

**EFFECTS OF MACROPRUDENTIAL POLICIES ON HOUSING PRICES IN
SMALLER MARKETS**

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ABSTRACT

This paper investigates the impact on housing prices of smaller census agglomerations when the maximum amortization period on high risk mortgages is changed. The Canadian government makes its decisions to change the maximum amortization period on high risk mortgages when they want to change the level of market involvement of at-risk buyers or to cool the housing markets in Toronto and Vancouver. After studying the housing markets in 19 Ontario regions from December 2005 to December 2015, I find that some of the smaller cities are negatively affected by these blanket policies and that investment factors may negate the targeted effects of macro-prudential policies.

1. INTRODUCTION

It has been more than a decade since the housing bubble burst in the USA, signalling a fire-sale of subprime secured debt that would act as a catalyst to the global recession of the late 2000's. Like most catastrophes, the financial crisis is still a fresh wound for those that lived through it. In part, this is why Canada is afraid of any resemblance of a housing-bubble in its two most vulnerable cities; Toronto and Vancouver.

Canada is vast country covering just shy of 10,000,000 square kilometres encompassing 4 distinct biomes: tundra, grassland, desert, and forest (including temperate rainforest, boreal forest and temperate deciduous forest)¹. In addition to its immensity, Canada is home to approximately 37 million² people across 10 provinces and 3 territories and boasts over 250 ethnic ancestries³. Despite this diversity, however, Canada's housing policy remains national and is applied to all regions equally. This means that mortgage rates across the country are similar regardless of the price of the house or major industry of the nearest city. It means investors value risk equally in each province, though employment and economic growth of local economies may drastically differ. Therefore, the major mechanism to adjust to regional differences and local and national economic shocks in the housing market is the nominal price of the house.

Though geographically massive, 2/3 of Canada's population is living within 100 km of the U.S. border; 3/5 of the population is living in the provinces of Quebec and Ontario and 1/3 of the population (12.5 million) reside in the largest Census Metropolitan Areas (Toronto,

¹ Information regarding Canada's biomes were taken from ScienceWorld.ca on 17 July 2018.

<https://www.scienceworld.ca/resources/activities/what-biome>

² Estimate from April 2018, taken from Statistics Canada on 17 July 2018.

https://www150.statcan.gc.ca/n1/en/subjects/population_and_demography?HPA=1

³ Taken from 2016 Census and reported by Statistics Canada "highlights."

<https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016016/98-200-x2016016-eng.cfm>

Montreal, Vancouver)⁴. If Canada has a housing bubble issue, it is likely to be isolated to the largest markets and not the entire country due to this concentration of wealth and population.

Moreover, losing control in these few markets that contain much of Canada's wealth would accentuate an economic downturn that would have massive effects across the country. This likely justifies maintaining national housing policies grounded on the fluctuations in the markets of Toronto and Vancouver; and cooling these markets when they appear to be bubbling is more strategically important to government leaders than any residual effects in smaller communities. This is why the Department of Finance, Bank of Canada (BoC) and Canadian Mortgage and Housing Committee (CMHC) watch these major cities closely and advise the government of the day how to react to changes in the major housing markets in Canada. However, when policy changes are made to quell the rising prices of the foremost markets is it not still prudent to ask, "what is the effect on smaller markets;" despite the dominance of the larger markets? My paper presents empirical studies that determine the effects of federal macro-prudential policies on smaller communities within Canada.

Using Toronto to set up a baseline model I examined the effects of 3 restricting policy changes and 1 enabling policy change in smaller Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs) in Ontario from December 2005 to December 2015. I compared the significance and magnitude of changes to the maximum amortization period approved by CMHC for high-risk mortgages in 18 communities, to that of their host city. The first policy change was in December 2006 and was intended to allow buyers with little cash flow to enter the market by increasing the maximum amortization period from 35 years to 40 years. The second change was implemented in October 2008 and reversed the terms of the first policy by returning

⁴ Information taken from 2016 Census and reported by CanadianGeographic.ca
<https://www.canadiangeographic.ca/article/key-population-facts-2016-census>

the maximum amortization period to 35 years. The third policy was implemented in March 2011, and further decreased the amortization period to 30 years. The final policy change took place in July 2012 and reduced the maximum amortization period to 25 years. During the time period studied, the government did enact other macro-prudential policies affecting the loan to value (LTV), and its main effects are limited to refinancing houses. Although this does reduce credit availability to homeowners, it is unlikely to affect house prices since people that rely on the equity in their homes to pay off debt are not usually in a position to purchase another home. The exception to this influence is in 2008 when the government increased the down-payment requirements to 5% (from 0%) at the same time that the maximum amortization period was reduced to 35 years. Since these two policies work in the same direction (restricting new buyers), I did not account for this LTV change in the model, and therefore the effects will be absorbed into the coefficient for the dummy variable associated with the amortization change. A detailed description of policy changes from 2006 to 2015 can be found in Table 1.

The findings in this paper are similar to the literature: one lag of the dependant variable; change in household income and its lagged value; population growth; and sales to new listings ratio all prove highly significant. Changes to the real rate of interest were not significant at the 10% level over the period of time that was examined. The dummy variable effects to capture between city differences are negative and significant, indicating that the base-price level is highest in Toronto. The policy affects are significant at the 5% level or better in the baseline model for Toronto, except the 4th policy, and have mixed results in the other regions. Overall, the results reveal the dual effect that macro-prudential policy is influencing the target market and minimizing unintended consequences in smaller markets. This is not universal, however, and there is evidence that some regions in Ontario are vulnerable to policies enacted to calm the

market in Toronto. The most revealing outcome, however, is that investment effects may trump macro-prudential policy effects.

1.1 A PRIMER ON MORTGAGES IN CANADA

A mortgage is considered high-risk when the borrower has a down payment that is less than 20% of the purchase price, and lenders require mortgage loan insurance for all high-risk mortgages. Since these mortgages are paid out by the insurance if the borrower defaults on their financial obligation, there is extremely low risk that the lender will not recover their investment. Therefore lenders encourage more buyers into the housing market by offering more favourable interest rates to borrowers with lower down payments⁵.

Since banking policy is established to limit risk and increase profits, and the central bank is unable to adjust the interest rate solely on housing market data, it is therefore left to government macro-prudential policy to enable or restrict new buyers in the housing market. The tools available to the government are limited, and a change to the amortization period lacks the precision that can be accomplished by slight changes in the interest rate. Consider the marginal buyer that needs to keep their monthly payments low. They will be most affected by changes to the amortization period, rather than a raise in interest rates. For example, a change of 0.25 points in the interest rate results in a monthly payment change of approximately \$50 on a \$400,000 mortgage. Conversely, decreasing the maximum amortization period by 5 years, increases the monthly payment by approximately \$200.

