterdown	-31,439.01	<0.0001 *

Significant at the level of 0.05
+ Reference category is Ancaster
 # Reference category is Other
R-squared: 0.765   Adjusted R-squared: 0.7649
F-statistic: p-value: < 2.2e-16

Model #1 Interpretation

Holding everything else constant and considering the year fixed effect, heritage designations are associated with an increase in sale price, on average. We cannot interpret the magnitude of this coefficient, since it is a weighted average of the designation effect across all years in our dataset and cannot be interpreted in the price of any specific year. Here, sale price also shows a strong correlation with the number of rooms, all municipalities, and many building materials. The fixed effect of year was added to control for pricing shocks relevant to specific years.

According to our measures of goodness of fit, 76.5% of the variation in sales price is explained by the model (R-squared) and 76.49% of the variation in sales price is explained by the model

after adjusting for the sample size and numbers of variables (Adjusted R-squared). Based on our F-statistic, we are certain that the probability of every regression coefficient equaling zero is extremely low.

In our test for multicollinearity, we observed that some of the building materials were highly correlated (Appendix 1). This may be due to the fact that buildings are typically composed of multiple types of building materials (e.g., aluminum and vinyl).

We observed the effect estimates for lot front and lot depth to be quite small. Upon further exploration, we observed that these variables are highly skewed (Appendix 2). The few observations with very high lot sizes impose undue leverage, which could explain why the effect estimates are counterintuitively low. Therefore, we conducted a sensitivity analysis of Model #1 in Appendix 3 without lot front and lot depth. Removing these factors did not affect our interpretations.

In our second regression model, the factors of interest, effect estimates, and level of significance are listed in Table 4. The factors of interest in this model were:

- Year (Fixed effect)
- Individual address (Fixed effect)
- Designation Status
- Number of Rooms

- Lot Depth
- Lot Front
- Building Material

Address fixed effect was added in the regression to separate out all factors that are pertinent to the property's specific address that could influence the closing price of a house. This allowed us to control for municipality-specific factors and other socioeconomic factors. Ultimately, this allowed us to better investigate designation status' impact on price.

Table 4. Regression Results for Model #2

Factors of Interest	Effect Estimate on Sale Price ($ CAD)	Significance
Designation Status	106,822.18	<0.0001 *
Number of Rooms	11,464.73	<0.0001 *
Lot Depth	0.00	0.1902
Lot Front	-0.43	0.7486
Building Material #		
Brick	17,018.10	<0.0001 *
Aluminum Siding	-37,705.66	<0.0001 *
Vinyl Siding	-23,792.65	<0.0001 *
Wood	15,507.78	<0.0001 *
Stucco (Plaster)	40,906.54	<0.0001 *
Stone	67,040.30	<0.0001 *

	Concrete	1,600.88	0.5558
	Brick (Front)	-8,902.11	0.0033 *
	Board & Batten	75,306.88	<0.0001 *
	Shingle	-35,800.20	0.0257 *

Significant at the level of 0.05
 # Reference category is Other
R-squared: 0.9548   Adjusted R-squared: 0.9093
F-statistic: p-value: < 2.2e-16

Model #2 Interpretation

Holding everything else constant and considering the year fixed effect and the individual address fixed effect, heritage designations are associated with an increase in the sale price, on average. We cannot interpret the magnitude of this coefficient since it is a weighted average of the designation effect across all years in our dataset and cannot be interpreted in the price of any specific year. The sale price also shows a strong correlation with the number of rooms and many building materials.

According to our measures of goodness of fit, 95.48% of the variation in sales price is explained by the model (R-squared) and 90.93% of the variation in sales price is explained by the model after adjusting for the sample size and numbers of variables (Adjusted R-squared). Based on our F-statistic, we are certain that the probability of every regression coefficient equaling zero is extremely low. Similarly, we conducted a sensitivity analysis of Model #2 in Appendix 4 without lot front and lot depth. Removing these factors did not affect our interpretations.

We were unable to test for multicollinearity in this model because the individual address fixed effect had too many variables to assess correlation between them.

Key Takeaways

Based on the results of our literature review and quantitative modelling, we determined that there is strong evidence to suggest heritage designation is associated with an increase in property sale values, though we cannot accurately determine the magnitude of this association.

The included articles in our review arrived at the consensus that heritage designations positively impact the sale price of residential properties. An early study by Shipley et al. (2000) concluded that heritage designation does not negatively impact selling price of properties. Subsequent studies conducted later across Canada supported these findings. A study conducted by Singbeil (2005) in Vancouver concluded that homes that are visually comparable perform the same in the real estate market regardless of heritage designation. Later studies conducted by Kovacs et al. (2015) and Shipley et. al (2018) concluded that heritage properties actually perform better in the market. Important factors that were considered when assessing for changes in property values were zoning, how the land was planned to be developed, and the quality of life each neighbourhood had to offer. A limitation to the literature search is that not many studies have been conducted outside of Ontario, so it is challenging to determine the

impact of heritage designation in the Hamilton context. We only observed a small body of literature on this topic and large, comprehensive studies have yet to be conducted. The lack of available literature may bias our conclusion. Further research should be conducted to address this issue.

