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# Spendthrifts and Savers: Are Canadians Acting Like they are “House Poor” or “House Rich”?

*Canadian household spending, apart from housing, has not dropped despite consumers taking on more housing debt. The author draws lessons for policymakers concerned about a hard landing.*

Jeremy Kronick



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## THE STUDY IN BRIEF

Are Canadians acting like they are “house poor” and scrimping on spending in other parts of their lives because of what they pay for homes? What is interesting about this question is the fact that Canadian monthly mortgage bills, measured by the mortgage debt-service ratio, are approximately the same in size as they have been historically.

The issue with a flat mortgage debt-servicing ratio, however, is it masks debt composition between interest and principal. With interest rates near zero, it is more likely that rates will rise in the future, causing an increase in mortgage debt-servicing costs. Furthermore, as we are more than seven years removed from the last recession, and there are strong arguments to suggest we have a housing-market bubble in our largest cities, there is additional risk of a negative economic shock. A high-leverage environment would exacerbate this situation.

Using Statistics Canada mortgage-debt data broken down between interest and principal, my results suggest that Canadian households, on aggregate, have not slowed non-housing consumption due to this riskier debt environment. Furthermore, households have spent out of accumulated housing wealth, suggesting the removal of a buffer, potentially worsening any negative economic shock should house values fall.

While these results are concerning, I find a lack of consumption sensitivity to increases in total debt-servicing costs. The implication is that the risk to Canadian households comes more from a negative economic shock than from rising interest rates that raise monthly mortgage payments.

From a policymaking perspective, the Bank of Canada can use these results to help model the economy now and into the future given current debt dynamics. Being prepared for a potentially larger consumption impact from a negative economic shock is prudent.

Governments at all levels should continue to monitor the effectiveness of their demand-side policies while considering what supply-side policies may be more appropriate in slowing down housing prices and cheap credit growth, thereby lowering debt loads. Options for the government to consider include the balancing of environmental concerns with housing supply growth, pricing the use of infrastructure, and making the application process for development more efficient and transparent.

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## With the housing market on policymakers' minds, this paper answers the question: Are Canadians acting like they are “house poor” and scrimping on spending in other parts of their lives because of what they pay for homes?

That is, have Canadian households decreased their spending to compensate for the additional risk from monthly mortgage bills that, while approximately the same in size as they have been historically, are now significantly more leveraged?<sup>1</sup> The results in this paper show that Canadians have not, in fact, lowered spending due to this additional risk, and on top of that, they have increased spending out of housing wealth. This increased spending weakens the argument that rapid house-price appreciation resulting in increased household wealth has been a sufficient form of precautionary savings.

Canadian policymakers of all parties and levels, along with their central banking peers, continue to warn of the risks associated with the country's frothy housing market, with the general focus on Toronto and Vancouver. One often-cited example of this frothiness is Canada's record high ratios of debt to GDP and debt to disposable income – at the end of 2015, household debt to GDP hit 98 percent while household debt to disposable income hit 168 percent.

While debt to GDP and debt to disposable income are relevant measures, they do not provide the most accurate measure of affordability. As Gordon (2015) argues, “The debt-income ratio becomes almost impossible to interpret as a measure of household finances when interest rates change.” A better measure of affordability is

the mortgage debt-servicing ratio, or how much households have to pay out of their disposable income on a monthly basis to cover mortgage payments. Perhaps surprisingly, given the size of the Toronto and Vancouver housing markets, Canada's mortgage debt-servicing ratio has been flat over the past 25 years. This is due to the fact that, despite house prices that in many cases have far outstripped income growth, interest rates have fallen to historic lows. So in some sense, we would expect to see no change in consumption behaviour on non-housing goods, since households are spending about the same on mortgage payments.

The issue, however, is that a flat mortgage debt-servicing ratio masks the composition of this debt. In the case of mortgages, the composition refers to the portion of debt made up of interest costs and the portion made up of principal (or leverage). With interest rates near zero, it is more likely that rates will rise in the future than fall, causing an increase in mortgage debt-servicing costs. Furthermore, as we are more than seven years removed from the last recession, and there are strong arguments to suggest we have a housing-market bubble in our largest cities, there is additional risk of a negative economic shock, and a high-leverage environment would exacerbate this situation.

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- 1 I follow Albuquerque and Krustev (2015) who define deleveraging as “persistent declines in the debt-to-income ratio.” It follows that leveraging represents increases in the debt-to-income ratio. Given this paper's use of debt-servicing ratios, one can also think of increased leverage as increases in the principal portion of one's monthly debt payments.



### *How have Canadians reacted?*

With this riskier debt composition in mind, how can we test the reactions of Canadian households? Statistics Canada produces mortgage debt-servicing ratio data that they break down between interest and principal costs. By taking the difference between the interest and principal mortgage debt-servicing cost ratios, we can see how the debt composition changes across time. I define this difference as the debt-servicing ratio gap measure, which is the focus of this paper.

As this debt-servicing ratio gap increases, interest makes up more of a household's monthly housing-debt payments. As this difference shrinks, as it has for much of the 1990Q1-2016Q3 period under analysis, households are more leveraged and more vulnerable, with principal making up a larger share of monthly housing payments.

My results suggest that Canadian households, on aggregate, have not slowed non-housing consumption due to this riskier low-interest, high-leverage debt environment. Furthermore, households have spent out of accumulated housing wealth, suggesting the removal of a potential buffer and, potentially worse, an exacerbation of any negative economic shock should house values fall.

While these results are concerning, a positive outcome is the lack of consumption sensitivity to increases in total debt-servicing costs. The implication is that the risk to Canadian households comes more from a negative economic shock than from rising interest rates that raise monthly mortgage payments.

What does this all mean from a policy perspective? Despite calls for the Bank of Canada to increase its overnight rate target to slow the rise of cheap credit, Canada's central bank has a clear mandate to target 2 percent inflation. Therefore, an increase in the overnight rate target will arise only out of a need to tame high levels of inflation, which in turn likely reflects an economy producing above potential. This would be a positive development for Canada. Additionally, the lack of sensitivity to changing total debt-servicing costs as a result of an increase in interest rates makes raising rates more palatable. However, should a negative economic shock occur, the results in this paper suggest the Bank may need to provide more stimulus than usual.

On the fiscal side, governments could help by focusing on policies related to increasing the supply of housing, as demand-side policies have had mixed success.<sup>2</sup> Provincial and local governments should look to increase the supply of semi-detached and detached homes, which will help reduce leverage concerns.