⁵ This fact is well known amongst mortgage brokers and is also mentioned in CMHC's website. <https://www.cmhc-schl.gc.ca/en/finance-and-investing/mortgage-loan-insurance/mortgage-loan-insurance-homeownership-programs/cmhc-mortgage-loan-insurance-cost> (last accessed 27 August 2018).

The reason that I chose to study the effects of changes to the amortization period is the greater effect on monthly payments⁶ and thus the changes to affordability and demand in the housing market for the marginal buyer. These changes in demand should have direct influence on the growth of prices in all markets, not just Toronto and Vancouver. Thus, decreasing the maximum amortization period to cool the housing market in Toronto, may have unintended negative consequences in a region like Thunder Bay, especially if Thunder Bay's housing market has already started to decline.

2. LITERATURE REVIEW

There is no leading consensus amongst economists regarding how to model house prices. This challenge is echoed in the works of Beltratti & Morana (2010) and Goodman (1988). Without consistency in the basic principles of what drives housing prices, it is difficult to compare results, further knowledge and refine models.

Bruno et al. (2017) conducted a comparative assessment of the effectiveness of macro-prudential policies. They state the aim of macro-prudential policies is to “reduce systemic risks arising from excessive financial pro-cyclicality... and other cross-sectional factors”. They surveyed 12 Asia-Pacific economies over 2004-2013 and examined capital flow management and macro-prudential policies. They conclude that macro-prudential policies are a significant tool for governments to use to restrict the actions of agents. Kahou & Lehar (2017) state similar aims of macro-prudential policies during their own comparative assessment of OECD countries, and add that “policymakers and academics have not yet achieved universal consensus on the objectives of macro-prudential policy.” They also point out that failures in the financial sector

⁶ Another consideration for study is the Loan to Value (LTV) which dictates how much of the value of the home that can be mortgaged. However, with regard to Canadian policy, changes to LTV mostly affects refinancing homes and likely has less (if any) influence on prices.

reduce available credit and caution that policy decisions “that make sense for individual institutions in isolation” do not always lead to “desirable aggregate outcomes.” They further assert that policies that change the maximum amortization period in Canada is one of the countercyclical methods used in regulation and they strongly believe that macro-prudential polices are the proper approach for long run stability in the financial system.

2.1 *DYNAMICS OF HOUSE PRICES*

Economists have used a variety of variables to explain the dynamics of house prices. Though dominant models have not been developed, many authors cite the same elements as having the most important explanatory factors. Jacobsen & Naug (2005) display interest rates, housing construction, unemployment and household income as the main variables. For Englund & Ioannides (1997) the main explanatory variables include GDP growth rate and the rate of change in the real rate of interest and their lags, while demographic data had less value when comparing OECD countries. Though some authors create more complex models with many variables (see Beltratti & Morana, 2010), they don't seem to improve the explanation for housing price dynamics. The main commonalities of the models reviewed, reveal that a suitable model must consist of an income growth component (wages, income or GDP), lags of these variables as well as the dependant variable, interest rate, a labour force component (unemployment or population), and controls for inflation and supply in the housing market (building permit, new construction, etc.).

2.2 *THE DUALITY OF THE HOUSING MARKET*

One of the leading reasons for the difficulty in modelling house prices is the fact that houses possess the duality of being consumption goods as well as investment goods. Both components influence the rise (or fall) of house prices, and it is difficult to determine which side is leading in

any region at any time. To create a model that perfectly weights the two factors to make accurate predictions is unattainable, as there is not enough good data to fully understand all of the dynamics in space and time. Still, we can capture a portion of the investment effect by understanding the decision making process of agents. Goodman (1988) shows that creating an owner-renter price ratio is inversely related to the decision to own a home and value-rent ratios are directly related. By using these ratios he develops a better understanding of the potential buyer's motivation behind owning or renting, and thus enhances the demand equation in the housing market. He upholds that the permanent income of an agent is used to make a tenure decision, but current income is used for the agent's demand decisions. Thus using disposable income in models is consistent with this theory. He concludes that "renter housing may have a complex impact on housing demand" and further clarifies that "increases in rents may increase housing demand... even though the actual price elasticity for the renter housing is negative."

2.3 THE CANADIAN CONUNDRUM

Another unique challenge when preparing this paper is the lack of Canadian literature. The International Monetary Fund has a number of working papers that include a more in-depth look at Canada (such as Krznar & Morsink, 2014), but most published papers only use Canada as a comparison to other countries at the national level (see Englund & Ioannides, 1997 and Beltratti and Morana, 2010 for example). Therefore, when it comes to analysing Canada's markets there is a prominent reliance on publications from the Bank of Canada (BoC) and CMHC. To this end I would like to highlight some findings in Allen et al. (2006) and the CMHC (2018) report.

Allen et al. (2006) document results for several empirical models and pay close attention to variables at the municipal level from 1981 to 2005. Primarily, they tested the validity of the aggregate housing index from Multiple Listing Services (MLS) and conclude that "cities'

average housing prices are not determined by some underlying national pricing model linking the cities into a single unique market.” In other words, movement of prices in the Canadian aggregate housing index cannot be used to explain the movement of prices in any given city or small group of cities. This is a leading reason to study the effects of policy on municipal markets, rather than relying on aggregation at the provincial or national levels.

The CMHC (2018) team was asked to explain price levels in several cities from 2010 to 2016. They declare that the key factors to house prices in Canada are income, population and the mortgage rate for long run trends, whereas agent expectations, demand shifts and temporary shocks explain short-run volatilities. They also point out that even though housing constructions is sometimes used to determine the increase of supply, it only represents 1.4 percent of the total housing stock in 2016, where home sales represent 3.8 percent. Moreover, they reiterate the duality of housing products as being a consumption and capital good. They further clarify this phenomenon by explaining, “the market for the use of real estate is the property market, similar to markets for other goods and services, while the market for ownership of real estate is similar to asset or capital markets.” They further breakdown the methodology of analysis for stock and flow models for the housing market as follows:

In the property market, demand comes from the occupiers or users of space, whether they be tenants or owners. In contrast, the supply of housing is given by the asset market, consisting mainly of the housing stock, and the cost for the use of housing is rent. The demand for space depends on rents, income levels, the number of households, etc. In the asset market the price of houses depends on how many households wish to own units, and how many units are available for ownership. The willingness to own a unit is jointly determined by the expected stream of rents or rent to price ratio, and alternative expected returns.