The results from our quantitative analysis indicated that property sale prices across Hamilton appear to be higher after receiving a heritage designation. While we did control for a variety of factors in our models, we were unable to control for all factors suggested to be important by our literature review. A major limitation of the results of our quantitative analysis is that the analysis was only able to show association and not causation. As we did not have many properties in the sample that were sold both before and after receiving a heritage designation, we could not conduct a difference-in-difference analysis that would have inferred causation.

Lastly, although we observed strong, positive associations between heritage designations and sale price in both our models, we cannot interpret the magnitude of our effect estimates since it is a weighted average of the designation effect. Therefore, the effect estimate cannot be interpreted in the price of any specific year. Future research could strive to estimate the effect of designation in current day (2023) value by multiplying the closing price to the corresponding housing index of Ontario for each year. This additional regression would allow for the effect estimates to be scaled to the closing prices in current day values and serve as an estimation of the magnitude of the designation. We chose not to pursue this additional regression because our two regressions on unscaled prices are sufficient to estimate the sign and significance of heritage designation.

Conclusion

In this study, we conducted a literature review to identify factors that may impact the sale values of heritage properties. We reviewed nine studies, which were mostly conducted in Canada, that applied various approaches to examine associations between heritage designations and sale values. None of the factors identified in our literature review appeared in the RAHB dataset, so we were unable to control for them.

While most studies applied in the difference-in-difference approach, we chose to pursue hedonic regression to maximize our sample size. When we modelled the relationship between heritage designation and sale values and controlled factors suggested by the City representative, we found that heritage designations were associated with a positive increase in sale value. While we cannot interpret the magnitude of the coefficients obtained in our models, we demonstrated the sign and significance of designation status.

Therefore, based on our analysis, we can conclude that heritage designations are associated with an increase in sale price of residential properties in Hamilton.

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Appendices

Appendix 1

Supplementary Table 1. Multicollinearity Test for Model #1

Factors of Interest	Generalized Variance Inflation Factor (GVIF)	Degrees of Freedom	Corrected GVIF
Designation Status	1.009983	1	1.004979
Number of Rooms	1.148509	1	1.071685
Lot Depth	1.000254	1	1.000127
Lot Front	1.000338	1	1.000169
Building Material			
Brick	1.733205	1	1.316512
Aluminum Siding	16.194955	1	4.024296
Vinyl Siding	15.259339	1	3.906320
Wood	1.065122	1	1.032048
Stucco (Plaster)	1.187696	1	1.089815
Stone	8.724429	1	2.953714
Concrete	1.011340	1	1.005654
Brick (Front)	1.018992	1	1.009451
Board & Batten	1.009357	1	1.004667
Shingle	1.004747	1	1.002371
Municipality (factor)	1.254770	11	1.010369
Closing year (factor)	1.517100	38	1.005499
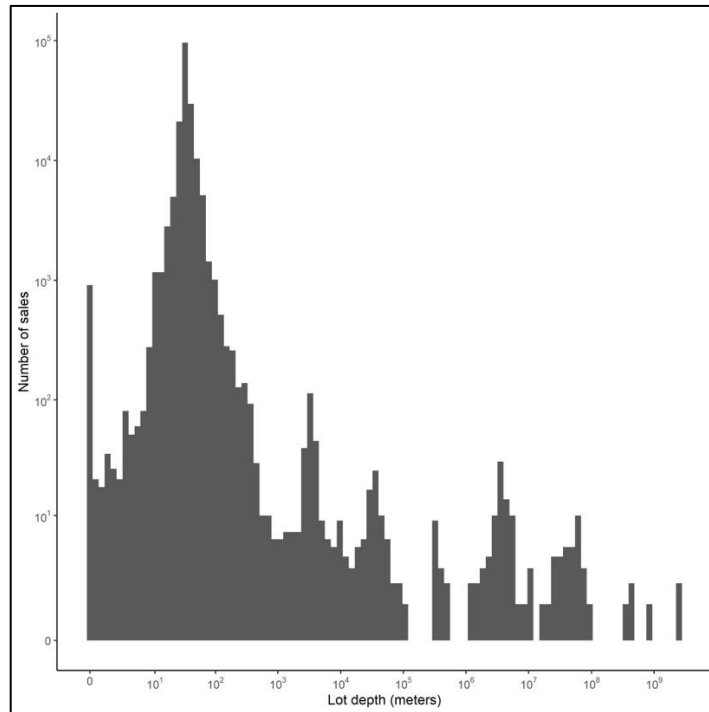
Supplementary Figure 1. Distribution of Lot Depth by Number of Sales Demonstrating Skew
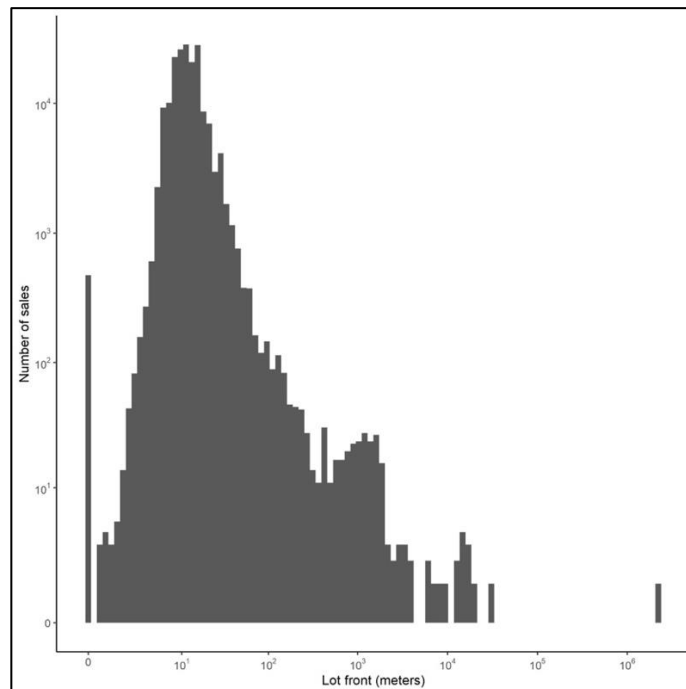
Supplementary Figure 2. Distribution of Lot Front by Number of Sales Demonstrating Skew