### **Theory and Literature**

Given the important role of debt in the ability of consumers to purchase housing, it is surprising that economics has taken as long as it has to establish any clarity on the theoretical link between both consumption and debt. The standard life-cycle permanent income hypothesis suggests that individuals will smooth consumption over their lifetimes by using a single asset that can be lent

2 Kuttner and Shim (2013), in a 57-country panel regression that includes Canada, find no significant effect from loan-to-value ratio changes on mortgage credit when allowing for cross-country heterogeneity. Kronick (2016a) also shows little to no significant effect of loan-to-value ratio changes on mortgage credit. However, other studies, including Kuncl (2016), find that, in the long run, loan-to-value policy changes affect the growth rate of residential mortgage credit. Many of the new policies, including the B.C. foreign buyers tax and greater stress testing on homebuyers putting down less than 20 percent, have not been around long enough to conclude about their overall impact. However, as mentioned later, some of the demand-side measures have led to increasing mortgage rates, which, in theory, are problematic for households whose debt-servicing costs will increase upon renewal.

or borrowed as individuals see fit. In this theory, consumption is driven by wealth and permanent income and the size of the response to each variable is driven by the marginal propensities of each. There is no role for debt in this theory. However, as time has gone on, the field has begun to catch up, including Hall (2011), Guerrieri and Lorenzoni (2011), and Eggertson and Krugman (2012), who have linked debt and consumption through credit and liquidity constraints, opening up the theory to a variety of specifications involving different debt variables.<sup>3</sup>

Furthermore, Muellbauer et al. (2015) show that in Canada, given credit conditions, the dominant impact of rising house prices relative to income is to lower consumption. The explanation is that with higher housing prices relative to income, potential homeowners have to save more to meet necessary down-payment levels. However, the authors also show that during the 2000s, as access to mortgage credit improved, the negative house-price effect on consumption attenuated. This access to credit included the introduction and growth of home-equity lines of credit (HELOCs) during the late 1990s and into the 2000s.

In general, the empirical literature finds mixed results regarding consumption's reaction to house-price appreciation relative to income. Albuquerque and Krustev (2015) provide a nice summary of the two competing theories that explain the diverging results. The first theory is the more benign view of debt, where households increase indebtedness based on the idea that they expect higher future incomes, leading to increased consumption. In this case, there is a positive relationship between consumption and debt.

The more alarmist view is that high levels of debt constrain households, which are thus forced to reduce consumption in order to improve their balance sheets. In this case, there is a negative correlation between consumption and debt.

Albuquerque and Krustev (2015) then attempt to resolve these mixed results by expanding on the debt and consumption link by arguing that a complete picture requires studying both the effect of deleveraging, measured by decreases in the debt-to-income ratio, and a debt overhang concept, which is the stock of debt above an estimated equilibrium.

### *Contribution*

This paper expands on that line of research by arguing that debt-servicing costs are more important than the debt-to-income ratio, as households react to how much it will cost to service their debt in a given month relative to other expenditures. In Canada, the total and mortgage-only debt-service ratios (DSR) over the 1990Q1 – 2016Q4 time period under analysis have been relatively flat, despite rising housing prices across the country (Figures 1 and 2). This flatness in total debt-servicing costs helps explain why households have been willing to increase their debt-to-income ratios over this period.<sup>4</sup>

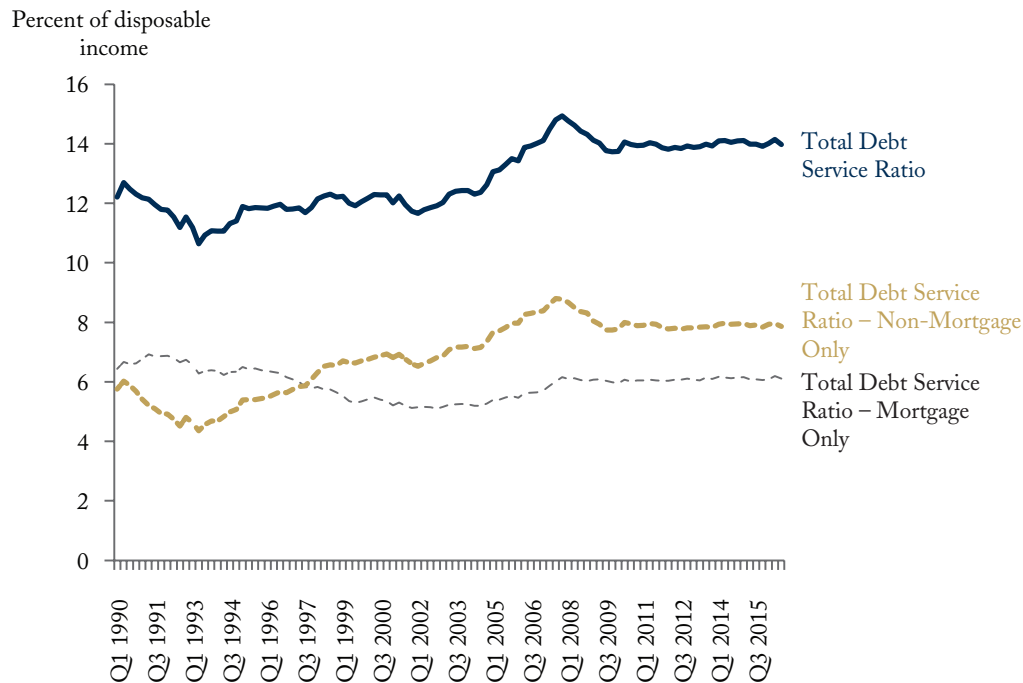
This argument would suggest that decisions to take on increased debt loads were appropriate for Canadians. But what the total debt-servicing story fails to capture on its own is the composition of that debt.

What we see in Canada is that the composition of a generally flat total debt-servicing ratio has shifted from interest-dominant to principal-dominant (Figure 3).

3 Muellbauer (2008) also shows that the life-cycle permanent-income hypothesis would have very little impact from a price-related increase in housing wealth on consumption if credit effects were not included.

4 Non-mortgage debt-servicing increased, and overtook mortgage debt as the larger contributor to total debt-servicing ratios in the late 1990s. However, on the whole, all measures were relatively flat.

Figure 1: Total Debt Service Ratios



Source: CANSIM Table 380-0073.