Though the above outlines the theoretical scenario for analysing the totality of the housing market, the authors admit that some data is only available in intervals of 5 years and therefore it

is impossible to fit the model above. They suggest an alternative model of estimating a demand equation by controlling for supply factors if proper variables are not available. They built a stock-flow model and compared the results of a Seemingly Unrelated Regression (SUR) model to Ordinary Least Squares (OLS). They found heteroscedasticity and arbitrary serial correlation were corrected, but the coefficients and t-statistics were virtually identical using the two methods and conclude that “results from separate OLS estimation of a simple demand equation are robust.”

2.4 JUSTIFICATION FOR MODEL CHOICE

Despite not having an agreement with regard to model choice for explaining housing market fluctuations, I feel we know enough about the main causes of house prices that researchers can be confident in their results. I also believe, however, that two additional components need to be considered and accounted for in future models. First, aggregated data is not optimal unless the units of observation are mostly or perfectly homogeneous. There is a large variation of nominal housing prices and growth within a large city and it becomes more complex if aggregated and compared to another (or several) municipal aggregated price indices. Second, contemporary models that ignore asset pricing in real estate are not viewing the whole picture. Perhaps there was a time when the working class bought a house and lived there until they had to upgrade, downsize or move due to changing jobs. Meanwhile, a separate investor class developed land, repaired damaged buildings and supported the rental market. But today this investor class is augmented by a middle class that is more active in capital markets. Some do-it-yourself-ers are flipping houses while working full time jobs. Others buy additional properties and rent them to let “someone else pay the mortgage.” And with advancement in technology, like “Air BnB” access to markets has become more simplified, and new ways to make money from property

investments are being found. Therefore conventional models before the financial crisis are likely accurate for their time, but contemporary models should take this increase in the asset market seriously when developing their models. CMHC (2018) also notes that in Canada prior to 2000, “housing prices fluctuated within the bands of disposable income and population,” but this has become less true starting in 2004 and the separation has expanded further since 2010.

The study of macro-prudential policies is vast. However, I found that most of the literature examines country effects to determine the effectiveness of policies. Success of macro-prudential policies at a national level may be more difficult to assess in Canada than in other countries. With 3 major cities controlling much of the wealth and population, an assessment would surely be biased towards the impact of these regions. But Canada is much more than Toronto, Montreal and Vancouver. In fact, these cities only represent 3 of the 10 provinces. So if a researcher suggests that a policy was implemented successfully, can they be confident that this success carried over to Alberta, the Maritime Provinces or the other Prairie Provinces?

The largest contribution my paper makes to the current literature that analyses macro-prudential policy is examining the effect policy has on smaller markets compared to the major market within the same province. To my knowledge it is the first paper to attempt such a comparison and will provide researchers with a better understanding between regional effects and policy. My paper is unable to address the problems associated with aggregated data, as complete, individual datasets across cities does not exist in Canada at this time. Still, using aggregated data is useful as it can measure large movements from the trend in housing markets. A policy change to the amortization period in 2006, 2008, 2011 and 2012 were promoted as having enough power to buck housing prices from trend, and therefore offers a terrific starting point.

3. DATA

Allen et al. (2006) surmises the biggest hindrance to this paper, “finding high-quality, comparable Canadian data at the municipal level is problematic.” They emphasize that municipal factors are more relevant to understanding price movements than what can be determined in national data. With this in mind, I purged data from the Canadian Real Estate Association (CREA), Statistics Canada and other sources to gather local information on Canadian Census Agglomerations (CA) and Census Metropolitan Areas (CMA). I examined data from December 2005 until December 2015 of 19 cities: Barrie, Brantford, Cornwall, Durham, Guelph, Hamilton, Kingston, Kitchener, London, Mississauga, North Bay, Ottawa, Peterborough, Sarnia, Sudbury, Thunder Bay, Toronto, Windsor and York. These cities were chosen because they represent the full geography of Ontario and the data from CREA and Statistics Canada had similar or perfect matching coverage for these regions. Where relevant, all of the variables are seasonally adjusted and corrected for inflation. Table 2 lists the complete characteristics of variables.

The log value of real house prices is used as the dependent variable. As mentioned above, a readily available table of non-aggregated house prices for cities across Canada does not exist. Therefore I use the city-level, aggregated average sale price provided by the CREA and the CPI from Statistics Canada to calculate the variable. Since all of the cities are in Ontario, I could have used nominal prices, but I opted to use real prices to be consistent with literature for a more accurate comparison with the magnitude of the results.

Income and population presented the unique challenge of being reported in 5 year intervals. I chose to use the log value of median after-tax income of households as reported by Statistics Canada and Census for the years 2001, 2006, 2012 and 2016 and used the population

figures for each city from those censuses as well. As pointed out by Kuttner & Shim (2012) and others, using household disposable income is desired to capture the demand in housing markets. Interpolation is used to convert these 5 year intervals into monthly forecasts for both variables. Though it is unlikely that median wages increased (or decreased) in such a smooth, weighted manner, it will stand as a proxy just as well as alternatives presented in the literature.⁷ I believe that median income is more appropriate than average income because it captures the variation of income in the population as population changes over time, better than average income. Average income is a good measure for the affluence of the local economy and is likely fitting for models that estimate the change in house prices over time, since demand will increase as wealth increases no matter the distribution of wealth. However, it can tell us little about policy affects, since changes to the amortization period has its greatest effect on the marginal buyer and not the total wealth of the city.

Similar to income, population changes are not as fluid as reported here and may have severe time-trend bias as a result. Though it is possible that a city experienced a boom or bust to its population that reversed within the 5 year time frame between censuses, I did not find any evidence of this in the areas being studied. The main loss here is that if population did spike in a short time period and was relatively flat for the rest of the time period, the regression will not attribute any similar spike or changes to house prices. However, population growth is an important metric to include since it stands as a proxy for labour and population density creates a natural demand for houses.

The “Sales to New Listing” ratio is calculated by CREA for each region on a monthly basis. This acts as the supply component in my demand equation and measures the health of the

⁷ Kuttner & Shim (2012) use GNI per capita (interpolated to quarterly series), Jacobsen & Naug (2005) use wage income and Allen et al. (2006) use the union wage index (UWI).

housing market. If new listings are relatively high compared to sales, this would present a buyer's market. Conversely, high sales with few new listings would suggest a low supply relative to demand and thus a seller's market. According to Comfree⁸, a ratio above 0.6 represents a seller's market and a ratio below 0.4 is defined as a buyer's market. There are 1077 data points that represent a ratio above 0.6 and 1155 data points representing a balanced market (0.4 – 0.6) and both indicators span all of the cities. The remaining 67 data points that represent a ratio below 0.4 span the following cities [North Bay, York, Windsor, Durham, Sudbury, Kingston, Toronto, Mississauga, London, and Cornwall]. Table 3 contains descriptive statistics regarding the sales to new listing data and prices.