Appendix 3

Supplementary Table 2. Regression Results for Model #1 <u>without Lot Depth and Lot Front</u>
(n=220,566)

Factors of Interest	Effect Estimate on Sale Price ($ CAD)	Significance
Designation Status	38,074.59	<0.0001 *
Number of Rooms	24,798.45	<0.0001 *
Building Material #		
Brick	16,515.36	<0.0001 *
Aluminum Siding	-63,332.18	<0.0001 *
Vinyl Siding	-33,847.00	<0.0001 *
Wood	38,482.50	<0.0001 *
Stucco (Plaster)	63,310.78	<0.0001 *
Stone	97,736.47	<0.0001 *
Concrete	-20,982.74	<0.0001 *
Brick (Front)	-7,232.51	0.0076 *
Board & Batten	110,397.63	<0.0001 *
Shingle	-22,956.98	0.0702
Municipality +		
Dundas	-72,885.81	<0.0001 *
Flamborough	108,256.70	<0.0001 *
Glanbrook	-52,894.04	<0.0001 *
Hamilton Centre	-180,976.12	<0.0001 *
Hamilton East	-149,777.72	<0.0001 *
Hamilton Mountain	-124,281.05	<0.0001 *
Hamilton West	-112,135.90	<0.0001 *
Stoney Creek	-94,192.97	<0.0001 *
Waterdown	-24,375.98	<0.0001 *

* Significant at the level of 0.05
+ Reference category is Ancaster
 # Reference category is Other
R-squared: 0.7351   Adjusted R-squared: 0.7351
F-statistic: p-value: < 2.2e-16

Appendix 4

Supplementary Table 2. Regression Results for Model #1 <u>without Lot Depth and Lot Front</u>
(n=220,566)

Factors of Interest	Effect Estimate on Sale Price ($ CAD)	Significance
Designation Status	110,753.63	<0.0001 *
Number of Rooms	13,342.70	<0.0001 *
Building Material #		
Brick	-1,417.70	0.0814
Aluminum Siding	-33,832.53	<0.0001 *
Vinyl Siding	-13,401.16	<0.0001 *
Wood	18,348.76	<0.0001 *
Stucco (Plaster)	30,323.17	<0.0001 *
Stone	50,363.71	<0.0001 *
Concrete	-21,639.82	<0.0001 *
Brick (Front)	-5,546.14	0.0275 *
Board & Batten	87,860.59	<0.0001 *
Shingle	-12,013.82	0.3387
* Significant at the level of 0.05 *[+] Reference category is Ancaster* *[#] Reference category is Other* *R-squared: 0.9453 Adjusted R-squared: 0.9019* *F-statistic: p-value: < 2.2e-16*		