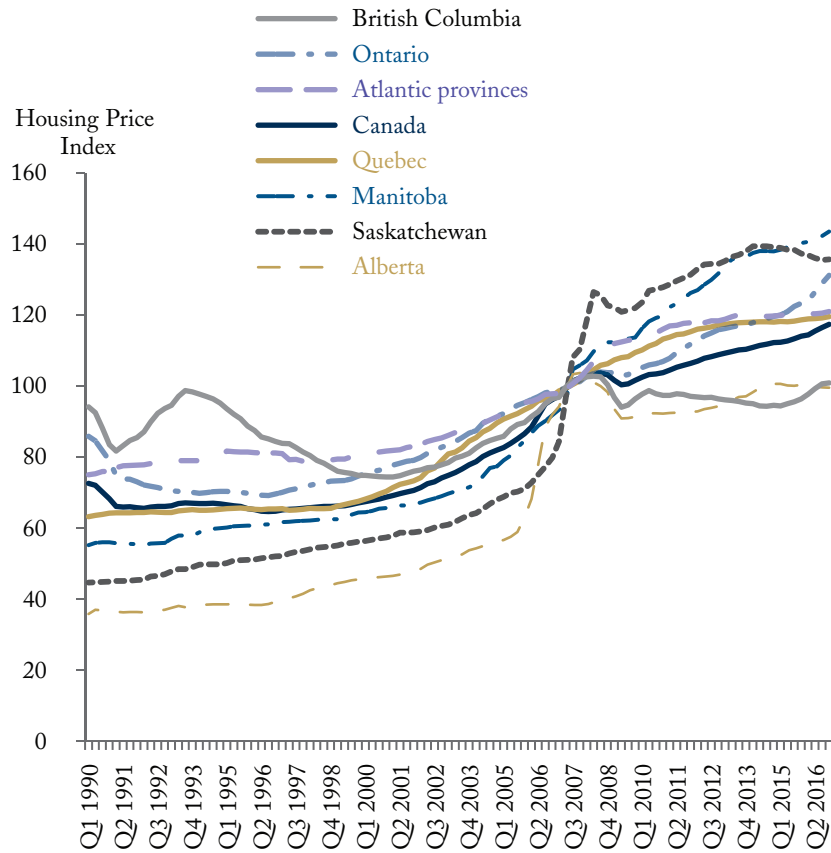
Since interest rates have fallen during the bulk of the period analyzed in the paper and house prices have increased, this is not a surprising result.<sup>5</sup> The question then becomes whether this low-interest-rate, high-principal-debt dynamic increases household risk.

### *Risky Dynamics*

There are two significant risks to homeowners from a low-interest, high-principal environment. The first is increasing interest rates leading to an unaffordable increase in debt-servicing costs, while the second is a significant negative economic shock that leads to, or results from, falling house values.

5 One potential caveat in the use of the DSR variables comes from Brunnermeier and Julliard (2008) and the concept of money illusion. The argument is that households mistakenly assume that nominal and real interest rates move together, and therefore a decrease in inflation, as we saw in Canada over the period under analysis, gets attributed to a decline in real interest rates. If that occurs, households will underestimate the real cost of paying for their mortgages down the line. This error creates upward pressure on housing prices and contributes to the increase in the principal component of the DSR variable. The story told so far omits this concern. However, even if the DSR variables cannot inherently capture this feature, this paper argues that, if anything, this mistaken calculation reinforces the fact that households should increase levels of precautionary savings as a result of this increased aggregate risk.

Figure 2: Provincial House Price Values



Source: CANSIM Table 327-0046, 2007 = 100.

*Increasing Total Debt-Servicing Costs*

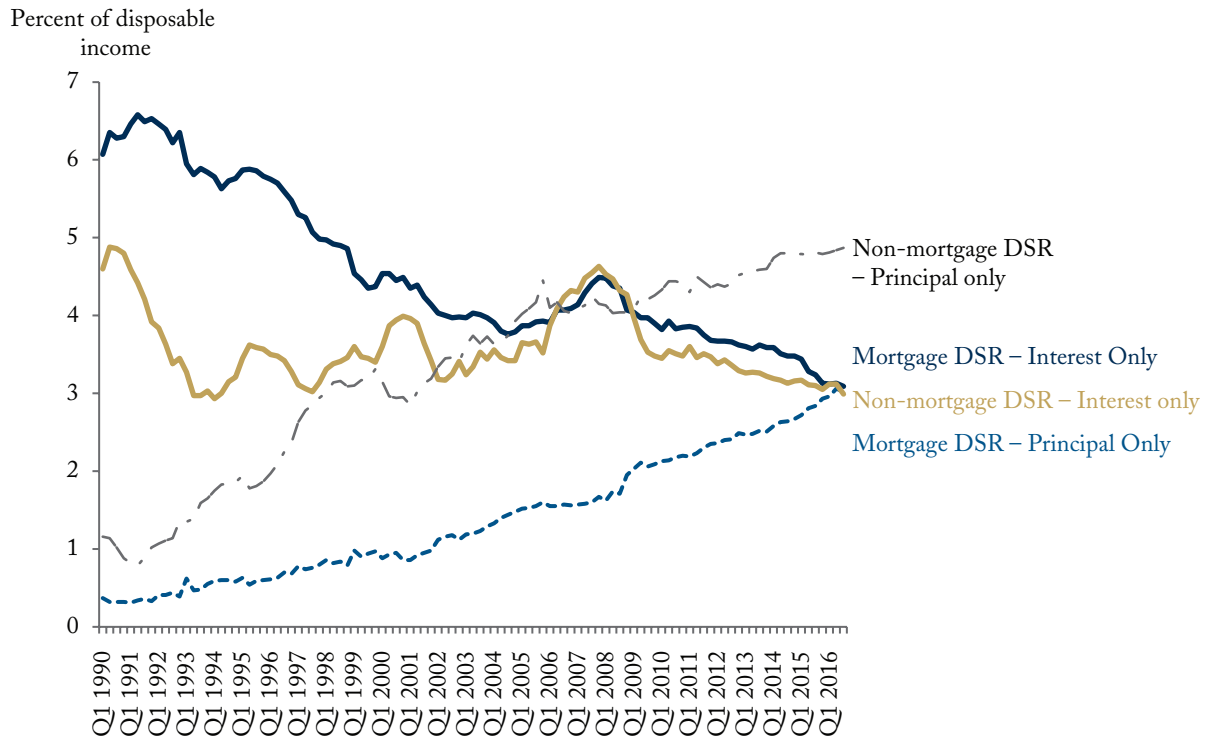
With five-year mortgage terms the standard in Canada, many current homeowners will have to renegotiate their mortgage rates multiple times

over their amortization period. If this happens in an environment of higher interest rates than we currently have, there could be household affordability challenges.<sup>6</sup>

6 For those on variable rate mortgages, there is a short-run debt repayment constraint. If households are unable to borrow to compensate for changes in nominal mortgage rates, additional repayments (assuming debt-to-income ratio is constant) cause a decrease in cash flows and therefore in consumption.