It may be common to use building permits as a supply measure, but I am skeptical about its relevance to this paper. There is a long delay between a developer getting a permit and actually building a home (adding to the supply). So, even though an increase in the number of building permits may provide good information regarding the health of the market, I believe it could be misleading as a control for supply. Further to this, Jacobsen & Naug (2005) iterate that “housing construction per year is low in relation to the total housing stock” and thus prices react to demand changes in the short run, and supply will adapt over time. Since this is an analysis of short term shocks, it is better to model a relatively fixed housing stock.

The best method to represent the interest rate within a model is a bit of debate within the literature. For example, Beltratti & Morana (2010) opt for nominal interest rates, Kuttner & Shim (2012) and Jacobsen & Naug (2005) use the bank lending rate, and Englund and Ioannides (1997) use the real interest rate. I retrieved the prime lending rate from Trading Economics,⁹ because they have more readily available historic tables and they report the same numbers as the

⁸ <http://blog.comfree.com/2017/07/05/what-are-buyers-sellers-and-balanced-markets/> Accessed 25 July 2018

⁹ www.tradingeconomics.com (<https://analytics.tradingeconomics.com/?source=chart>) Accessed 18 July 2018

Bank of Canada. The prime lending rate is defined as “the average rate of interest charged on loans by commercial banks to the most credit-worthy borrowers” on the Trading Economics website. The prime lending rate varies very closely to both the fixed 5-year mortgage rate and the variable rate, and thus encompasses the demand side of the housing market well. Since the prime lending rate was very low and stagnant for most of the period examined, I subtracted the real inflation rate from this value.

4. MODEL

My concern is not with determining price levels, or analysing the existence of a bubble. These questions require much more detailed models to tease out which economic factors are leading or lagging, stochastic or speculative. Econometrically speaking, I am developing a simple comparison between several groups: a mega city that may have a market bubble; and smaller census agglomerations. Therefore, it is of more importance to accurately control for economic variations than it is to predict the price level in equilibrium. I follow the advice from the CMHC (2018) report that suggests analysing a demand equation with control for supply is sufficient and robust. Therefore, I use the following base model for OLS regression:

$$(1) \quad Y = B_0 + B_1Y(-1) + B_2I + B_3I(-1) + B_4L + B_5Z + B_6S + B_7C + B_8P + B_9(C \times P) + u$$

Where, “Y” is log of real house price, “B₀” is constant, “I” is log of real disposable income, “L” is the log of population, “Z” is prime lending rate (adjusted for inflation), “S” is the Sales to new listing ratio (control for supply), “C” is a matrix of city effects (excluding Toronto), “P” is a matrix of policy effects and “(-1)” indicates a one-period lag. The coefficient, B₉, will capture the additive policy effects for individual cities, where B₈ will capture the policy effect for Toronto.

4.1 DUMMY VARIABLES

In the literature review there were papers that assessed the effects of macro-prudential policies across different regions (see Kahou & Lehar, 2017 and Bruno et al, 2017 for example). The authors conducted separate regressions for each region because they had to account for a severe degree of heterogeneity. That is, each country has a different tax system, geography, and culture towards owning houses to name a few differences. My model is restricted to Ontario, where provincial and national decisions are applied equally upon municipal agents. However, I do acknowledge that there are differences between cities and thus I created 18 city dummy variables, covering each region except Toronto. These CMAs and CAs are defined by Statistics Canada and are closely matched to the regions defined by CREA¹⁰. Although I maintain that it would be better to control variation of the regions by using the postal code¹¹ (to account for the variation of affluence within a city), city effects will capture underlying differences in base prices, property taxes, short run supply, and other important characteristics. The city effects of the regression are expected to be negative, indicating that they have a lower base-price level (constant) than Toronto. This allows a further analysis of the slope changes of the variables of interest, which is the main focus of this paper.

There are 4 dummy variables, one assigned to each policy effect. The variables are assigned a value of 1 for every period that the policy is in effect and zero otherwise. Thus the dummy variable for the first policy carried a value of 1 when the amortization period was 40 years; the second policy when the amortization period was 35 years; the third policy when the amortization period was 30 years; and the fourth policy when the amortization period was 25 years. Alternatively, a value of 1 could have been used only for the month that the policy came

¹⁰ Table 4 provides information regarding the areas covered by each representative city name.

¹¹ Readily available information in Canada does not exist at this level.

into effect (December 2006, October 2008, March 2011 and July 2012). Kuttner and Shim (2012) point out that using dummy variables in this fashion implies that the result will only reflect a transitory effect on housing price growth, and other variables will return to previous levels (all things being equal). Since I am analysing the total effect, and not just the shock, I opted to use the former method. Furthermore, since the policies were implemented randomly throughout the year (December, October, March, July), I think it is important to use monthly data rather than quarterly. Two of the policies (2 & 4) were implemented at the beginning of a quarter, and the remaining two policies were implemented at the end of the quarter. Since this is not consistent, there may be biasedness using quarterly data. For the second and fourth policies, the regression would measure changes to the previous months within the quarter, as if the policies were enacted at the beginning, rather than the end, of the quarter. Still, there are some advantages to quarterly data, such as amplification of effects and less time intervals. Therefore I have incorporated two regressions (with lags and without lags) using quarterly data.

4.2 ENDOGENEITY

One obvious concern is the endogeneity of the policy variables in the model. Since the macro-prudential policies were implemented in response to rising house prices and other market data, they are, by definition, endogenous. Fortunately, as Kuttner & Shim (2012) point out, any endogeneity of policies will simply “understate their effectiveness.” For example, a policy implemented to restrict the demand should lower housing prices. However, if the policy is unable to fully stop the increase in price and stabilise the market as intended, then the variable would correlate positively with housing prices. In other words, any desired (negative) effects of the policy will be diluted by this positive inflection. This is confirmed by Cerutti (2015) et al. who used the GMM estimator to “mitigate important endogeneity concerns.” They compared

their baseline regression with the OLS estimator and found that the two methods were empirically similar, though the magnitude of the OLS coefficients were smaller. In light of these observations and the CMHC (2018) report that found results from OLS and SUR regressions to be similar, I believe that OLS is a sufficient estimator to determine if smaller markets are being affected negatively by macro-prudential policies. Since the effects are likely understated, any findings of harmful effects can be presented with confidence.