Figure 3: Interest and Principal Components of Debt Service Ratios



Source: CANSIM Table 380 0073.

The source of an interest-rate increase is important in determining the effects it will have on affordability. If the Bank of Canada is increasing its overnight target rate as a result of a growing economy – one that generates a positive output gap – consumers presumably now have additional income to support rising mortgage costs. Leverage fears would then be at least partially mitigated. However, if the distribution of income gains as a result of a boom in economic activity is not

widespread, or results in highly leveraged households receiving less of the income gains, an increase in interest rates would be detrimental to affordability.<sup>7</sup>

Additionally, already enacted macroprudential regulations are likely to cause higher mortgage rates, as the costs to lenders increase and the market faces potentially decreasing competition while rules make lending harder for smaller financial institutions.<sup>8</sup> Therefore, even if the Bank keeps its overnight target the same, rates might still increase. In fact,

7 Unfortunately, data do not exist at the household level for the variables in this study.

8 In fact, we have already seen Canadian banks increase mortgage rates. The Royal Bank of Canada increased its three-year fixed rate by 25 basis points, and its four- and five-year fixed rates by 30 basis points in November, 2016, following federal regulation changes to mortgage rules.

this is a general rule about central-bank interest-rate targets and mortgage rates: There is not a one-for-one pass-through between them, and mortgage rates can move without any central bank intervention.

Mitigating some of the potential impact of increased rates has been the interaction effect associated with the balance sheets of households and their ability to borrow in order to smooth interest-rate changes. As access to mortgages has increased through home equity loans and lines of credit, smoothing consumption has become simpler for households. In such an environment, changes in nominal interest rates have a lessened impact on consumption.

### *Negative Economic Shock*

The second major risk is a negative economic shock causing a recession. It is certainly true that should a recession hit, the Bank of Canada would not increase interest rates. However, if a housing-price crash precipitates or results from a fall in economic activity, wealth accumulated from housing-price gains in the boom times may be lost.<sup>9</sup> If the economic shock results in increased difficulties making monthly mortgage payments, such that a household will either have to sell or borrow out of housing equity, a fall in house values will make this more difficult. If households have already consumed out of this housing wealth, the effects of the shock

will be exacerbated. As we are seven years removed from the last recession, we are likely closer to the next one than to the last.<sup>10</sup>

### **Empirical Methodology**

As the theory linking consumption and debt-related decisions has evolved, more papers have looked at these questions empirically, with mixed results as discussed above. The methodology in this paper extends the work done in Albuquerque and Krustev (2015), who evaluate housing debt's relationship with consumption across U.S. states.<sup>11</sup> While many of the variables in this paper are similar to Albuquerque and Krustev, two important distinctions are worth mentioning prior to explaining this paper's methodology.

First, Albuquerque and Krustev's variable of interest is an equilibrium debt gap variable. This variable is an estimate of a household's equilibrium debt-to-income ratio generated based on economic fundamentals, including "a measure of house prices, the homeownership rate, the interest rate, and proxies for income uncertainty and credit supply." The gap comes from the difference between actual debt-to-income levels and this estimated equilibrium level.

The focus in this *Commentary*, however, is on the mortgage debt-service ratio (DSR) gap variable, since

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- 9 Gordon (2015), ironically in a piece on how we exaggerate household debt fears because of our use of stock and flow variables, still makes the point that "asset prices do have a large downside potential, and the illiquidity of housing assets is a serious concern for household finances." Flood et al. (2008) also discuss the illiquidity of housing wealth due to high transaction costs.
- 10 Cross and Bergevin (2012) provide recession dating for Canada ending in 2012, with no recessionary periods from 2009-2012. While we have experienced one period of two recessionary quarters in a row since 2012, Kronick (2016b) shows that a diffusion index of Canadian industries indicates a lack of widespread impacts of the underlying negative economic shocks. Taken together with steady employment figures, a recessionary call cannot be made at present for this period.
- 11 Using novel data innovations, including a quarterly personal consumption expenditure and household equilibrium debt variable, the authors run a panel study of the US housing market. The authors are forced to generate the consumption variable as such a measure does not exist quarterly at the state level. Unfortunately, a lack of many important variables at the provincial level in Canada forces this paper to perform a national aggregate time-series analysis. However, without disaggregated data, there is no need to generate a provincial consumption variable.

it requires no additional estimation and debt-servicing ratios tell a more accurate story of the relationship between debt dynamics and consumption.

The second distinction is the lack of Canadian provincial-level data on many of the important variables including my independent variable of interest, the mortgage DSR gap variable. Regional divergences will play a role in how consumers react to changing debt dynamics. Negating some of this concern, however, are the similar dynamics underlying some of the key housing variables, including the increase in house prices in all provinces over the period under analysis, as we have seen, and the consistency of mortgage rates across provinces.<sup>12</sup>

### Dependent Variable and Independent Variables of Interest

A discussion of sources and definitions of all variables is found in online Appendix A, along with descriptive and correlation statistics. Here, I will outline the role the variables play in this analysis.

The dependent variable is real non-housing consumption growth, obtained by removing housing services from aggregate consumption data.

Earlier, this paper looked at the total debt-servicing ratio and the breakdown of its components – interest and principal. The DSR gap variables are therefore the difference between the portion of one's monthly payments relative to disposable income made up of interest, and the portion made up of principal. While the focus is on the mortgage DSR gap variables, it is important not to leave out other forms of debt. To address this

concern, this paper also includes a non-housing DSR gap variable.

So what does it mean when DSR gap variables shrink, as they have for much of the past 25 years? A shrinking DSR gap variable implies that the portion of one's monthly debt costs made up of interest is falling relative to the principal portion. Therefore, a negative coefficient means households have actually increased consumption and thus not compensated for any vulnerability arising from increased leverage by enhancing precautionary savings. The opposite is clearly true as well: A positive coefficient implies a falling level of consumption and an increase in precautionary savings.<sup>13</sup>

### Other Control Variables

This paper also controls for the total debt-service ratio, in order to control for the aggregate debt-servicing effect separately from the impact of changing debt dynamics. In addition to the total debt-service ratio, this paper controls for other variables in order to generate an accurate assessment of the impact of the mortgage DSR gap measure on real non-housing consumption. These control variables include many from Albuquerque and Krustev (2015), including real housing wealth, the unemployment rate and a loan-to-value ratio variable. Additionally, given the life-cycle consumption theory's use of permanent income, this paper replaces the current income found in Albuquerque and Krustev (2015) with a weighted average of forward-looking income-growth rates calculated as in Muellbauer et al. (2015).

12 Current mortgage rates by province: <https://www.ratehub.ca/best-mortgage-rates>. At the time of writing, one can see consistent rates across provinces and territories.

13 One potential issue with the DSR gap variable is that while looking at the repayment of debt and its relationship with consumption is important – as is the fact that repaying debt means increases in housing equity – we are simultaneously looking at savers recouping funds previously loaned. Since we cannot break consumption out between different cohorts of homeowners/household-types, e.g. outright owners and renters, we are perhaps getting some of the impact of the DSR gap variable on those that are the ones doing the lending. One task for future research would be to follow in the footsteps of Campbell and Cocco (2007), who build regional and homeowner cohorts to study the causal effects of house-price changes on consumption using household level data from the UK's Family Expenditure Survey over the 1988-2000 period.

It is important to review why one needs to control for these variables. First, an increase in housing wealth increases a household's net worth, providing incentive to increase consumption. To generate housing wealth, this paper looks at housing assets, including residential structures and land, and uses inflation to create real values. Housing wealth is based on market value and does not subtract from debt.

To control for income effects, this paper uses a weighted average of forward-looking income-growth rates, which comes right out of the life-cycle permanent income hypothesis. The baseline of this theory is that current consumption depends on end-of-period household real net asset value and the present value of permanent disposable income. Increases in a household's future income expectations, through wages or otherwise, lead to increased current consumption.

Unemployment rate, in this paper, is a proxy for liquidity constraints as in Craigwell and Rock (1995). As unemployment increases, households are more constrained and spending falls.

Lastly, the loan-to-value ratio works as a proxy for macroprudential regulation or what Albuquerque and Krustev (2015) term "financial innovation." It can also be thought of as a proxy for credit constraints. If the ratio increases, households require lower down payments, which mean increased credit availability and more money accessible for consumption. If the ratio decreases, the opposite occurs and the loan-to-value ratio (LTV) acts as a credit constraint.

Over time, the target population of LTV regulation changes to the down-payment requirements in Canada has differed. For example, the regulation in 1992 was for first-time homebuyers only. In 2006, it was for all homebuyers. In 2010, it was targeted at refinanced insured mortgages. Given the difficulty in creating a measure that captures each of these different effects, this paper uses the LTV regulation only on first-time homebuyers, who, depending on the year, make up between 35 and 50 percent of the market.<sup>14</sup> Muellbauer et al. (2015) estimate a latent credit conditions index variable, which I use as a robustness check.<sup>15</sup>

With this setup in mind, this paper now turns to the evaluation of the impact of the change in the DSR mortgage gap variable on real consumption growth.<sup>16</sup> See Box 1 for a more technical discussion of the primary regression, the assumptions undertaken and important specification tests.

## Results

In this section, I provide and explain the results from running the main regression (Table 3). Online Appendix B contains the more formal regression tables for the main regression and two sensitivity analyses – one that removes future income growth and focuses on current income as in Albuquerque and Krustev (2015), and one that removes the non-mortgage DSR gap variable in case collinearity is a greater issue than tests show.<sup>17</sup>

14 [https://www.canadianmortgagetrends.com/canadian\\_mortgage\\_trends/2015/04/first-time-buyers-by-the-numbers.html](https://www.canadianmortgagetrends.com/canadian_mortgage_trends/2015/04/first-time-buyers-by-the-numbers.html)

15 The authors describe their credit conditions index as follows: "CCI can be interpreted as the jointly estimated long-run impact of the relaxation of mortgage down payment constraints (and possibly consumer credit constraints) on consumption."

16 Note that this paper follows Albuquerque and Krustev (2015) and lags both the total mortgage debt-service ratio and DSR gap measure. This is consistent with other studies (e.g. Olney 1999) that empirically show a delay in high levels of debt impacting consumption. This paper finds less-stationary variables than Albuquerque and Krustev, with only the loan-to-value ratio integrated of order zero. Thus, this paper differences all variables safe for loan to value.

17 Online Appendix A has more details variables themselves including descriptive and correlation statistics.

### Box 1: The Primary Regression

The baseline regression related to the discussion in the main text is as follows:

$$\Delta C_t = \alpha_t + \beta_1 \Delta DSRGap_{t-1} + \beta_2 \Delta DSR\_NM\_Gap_{t-1} + \beta_3 \Delta TotDSR_{t-1} + \beta_4 \Delta HWealth_t + \beta_5 \Delta F\_Income_t + \beta_6 \Delta Unemp_t + \beta_7 LTV_t + \beta_8 Cointegration_{t-1} + e_t$$

where  $\Delta C_t$  is real non-housing consumption growth,  $\Delta DSRGap_{t-1}$  is the growth in the mortgage DSR gap variable lagged by one period to deal with reverse causality concerns as in Olney (1999),  $\Delta DSR\_NM\_Gap_{t-1}$  is the growth in the non-mortgage DSR gap variable also lagged by one period,  $\Delta TotDSR_{t-1}$  is the growth in the lagged total DSR variable that incorporates both mortgage and non-mortgage debt,  $\Delta HWealth_t$  is current housing wealth growth,  $\Delta F\_Income_t$  is a weighted moving average of forward-looking income growth rates calculated as in Muellbauer et al. (2015),  $\Delta Unemp_t$  is the change in the unemployment rate,  $LTV_t$  is the loan-to-value ratio, and  $Cointegration_{t-1}$  is the long-run speed of adjustment term, which I will discuss shortly.

All variables are quarterly and the differences ( $\Delta$ s) are quarter over quarter. I calculate the log change for consumption, housing wealth and future income. The remaining variables are already in percent units and are thus left in their original form.