4.3 ROBUSTNESS

To ensure findings were robust, I made a few amendments to the base model¹². First, I changed the data to quarterly intervals to match the majority of literature. This also has the dual advantage of identifying a different reaction time of agents and limiting the number of time periods. Buying a house is a large decision and people may be unlikely to discontinue their search of a home in the face of changing policies. Therefore, aggregate changes to demand may take longer than a month as agents adapt to changing conditions. The reduction in time periods is also expected to amplify the effects of policy changes and make the results more comparable to other literature.

Second, I created a new matrix that captured the 3 months prior to policy implementations. This captures the period where rumours may be circulating regarding the change of policy and includes the time between the announcement of policy and the implementation. During these months, buyers may rush to buy a house (putting an upward pressure on prices) to avoid purchasing under the next policy regime. I added policy lag dummies to the base monthly and base quarterly regression sets.

¹² Using unemployment as an explanatory variable was considered as a robustness check (data for all of the cities is not available). Even though this variable was found to be significant, and the real interest rate was also significant, I did not include it because it further complicates the problem of endogeneity and does not add to the conclusions of this paper.

As mentioned during the literature review, I believe it is very important to study investment effects to capture the asset appreciation portion of the housing market. Therefore, I added to the baseline model the log value of the ratio between costs to a renter and costs to an owner. These values were captured from Statistics Canada's censuses, and the new model becomes:

$$(2) \ Y = B_0 + B_1Y(-1) + B_2I + B_3I(-1) + B_4L + B_5Z + B_6S + B_7C + B_8P + B_9(C \times P) + B_{10}(R/O) + B_{11}(C \times [R/O]) + u$$

Where, (R/O) is the log value of the ratio between renter's costs and owner's costs. Statistics Canada uses 25% of the data in the census to calculate renter and owner costs, and defines the variables as follows:

Shelter costs for owner households include, where applicable, mortgage payments, property taxes and condominium fees along with the costs of electricity, heat, water and other municipal services. For renter households, shelter costs include, where applicable, the rent and the costs of electricity heat, water and other municipal services.

If renter costs are rising faster than owner costs, this is a good signal that investment potential is intensifying. Investors will increase their demand for housing to take advantage of higher potential profits and prices will increase. Similarly, if ownership costs outpace renter costs, this may signal that profitability is on the decline, and investors will look for more lucrative markets.

5. RESULTS

My results from the base regression (Table 5) are in agreement with the literature with regard to the key explanatory variables. The lag of real housing price growth rates, disposable real income growth rates and their lag, population growth rates and the Sales to New Listing ratio (supply variable) all prove very significant. Real interest rate is not significant, which is in line with Case & Shillar (1989) who propose that buyers do not time their purchase of a home based on the interest rate and therefore real interest rates are not a strong explanatory variable for house prices. This is also empirically shown to be the case for Allen et al. (2006), who found the

interest rate to be mostly insignificant in Canadian cities¹³. They state that this result is consistent with many researchers who fit linear models and suggest that future research could examine non-linear relationships between the interest rate and house prices.

There is also a puzzle with the sign of the population variable. It is expected that an increase in population would increase demand and thus increase housing prices. Allen et al. (2006) have theorized that increasing the labour force creates a downward pressure on wages even though the increase in population density should increase demand for houses. This could explain the negative correlation shown in this model, if population growth slows the rate of income growth due to competing wages. Although, this particular puzzle may also be reflective of the interpolation process of income and population data. More study would have to be conducted to verify the source of the puzzle; and, perhaps, segregating house types may show that population increases are positive for one type of house or value-range, but negative for others.

A summary of expected effects of the policies are summarized in Table 1, and empirical effects in Toronto using the base regression are as follows. The coefficients for the second and third policies are negative and significant at the 5% level. Policies 1 and 4, however, show opposite signs than expected and this reveals a puzzle. Although the maximum amortization was raised from 35 to 40 years with the first policy and is expected to increase prices through an increase in demand, it is possible that this only affected a small portion of buyers. If the overwhelming number of buyers opted for an amortization period less than 40 years, then the increase in demand would be too small to be captured in the policy effect. Policy 4 is a more difficult puzzle to explain and will be covered in more detail in the robust models.

¹³ The interest rate was found to be positive and significant in Calgary, Edmonton and Vancouver, and negative and significant in Ottawa and Toronto.

5.1 CITY EFFECTS

It is well known that the prices in Toronto were growing faster than other parts of Canada during the time period analysed, and therefore it is not surprising that all city coefficients are negative and significant at the 1% level. What is intriguing, are the policy effects on the cities when compared to Toronto. In the following paragraphs I will provide a breakdown of each policy.

5.2 POLICY EFFECTS (1 & 2)

The first policy was not significant at the 10% level in half of the cities,¹⁴ and was only a puzzle in Windsor (which was not significant). Of the 9 remaining cities; effects in Hamilton and North Bay showed significance at the 10% level; effects in London, Kitchener-Waterloo and Mississauga proved significant at the 5% level; and effects in Sarnia, Sudbury, York and Barrie were significant at the 1% level. In this paper there is no obvious reason why particular regions benefited or were impaired from this policy change. For example, Hamilton and Windsor are both heavily reliant on the manufacturing industry, but Hamilton benefited from this policy and Windsor was not statistically affected. Similarly, Durham, York and Mississauga are part of the Greater Toronto Area (GTA), but have varied results.

It was the government's intention that this policy would allow families with insufficient capital or monthly income to be able to enter the housing market. Since Toronto had a healthy housing market, it is unlikely that they were the target of this policy. Therefore, this policy is successful in meeting the government's intention since several cities showed demand increase, but it did not inflate the Toronto market, which could have endangered their economic stability.

The second policy was a reversal of the terms of the first policy. As such, expectation may be that the consequences would be similar in the regression to the first policy. That is, those

¹⁴ Kingston, Peterborough, Thunder Bay, Windsor, Cornwall, Brantford, Durham, Guelph and Ottawa

regions that benefitted from 40-year maximum amortization period, would now see a downward pressure on demand. However, it is important to note that there were nearly 2 years between policy 1 and policy 2, and in 2008 the housing market was in a different situation than in 2006. In 2008, the Canadian government was reacting to the financial crisis and wanted to ease fears that the mortgage insolvency in the USA would not replicate in Canada.

The second policy was negative and significant in Toronto, showing a marked difference of 0.8% decrease in price growth. The effect in the other cities was much different, as policy 2 produced the most puzzles. Sarnia, Hamilton, London, Kitchener-Waterloo, North Bay, Sudbury, Brantford, Durham, Mississauga, York, Barrie and Ottawa all showed puzzles at significant levels of 10% or better. In addition to this, Kingston, Peterborough, Thunder Bay, Cornwall and Guelph also produced positive signs; however the coefficients were not significant. Only Windsor, in addition to Toronto, carried the proper sign and was significant at the 1% level. The impact in Windsor is similar to Toronto, as it shows a 0.7 % decrease in prices.

The Government's intention for policy 2 was to minimize the risk of rapidly increasing prices in the housing market in Canada's most vulnerable cities. Since this is the effect in Toronto and only one other region, this policy is successful. For the cities that did not show policy 2 as significant, it is likely that 40 year amortization periods were not utilised by very many buyers, and thus decreasing the maximum amortization period was inconsequential. Further to this argument, it is likely that the bulk of persons that required a 40 year amortization period in order to enter the market took advantage of this program within the first several months of it being enacted. Krznar & Morsink (2014) also reported that the 2008 policy change was not significant for national data, though it carried the proper sign. Perhaps the policy was effective

in the larger Canadian markets, but the total significance of the policy was drowned-out by the cumulative effect of all other markets.

5.3 POLICY EFFECTS (2 & 3)

Similar to policy 2, the third policy was negative and significant in Toronto signifying a 0.5% decrease in price growth. Policy 3 produced puzzles that were significant at the 10% level or better in Hamilton, Kitchener-Waterloo, Sudbury, Thunder Bay, Mississauga, York, and Barrie. The policy was not significant in 7 cities: Sarnia, London, North Bay, Brantford, Durham, Guelph and Ottawa. The policy was negative and significant for Cornwall, Windsor, Peterborough, and Kingston. In Cornwall, the decrease in the price growth rate is approximately 0.35%, for Windsor 1.1%; Peterborough 0.55%; and for Kingston 0.4%. For those cities that experienced puzzles; Hamilton showed an increase of growth rate of approximately 0.3%; Kitchener 0.37%; Sudbury 0.98%; Thunder Bay 0.35%; Mississauga 1.0%; York 1.5%; and Barrie 1.0%.

When judging the success or failure of policies, we cannot be too concerned about minor cities that produce puzzles. If a policy is designed to cool a market, like policy 3, and a minor city's price increases despite this fact, this only shows the strength of the housing market in those areas. Since these regions are not at high risk for bubbles, the policy is still deemed successful even though the policy had effects opposite of the intention. More concerning are the cities that experienced negative effects (the intention of the policy), because it is possible that the economies in these areas could have benefitted from a growing housing market. For example, Windsor prices dropped one percent during the period where the maximum amortization was reduced from 35 to 30 years. In 2008, when the financial crisis had commenced, unemployment was under 10%. This number jumped to over 15% in mid-2009. Windsor started to recover and

the unemployment rate hovered around 10% again in 2011 when policy 3 came into effect¹⁵.

With an increasing labour force, and the economy seemingly on a rebound, Windsor's housing market could have benefitted from a neutral or positive policy. Instead, workers that had started to get their life back on track after a period of not being able to work, were likely prevented from entering the housing market because of the reduction in the maximum amortization period. This decrease in demand (at a time when demand should have been increasing, naturally), reduced the growth of prices for the region.

Policy 4 carried the wrong sign for Toronto, though the coefficient proved not significant. This means that when the maximum amortization period was reduced to 25 years, this did not have a statistically significant effect in Toronto. It is possible that the majority of buyers in Toronto in mid-2012 did not require 30 year amortizations on their mortgages or perhaps demand was driven by other factors than the entrance of marginal buyers; in either case policy 4 did not have the effect that government intended. As for the smaller markets, Hamilton, Sudbury, Thunder Bay, Durham, Mississauga, York, and Barrie all had puzzles with a significance level of 10% or better; whereas, Sarnia, London, Kingston, North Bay, Peterborough, Windsor, Cornwall, Brantford, and Ottawa experienced a decrease in housing price growth. In addition to Toronto, Kitchener and Guelph produced coefficients that were not significant.

Policy 4 is the only macro-prudential policy that failed to correct the housing market in Toronto and had major impact amongst at least half of the smaller CMAs. This is the second time that Cornwall, Peterborough and Kingston experienced negative and significant effects from macro-prudential policy and the third time for Windsor. From the baseline regression, there is

¹⁵ Local employment rates were taken from Statistics Canada, Table 14-10-0294-02 "Labour Force Characteristics by CMA, 3 month moving average, seasonally adjusted (x 1,000).

enough evidence to suggest that some smaller CMAs and CAs are negatively affected by policies intended to decrease demand in Toronto.

5.4 ROBUSTNESS CHECK (QUARTERLY DATA)

To verify that these results are robust, I amended the model in various ways. First, I changed the time of the observations from monthly to quarterly, and the resulting regression can be found in Table 6. Checking the regressions against quarterly data achieves two objectives. First, it decreases the number of time intervals and, second, it better relates to the literature that uses quarterly or yearly data. Most of the result changes are inconsequential, as there are only slight changes to the coefficients, which likely reflect the change in time interval. Also, in every instance where the sign of a statistically significant coefficient flipped, the result was not significant at the 10% level and therefore this is also unimportant. What is interesting is the change of significance of policy effects for a number of cities. Hamilton, Peterborough, and Cornwall all show insignificant values for the coefficients representing the effects of policy 3, whereas London and Ottawa now show that the effect is significant. Similarly, Sarnia, London, North Bay, and Ottawa now have insignificant coefficients representing policy 4. Cornwall, Peterborough, Kingston and Windsor appeared as the most vulnerable cities to macro-prudential policy in the first regression; however, when using quarterly data, Cornwall, Kingston and Peterborough become less vulnerable and only significantly affected by policy 4. Windsor remains vulnerable to all 3 of the macro-prudential policies that were intended to restrict demand.

Comparing the overall effects between the models that use monthly and quarterly data, it is important to note that there are few differences between the analyses of the models. Although there were marked differences for London, Cornwall, Kingston, Peterborough, Guelph and

Ottawa; only Guelph, Ottawa and London had results that became significant after using the quarterly data. For London, the third policy decreased price growth by 0.5%, but the fourth policy's effect became insignificant using quarterly data, where the coefficient had previously been negative and significant using monthly data. Similarly, Ottawa showed a positive value for the third policy effect in both regressions but it was only significant using the quarterly data. Further, the significant, negative effect of the fourth policy (Table 5) became not statistically significant in Ottawa when using quarterly data (Table 6). So the two models agree that London and Ottawa were affected, but disagree about the time and policy. For analysis, it is more important that there is consensus between regressions that cities were or were not affected, and less important regarding the specifics of how and when. Guelph was more unique as it now showed significant positive coefficients for policies one and two. This is a noteworthy difference between the models and implies that the first policy enabled new buyers to enter the market and this increase in demand raised price growth by 4% from the natural trend. The second policy is also positive which doesn't endanger the housing market and is therefore trivial to the analysis.