Stationarity tests revealed that all level variables are integrated of order 1, i.e. they need to be differenced to be stationary (Table 1).<sup>a</sup> This paper uses three different unit root tests: the augmented Dickey-Fuller test, which has a null of unit root, the Dickey-Fuller Generalized Least Squares test with a similar null, and the Kwiatkowski-Phillips-Schmidt-Shin test with a null of stationarity. Note that LTV is a bounded, non-continuous variable, and thus cannot follow a random walk, so there is no need to test for stationarity. Results indicate that all variables are unit root, with only a couple instances of divergences across tests.<sup>b</sup>

Additionally, Fernandez-Corugedo et al. (2007) find that there is a stable long-run relationship among the levels of consumption, income and wealth. In other words, these variables are cointegrated, implying that some linear combination is stationary. Albuquerque and Krustev (2015) expand on the Fernandez-Corugedo et al. (2007) finding by adding their two debt measures to their cointegration tests.

This paper does the same with the DSR gap and total DSR variables in levels. I also add unemployment and LTV to the cointegration test, also in levels. I run the Engle-Granger two-step method for testing for cointegration. In step 1, I regress consumption on all the independent variables in levels. I then gather the residuals and run an augmented Dickey-Fuller test to determine whether the error terms are integrated of order 1. If they are, there is no cointegration. If they are not, then we have cointegration.

The results indicate we can reject the null of no cointegration (Table 2). Therefore, to run a differenced regression, one must add a cointegration term, which is essentially the residuals from step 1 of the Engle-Granger method. The expected sign of this cointegration variable in the regression will be negative. This is because if consumption exceeds where the independent variables suggest it should be, we would expect consumption to decrease over the long run to return to equilibrium. This paper uses standard errors that are robust to heteroscedasticity in order to deal with any concerns over misspecification. Additionally, quarterly and time dummies were included in case seasonality issues remained. Results show that these additional time variables had no statistical significance.<sup>c</sup>

a Except for the loan-to-value ratios.

b All variables that were unit root in levels are stationary in differences.

c Actual results available upon request.



## Box 1: Continued

### Table 1: Unit Root Tests – Test Statistic

	(1)	(2)	(3)
	Augmented Dickey Fuller	Dickey Fuller – GLS	KPSS
Consumption	3.665**	-1.260	0.351***
DSR Gap Growth (Mortgage)	-2.870	-2.399	0.280***
DSR Gap Growth (Non-Mortgage)	-4.161***	-2.229	0.264***
Total DSR Growth	-2.645	-1.412	0.274***
Housing Wealth Growth	-1.308	-0.151	0.884***
Future Income Growth	-2.084	-1.288	0.408***
Unemployment Rate Growth	-2.247	-2.530	0.334***

All tests are analyzed at optimal lag using Akaike criterion.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: Author's calculations.

### Table 2: Cointegration – Test Statistic

	(1)	(2)	(3)
	Augmented Dickey Fuller	Dickey Fuller – GLS	KPSS
Residuals	-2.992**	-2.555**	0.232

All tests are analyzed at optimal lag using Akaike criterion.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Source: Author's calculations.

Remember, as stated above, that a 1 percent increase in a DSR gap variable means debt consists more of interest than principal. As we have been in the opposite reality during most of the period under analysis, i.e. we are more leveraged, what we are really interested in is how a 1 percent *decrease* in the gap variables has impacted consumption. Therefore, a negative coefficient implies that consumption has increased as the particular gap variable has declined.

The results indicate that the variable of interest, the DSR mortgage gap, has had a negative but

insignificant effect on consumption, and this is robust across the different sensitivity analyses. From a statistical standpoint, we cannot distinguish the coefficient from zero. What this means is that to the extent that a low-interest, high-principal *mortgage* debt environment creates increased risk that might suggest a need to lower levels of non-housing consumption, households have not responded in this fashion.

Furthermore, we see a similar negative coefficient but now get significance from the non-mortgage

Table 3: Results Summary

A 1 Percent Increase in...	Results in a Percent Change in Consumption	Statistical Significance?
DSR Gap Growth – Mortgage	-0.67	NO
DSR Gap Growth – Non-Mortgage	-0.60	YES
Total DSR Growth	0.38	NO
Household Wealth Growth	0.20	YES
Future Income Growth	-0.18	NO
Unemployment Growth	-0.74	YES
Loan-to-value - Housing	0.03	NO
Speed of Adjustment*	-0.15	YES

\*Speed of adjustment is the degree to which consumption that has over/undershot where the rest of the variables suggest it should be in the short-run returns to long-run equilibrium.

See Box 1 for a detailed discussion of the underlying cointegration that leads to the formation of this variable.

Source: Author's calculations.

DSR gap variable. The implication is again that the potential increased risk from a low-interest, high-principal *non-mortgage* debt environment has not been met with decreased non-housing consumption. Indeed, it is quite the opposite.

Additionally, the results suggest that households do appear to be spending out of their housing wealth at a rate that is fairly consistent with the literature. The results of the different specifications in this paper fall between 0.15 and 0.20.<sup>18</sup> This means that a 1 percent increase in household wealth from rising house prices will cause an increase of between 0.15 and 0.20 percent in non-housing consumption.

Therefore, from the perspective of responding to the changing debt dynamics seen over the period

under analysis, on aggregate, Canadian consumers have not increased precautionary savings and have additionally consumed out of housing wealth.

Negating some of this concern is that as total debt-servicing costs increase – say, from an increase in interest rates that does not lower principal costs – household consumption does not appear to respond with statistical significance.

A lack of significance of the total debt-service ratio is consistent with a similar finding in Albuquerque and Krustev (2015). This result in Canada may be in part due to a stable total debt-service ratio over the period under analysis, save for the period between 2003 and 2007, when essentially all of the increase in this ratio since 1990 occurred. This period was also marked by higher than normal

18 Case et al. (2013) find a range of 0.110 to 0.166 in their international comparison of housing wealth effects on consumption.

consumption and income growth, potentially explaining the positive coefficient.<sup>19</sup>

Overall then, from a macroeconomic perspective, the risk to the economy is less about rising interest rates that increase total debt-servicing costs, and more about a negative economic shock that will be exacerbated by higher leverage debt and housing wealth that may not be there to compensate.

### *Other Relevant Results*

According to the results, not surprisingly, a negative economic shock that causes an increase in unemployment has a strong negative impact on non-housing consumption. Furthermore, while the impact of future income has an insignificant effect on non-housing consumption, recall that this variable is a measure of household expectations of the future *relative* to the present and therefore is made up of both a forward-looking and current component. As shown in online Appendix B, current income does have the expected positive impact on consumption (Figure B1 in Appendix B).<sup>20</sup>

The negative sign on the speed of adjustment is as expected, since it suggests that if consumption exceeds where we it ought to be given the other variables of interest, it must come down in the long run. One potential area of concern is the magnitude of the speed of adjustment coefficient of -0.15. This coefficient suggests that it will take approximately 15 quarters for about 90 percent of a shock to consumption to dissipate. This is obviously higher than the two years (eight quarters) central

bankers expect monetary policy to take to work its way through the economy. This suggests some misspecification.

Muellbauer et al. (2015) find that using their novel credit constraints index (CCI) causes the speed of adjustment coefficient to increase from approximately the level of this paper's results to a range of 0.3 to 0.4. At this range, it will take less than two years for 90 percent of a shock to consumption to dissipate. I test the results using CCI and find no upward movement of the speed of adjustment term. Other possible explanations include an omitted variable arising from the lack of regional data as described earlier, and/or the lags of the non-mortgage DSR gap variable as discussed in online Appendix D.<sup>21</sup>

Overall, however, most of the coefficients, both in magnitude and sign, are consistent with the literature suggesting that the results are plausible. Additionally, further robustness checks support the results as discussed in online Appendix D. Lastly, this paper also performs other standard post-regression tests, all of which suggest the regression is well-specified.<sup>22</sup>

### **Policy Implications**

Prior to getting to direct policy implications from the results, it is important to point out that this analysis would improve with a provincial dataset that allows for a running of a more robust panel set accounting for regional variances. So the first policy recommendation is to have provincial and

19 Year-over-year quarterly real non-housing consumption growth was 3.83 percent over the 2003-2007 period compared with 3.33 percent during the entire sample. Year-over-year quarterly real-income growth averaged 3.73 percent over the 2003-2007 period and 2.01 percent over the entire sample.

20 The magnitude on the current income coefficient of 0.301 is consistent with Bacchetta and Gerlack (1997), who find an elasticity of income of 0.3. The implication is that a 1 percent increase in current income will cause a 0.301-percent increase in non-housing consumption.

21 Other potential caveats to the results in this paper can be found in online Appendix C.

22 Durbin-Watson tests in Table 3 suggest no autocorrelation. Skewness and kurtosis tests for normality show no concerns – results available upon request.

municipal governments work with Statistics Canada to generate data at these levels on the variables used in this analysis.

Returning to more direct policy implications, a clear question emerges: With Canadian households not adjusting consumption behaviour to changes in the composition of their mortgage debt, and spending out of housing wealth to boot, what does this all mean for both monetary and fiscal policy?

### *Monetary Policy*

On the monetary policy front, there are a few implications. While the Bank of Canada has a very clear mandate to target 2 percent inflation, an objective they look to achieve in the medium term (six to eight quarters), it is clearly relevant to have an understanding of potential reactions to interest-rate movements and economic shocks.

An increase in the interest rate that causes the DSR gap variables to expand while the total DSR remains flat, i.e. is met with a reduction in principal payments, would have only a mild effect of reducing consumption through the non-mortgage DSR gap variable. Furthermore, the insignificance of the total debt-service ratio coefficient in the main specification, and the smoothing behaviour seen in the sensitivity to lags analysis (Appendix D), suggests that if rising interest rates increase total debt-servicing costs, i.e., are not met with a fall in the principal portion, consumption would not be greatly affected. These results are relevant in that it potentially makes the Bank's decision to start normalizing the overnight rate target to the presumed neutral rate of interest – between 2.5 and 3.5 percent – more palatable should the Canadian economy start growing at a faster pace that justifies such moves.<sup>23</sup>

The bigger concern for the Bank is the size of the impact from an economic shock that negatively impacts housing values. Any negative economic shock will impact income and unemployment, and therefore consumption. The lack of precautionary savings in light of outsized leverage, and additional spending out of housing wealth, will exacerbate the normal fall in economic activity. This larger than normal impact may generate a deeper fall in output and may therefore require a more significant stimulus on the part of monetary policy.

### *Fiscal Policy*

On the fiscal front, the question is this: If increasing leverage is not being met with increased precautionary savings, what can be done to lower future debt loads? So far, we have seen much in the way of demand-side policies, including the federal government's decision in December 2015 to lower the loan-to-value ratio again, forcing a higher down payment on houses above \$500,000 – a policy targeted at new homebuyers looking to purchase detached and semi-detached homes in Toronto and Vancouver. This lowering of the loan-to-value ratio is the latest in a string of such decreases since 2008 that have arguably had only a mild effect.<sup>24</sup>

Furthermore, there have been more recent demand-side announcements by both the provincial and federal governments. The B.C. government implemented a foreign buyers' tax, which slaps a 15 percent transfer tax on foreigners looking to buy in B.C. The federal government recently implemented a new set of policies, including stress tests at higher mortgage rates for homebuyers putting down less than 20 percent, changing the restrictions on when it will provide insurance for mortgages with low down payments, and new rules

23 The neutral rate can be found in the Bank of Canada's April 2017 Monetary Policy Report.

24 See Kuttner and Shim (2013) and Kronick (2016a).

for who is considered a resident for the purposes of receiving capital-gains exemptions. Lastly, the Ontario government announced a larger land-transfer rebate for first-time homebuyers, and recently adopted its own version of the foreign buyers tax. It is probably too soon to tell the exact impact these recent policies have had, but they continue to highlight the government focus on housing's demand side.

### *What about Supply?*

What we have not seen is much on the supply side – very little which will cause an increase in the amount of single-family or semi-detached housing available. The recent Ontario government announcement did take a first step by including some measures related to supply, such as identifying surplus land that could then be used for affordable housing. However, much more needs to be done.

In many ways, supply-side policies are better policies, assuming that the demand exists, since they both slow down housing-price and credit growth while still generating economic growth by fostering increased production of homes, supporting a construction industry that plays an important role in the Canadian economy.<sup>25</sup>

If we limit ourselves to the places driving these heavy increases in household leverage – Toronto and Vancouver – what can be done on the supply side?