Despite showing that the two models illustrate different results, I do not hold that one method is superior to the other. The two regression techniques represent different theories regarding the reaction time of agents to fluctuating economic information. If agents have perfect information, I believe they make their decisions quickly. Though it is true some information (like inflation rates) are reported retroactively, I believe that people "feel" the changes before they are reported. For instance, a consumer feels the inflationary pressure at the grocery store when prices are unseasonably expensive, even though the agent does not yet realize the percentage increase; month over month or year over year. Similarly, one may fear that their job

is in jeopardy due to economic factors before the employment data is reported publicly, and before their employer begins lay-offs; and this fear will influence consumption decisions. Others may disagree that agents change their behaviour so quickly and thus rely on quarterly data for their models. One method to measure agent response time is adding a policy lag variable to capture behaviours before the implementation of the policy.

5.5 ROBUSTNESS CHECK (POLICY LAGS)

Upon hearing that the government is going to make it tougher to acquire a mortgage in the future, agents may rush to solidify an agreement under the current terms. This will likely increase demand for houses in the short term (before the new rules are in place). In the previous regressions, an increase in demand during the last month or two leading to a policy change would be associated with the last policy that was active during that time-frame. This may assign false credit of price changes, as it is not the policy that is influencing demand but the knowledge of a future policy that is driving agent actions. Implementing 4 policy-lag dummy variables will alleviate any surge of demand from active policies to the lag policies.

For the lag of the first policy, only agents that require a 40 year amortization will wait for the new policy to be active. Therefore, the coefficient is likely not significant or is negative for any of the cities. For all of the other lag-policy variables, the expectation is that buyers will surge to buy before the next policy becomes active. Therefore, the coefficient for the other lag variables will be positive or not significant.

5.5A POLICY LAGS – MONTHLY DATA

Table 7 summarizes the regression results that use monthly data and three-month policy lags. The third and fourth policy-lags are not significant in Toronto. The confidence intervals for the policies between the base regression (Table 5) and this regression overlap, signaling that the

magnitude of the effect is robust between models. The first policy lag indicates that Toronto experienced a 0.14% decrease in prices leading up to the implementation of the first policy. As stated earlier, this fits with the theory that aggregate demand may fall as buyers wait for the next policy to become active. However, the first policy effect is also negative and decreased growth rates by 0.4%. If the policy lag was negative because buyers waited until the policy was implemented, then there should be an upward pressure on prices when the policy came into effect. Since this did not happen, it is unlikely that the negative coefficient was due to patient buyers. The second policy lag is a bit of a puzzle as its coefficient is also negative. The second policy occurred in 2008 when investors were most skittish about the housing market, so this result may be influenced by asset pricing rather than demand for housing. But there is not enough information here to make a determination. There were no real changes to the effects of policies one to four in any of the minor cities, after adding lag variables. The first policy-lag was not significant in any smaller market except Sudbury, Thunder Bay and Barrie. All three coefficients were positive, which means growth in prices increased above trend by approximately 0.8% in Sudbury, 0.57% in Thunder Bay and 0.6% in Barrie. These puzzles could mean that sellers anticipated an increase in demand and thus increased their prices early, or it could be indicative of other exogenous factors.

The second policy-lag was positive and significant for only Sarnia and Sudbury. Similarly, the third policy-lag was negative and significant for Windsor and Cornwall. All remaining policy-lag coefficients were not significant across all cities. As mentioned in the theory, it may be that buyers rushed to purchase homes in Sarnia and Sudbury, when the 40 year amortization was being revoked. However, positive coefficients were also ascribed to the second policy in Sarnia and Sudbury, indicating that prices continued to increase above trend after the

maximum amortization dropped to 35 years. Therefore, it is not conclusive that the policy had an isolated effect on the behaviour of agents or housing prices in the region.

In Cornwall, average prices mirrored a roller-coaster in the first few months of 2011. In December 2010 prices dropped from \$161,724 to \$134,888 in January 2011 and then back up to \$164,698 in February, and down again in March to \$146,473 before prices finally rested above \$160,000 for the rest of the year. Some of the other cities have normal drops in price during one of the months from January to March, but prices do not show this volatility except in Cornwall. Additional cities, perhaps more economically stable, present drops that are more nominal and not very pronounced during winter months. Upon closer examination, Cornwall exhibited this type of market volatility since the commencement of the financial crisis (2008-2009) until 2012-2013, when the city started to mimic price patterns similar to other regions. Since this is the only policy that became effective during the first quarter, and the volatility of house prices continued in other years in Cornwall when policy was not initiated, it is difficult to accept that this particular policy had a pronounced effect on buyer-agents.

Windsor, on the other hand, displayed more regular market tendencies. In January 2011 average prices were \$161,033 which is an increase from the month before. In February the prices dropped to \$146,586 and Windsor experienced a partial recovery in March (\$151,851) before stabilizing prices above \$161,000 in April. The sales to new listing ratio dipped below 50% for the entire first quarter in 2011 which was not typical for the previous year or any of the following years. From June to September 2010, Windsor experienced another period where the sales to new listing ratios were steadily below 50%. However, prices in the two periods do not imitate each other, except that they both peak during the second interval. Therefore, this may be a true puzzle.

5.5B POLICY LAGS – QUARTERLY DATA

Changing the lag-model to a quarterly dataset yielded few meaningful differences, and I will highlight them below; the full results are found on Table 8. The first policy lag was significant in more cities (London, Sudbury, Mississauga, York, Barrie, Guelph, and Ottawa) when using quarterly data. However, the values were positive and was followed by positive coefficients for the first policy. Therefore, these positive attributes are not descriptive of a drop in demand due to patient buyers.

Using quarterly data, the second lag did not add value over the regression using monthly data, either. The only changes with regard to the second lag, are that Sarnia and Sudbury displayed non-significant coefficients. Similarly, there were numerous changes in the third and fourth policy lags as several cities now showed a statistically significant coefficient. However, this result was always counteracted by another value change in the regression. For example, the first and third policy effects became significant in North Bay with the quarterly data, but the third policy carried the wrong sign and the fourth policy effect became not statistically significant. So although there were several changes to North Bay, the conclusion is the same – macro-prudential policies did not threaten the stability of the housing market in North Bay.

The only real significant changes to the results, were in Toronto. Using quarterly data with lags, the fourth policy became statistically significant at the 6% level, where previously, the policy was not significant in the quarterly-data model without lags (Table 6). I believe the volatility of the effects of the fourth policy in Toronto are a result of asset pricing factors that are being captured differently in each model. Therefore, I added a renter / owner cost ratio to the base model to measure investment effects within each housing market.

5.6 ROBUSTNESS CHECK (ASSET MODEL)

The result for Toronto using this model fits theory and conventional conjecture better than the previous regressions. For instance, the coefficients for population and the real interest rate are not significant. This is common place for the real interest rate in these models; and this result also improves the explanation regarding population. In the base regression, the population presented a puzzle. However, when investment is added to the equation population is no longer a factor. Therefore, investments are driving demand more strongly than population density. A complete summary of the results can be found on Table 9.

The next important result is the magnitude of the coefficient for the investment variable. If rents increase by 10%, this will increase price growth by almost 4%, in Toronto. The greatness of this effect diminishes the first and third policy effects to not statistically significant. The second and fourth policy effects are now more robust, indicate the proper sign, and are both significant at the 5% level.

The magnitude of city effects also changed prominently; including the city effect for Durham is now positive and significant at the 5% level, and the city effects for York and Hamilton became not statistically different from Toronto. Investment effects in the minor cities were negative and significant except Durham (which was not statistically significant) and the investment effect was only significant at the 14% level in Hamilton. Since the coefficient for the city-investment effect in Durham was not statistically different from Toronto, the growth rates of prices will increase as renter costs increase. Thus demand is increased in the housing market as investors capitalize on higher rents in Durham and Toronto. In all of the other regions, higher rental costs, compared to ownership costs, lessens the demand for houses and thus exhibits a downward pressure on prices. I believe this shows that in smaller markets the traditional

negative renter-elasticities reported by Goodman (1988) still hold. Increasing rents make it difficult for people to save money, and therefore potential new buyers may not have the means to enter the market. Conversely, in markets where investment is plentiful, increase in rents will increase total demand for housing through the increased investment potential.

Many of the policy effects, once investment demand is controlled for, are no longer significant at the city level. The first policy was positive and significant for Sarnia, Hamilton, Sudbury and Barrie, with puzzles in Windsor, York and Durham. All others were not statistically significant. Therefore it is likely that investment effects were facilitating an increase in house prices in London, Kitchener, North Bay, Sudbury, Brantford and Mississauga at the time when the first policy was implemented.

Kingston, Windsor, Durham, Guelph, and York showed significant effects from policy two, with the correct (negative) sign, and there were puzzles in Sudbury, Thunder Bay, and Barrie. The investment effect in Durham was not significant; but this regression corrected the puzzles for the policy effects in Durham and York, that were present in the base model (Table 5). These five cities showed that they were vulnerable to macro-prudential policy implemented by the government, intended to cool the housing markets of Toronto and Vancouver. Reducing the maximum amortization period to 35 years decreased the growth rate of house prices in Kingston by 0.4%; Windsor 1.0%; Durham 0.9%; Guelph 0.5%; and York by 0.8%. Though, York and Durham are part of the Greater Toronto Area (GTA) and Durham has a larger constant value in this model, so perhaps the Government intended to suppress housing prices in these cities as well.

The decrease of the maximum amortization period to 30 years, proved significant in London, Kingston, North Bay, Peterborough, Windsor, Cornwall, Brantford, Durham, Guelph, and York, with puzzles remaining in Sudbury and Thunder Bay. This policy was implemented

when many Canadian cities began to recover from the financial crisis¹⁶ and thus had the largest negative impact across cities. This policy reduced the growth rate of prices by more than 1.0% in Windsor and Durham and more than 0.5% in London, Kingston, North Bay, Peterborough, Guelph and York. It reduced the growth rate of prices in Cornwall by 0.36% and 0.4% in Brantford. Meanwhile, the policy did not have any meaningful, empirical effect in Toronto.

The final policy change dropped the maximum amortization period to 25 years. This policy managed to shave off about 0.3% off the growth rate of housing prices in Toronto, but also had greater negative consequences in North Bay, Peterborough, Windsor, Durham, Guelph and York. The growth rate in North Bay was decreased by 0.36%; Peterborough 0.45%; Windsor 0.74%; Durham 1.5%; Guelph 0.57%; and York by 1.0%.

5.7 SUMMARY OF RESULTS

The above models showed varying degrees of policy effect across Canadian cities. However, some city effects were consistent throughout this paper. Windsor showed a high vulnerability to macro-prudential policies across the models, and Kingston and Cornwall also displayed an increased vulnerability to macro-prudential policies. On the other hand, Ottawa appeared to be unaffected and London, Mississauga, Kitchener, Brantford, Barrie, Hamilton, Sudbury and Thunder Bay were highly resistant to the effects of macro-prudential policies. Similarly, Durham, Guelph, York, North Bay, and Peterborough seemed mostly resistant to macro-prudential policy changes, but appeared most vulnerable once investment was considered in the model.

¹⁶ Employment and GDP were on the rise, according to The Canadian Encyclopedia (online) article, “Recession of 2008-09 in Canada. <https://www.thecanadianencyclopedia.ca/en/article/recession-of-200809-in-canada>.

6. CONCLUSIONS

The objective of macro-prudential policies is to stabilize the economy when other fiscal and monetary policies are unable or not appropriate. Since the mid-2000's, prices in the housing markets of Vancouver and Toronto have been increasing at levels greater than most of the other Canadian cities. When the financial crisis arose in 2008, the Canadian government became wary of housing bubbles and reduced the maximum amortization periods on mortgages in an attempt to help stabilize prices in the face of low interest rates. This paper analysed the effects of four policies on cities across Ontario, and compared the effects in smaller CMAs and CAs to the effects in Toronto.

The base model and its variations showed that macro-prudential policies did not always effect the growth rate in Toronto as intended, but often affected a smaller market negatively. When local investment was added to the model, it polarized the results further. Some markets that seemed unaffected in other models, like Durham, York and Guelph, were suddenly pounded with reduced growth rates each time the maximum amortization period was reduced. However, other cities, such as Hamilton, Mississauga, and Sarnia, were now found to be resistant to policy changes even though they had mixed results in the previous regressions.

Examining the consistent components from all of the models, it is clear that macro-prudential policies affect some smaller markets more severely than Toronto. Though policies should be enacted to cool the markets of the cities that hold a great portion of Canada's wealth, the government should not ignore harming effects in other regions. Particular vulnerable cities like Windsor, and to a lesser degree Kingston and Cornwall, would benefit from local incentive policies that could offset the effects of macro policies.

This paper achieved its goal by determining the effect of macro-prudential policies in smaller CMAs and CAs, but there are still many unanswered questions. Are policies restricting the middle class from upgrading their home; young buyers from entering the market; or are regulations making it difficult for recent immigrants to purchase a home? Future studies that analyse individual factors and municipal prices of housing would allow researchers to determine which classes of buyers are most vulnerable to policy effects.

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