There are many ways to evaluate whether demand is being met by supply, but one way is to look at housing completions in areas of high demand; i.e., detached and semi-detached homes. In Ontario and B.C., we see declining total housing

completions for detached and semi-detached homes since their peak in the early-to-mid 2000s and a stagnant level since the crisis rebound (Figure 4). Further, population growth since 1990 for Canada, Ontario and B.C. has averaged 1.0 percent, 1.2 percent and 1.4 percent respectively, outstripping average housing completion growth, which came in at -0.5 percent, -0.7 percent and -1.3 percent respectively.<sup>26</sup>

One explanation for the lack of housing completion is that limiting new housing outside of already built up areas – such as in Ontario – creates a shortage of land for housing, reducing completions and causing the cost of low-rises to increase faster than high-rises.<sup>27</sup> However, others have argued that the issue isn't land but a lack of infrastructure in areas earmarked for development.<sup>28</sup> In any case, both stories would support additional supply-side related measures.

Additionally, some of the difficulty on the supply-side may lie in the fact that home builders have historically had trouble getting approval for real-estate development in the municipalities of Toronto and Vancouver, due to time and/or cost. A recent study of major metropolitan Canadian cities, including Toronto and Vancouver, shows that the efficiency and quality of regulation around, among other things, approval timelines in both Toronto and Vancouver, has had a negative impact on growth of housing supply.<sup>29</sup> In an announcement earlier this year, Toronto admitted as much by promising to spend almost \$275 million over the next five years to increase construction of affordable housing through, among other things, “fast-tracked building approvals” that reduce application periods

25 In 2016, construction represented a sizable 7.0 percent of real GDP. See CANSIM Table 379-0031.

26 See Porter and Kavic (2016) for a further discussion on detached housing completions.

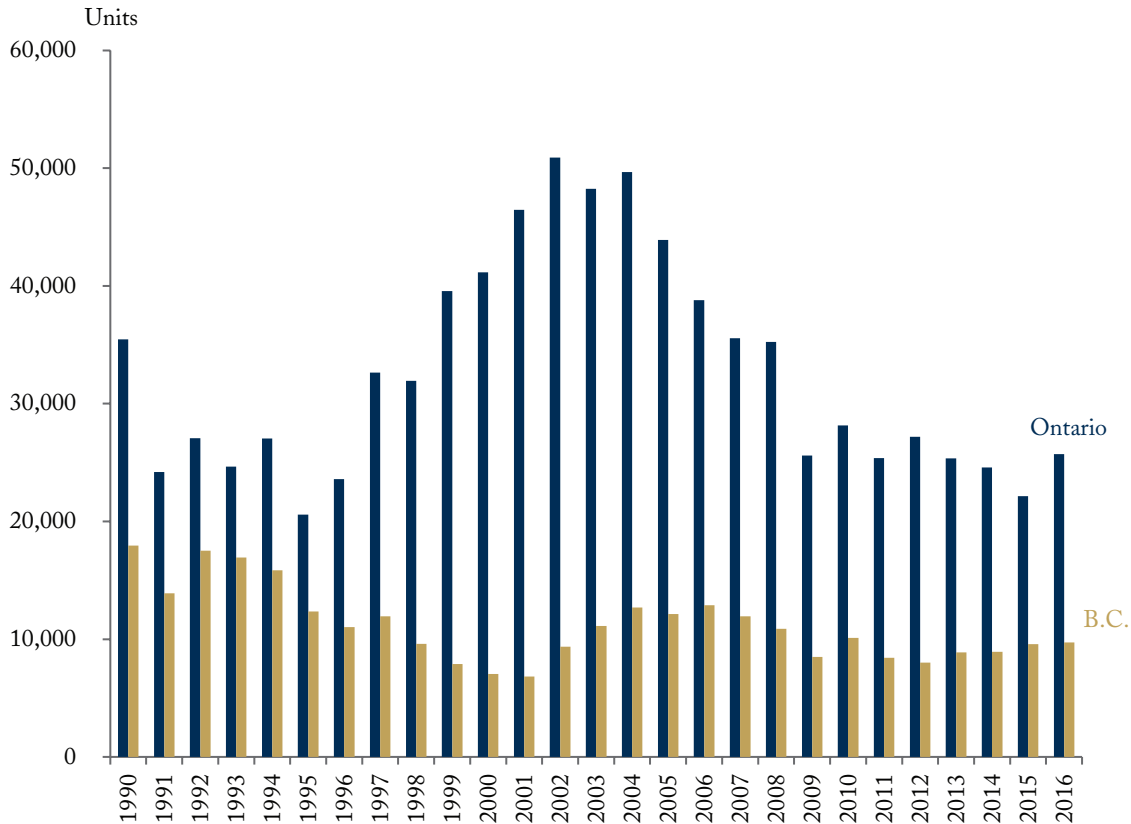
27 Clayton (2015).

28 Burda (2017).

29 Green et al. (2016). Another study, Clayton (2015), finds that the process of trading density for benefits in the application process in Toronto and Vancouver is overly complex and lacks transparency.



Figure 4: Housing Completions – Ontario and B.C. Detached and Semi-Detached



Source: CANSIM Table 027-0001.

from 18 months to 12.<sup>30</sup> This delay is a cost to consumers in wasted time or direct costs if builders deem this time as financially punitive and pass these costs on to consumers.

The point is that whether it is demand or supply, we have seen many demand-side policies, and there are clearly policies available to improve the supply side. Given the increased risk from the current debt dynamics and the lack of increased precautionary

savings, it would be worthwhile for governments to test new supply-side policies to slow down rapid house-price growth.

**Conclusion**

Looking over the 1990-2016 period, this paper finds that consumers have not raised their level of non-housing precautionary savings as a result of the increased risk of housing debt from high-

30 Monsebraaten (2016).

principal, low-interest-rate mortgages. Of further concern, some of the housing-wealth gains have been spent on non-housing consumption. One offsetting positive is that household consumption has not been sensitive to increases in total debt-servicing costs. Overall, though, the implication is that a negative economic shock affecting home values will cause an exacerbated fall in consumption.

From a policymaking perspective, the Bank of Canada can use these results to help model the economy now and into the future given current debt dynamics. Being prepared for a potentially larger consumption impact from a negative

economic shock is prudent.

Governments at all levels should continue to monitor the effectiveness of their demand-side policies while considering what supply-side policies may be more appropriate in slowing down housing prices and cheap credit growth, thereby lowering debt loads. Options for the government to consider include the balancing of environmental concerns with supply growth, pricing the use of infrastructure and making the application process for development more efficient and transparent.

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