The Impact of Macroprudential Housing Finance Tools in Canada: 2005-2010

Jason Allen, Tim Grieder
Brian Peterson, Tom Roberts

Bank of Canada

June 13, 2016 [1]

[1] The views presented in this paper are those of the authors and not necessarily those of the Bank of Canada.

Motivation

- Since the financial crisis governments have increased intervention in mortgage markets
  - Stimulate or dampen credit demand and house prices
- Evidence on the impact of macroprudential policies is mixed; Consultative Council of Americas joint project aimed at studying the effectiveness of macroprudential policies across 8 countries
- Canada has extensive experience with macroprudential policies in the mortgage market
  - Implemented via mortgage insurance requirements

Research question

What are the impacts of macroprudential housing-finance policies on mortgage demand?

1. Direct impact on household borrowing of first-time-home-buyers through wealth and income constraints
   - **Wealth constraint**: house purchase constrained by the down-payment requirement
   - **Income constraint**: house purchase constrained by monthly mortgage payment requirement

Policies

- Loosening: 2006-2007
  - Amortization: 25 to 40 years in 5 year increments
  - Loan-to-Value: 95 to 100
- Tightening: 2008-2010
  - Amortization: 40 to 35 years
  - Loan-to-Value: 100 to 95
  - Minimum credit score requirements introduced

Substantially more tightening since 2010. Lower amortization, price caps, nonlinear LTV requirements, etc. All used to dampen mortgage demand.

Methodology

- Descriptive
  - Use transactions-level data to estimate the impact of policy changes on mortgage and borrower characteristics
- Microsimulation model (HRAM)
  - Use the model to estimate the impact of policy changes on mortgage demand
  - Model allows us to quantify impacts of macroprudential policy changes and conduct counterfactual policy analysis

Standard Canadian mortgage contract up until 2006

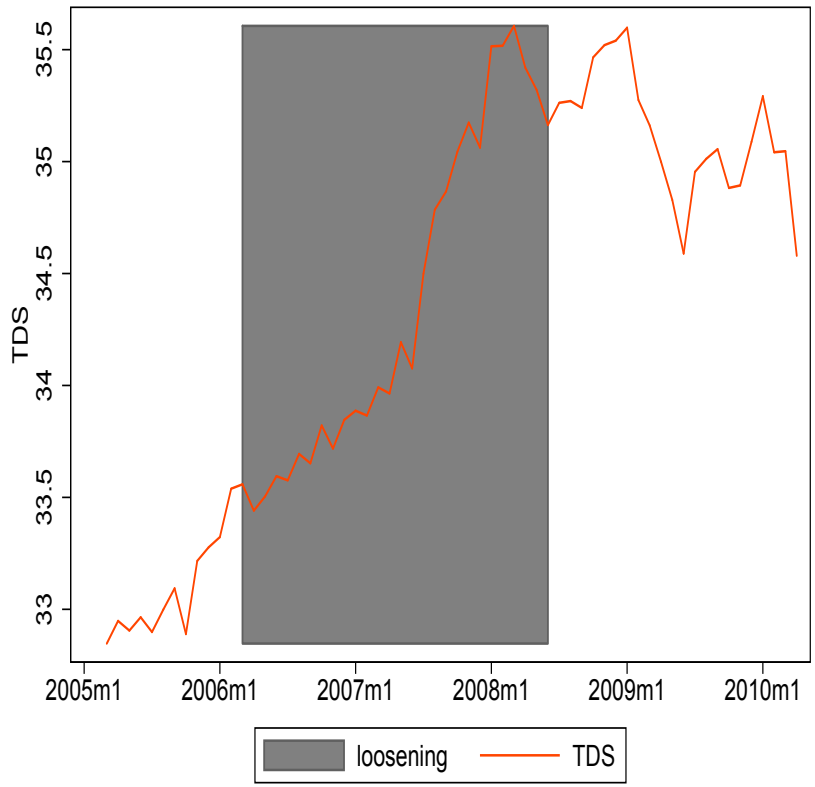
- $>$ 50% of mortgages are gov't insured (publicly or privately)
- Require insurance if LTV at origination is 80 or higher; Mortgage insurance is for the life of the amortization; Gov't sets mortgage insurance guidelines.
  - Source of macroprudential authority
- Applies to all regulated and un-regulated lenders
- Amortization: 25 years
- Contract term: 5 years with balloon payment
- LTV: 2/3 mortgages in the insured space have an LTV of 95%
- Typical Total-Debt-Service ratio is 30%-33%

Data

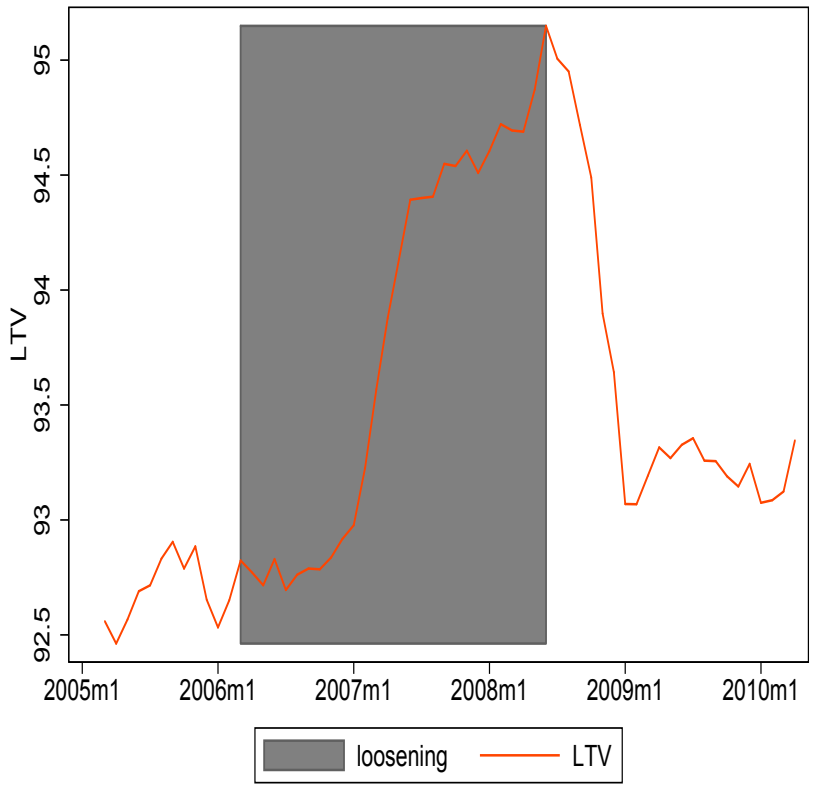
- Population of insured mortgages from public insurer (CMHC)
- Transaction-level data from 24 February 2005 to 19 April 2010

- **Key variables:** (i) contract terms, (ii) household financial characteristics, (iii) lender, (iv) location, (v) prior relationship with lender.
- Sample selection:
  - First-time home-buyers
  - Mortgage terms of 1-10 years
  - Fixed-rate mortgage contracts

Average TDS and LTV for first-time home-buyers

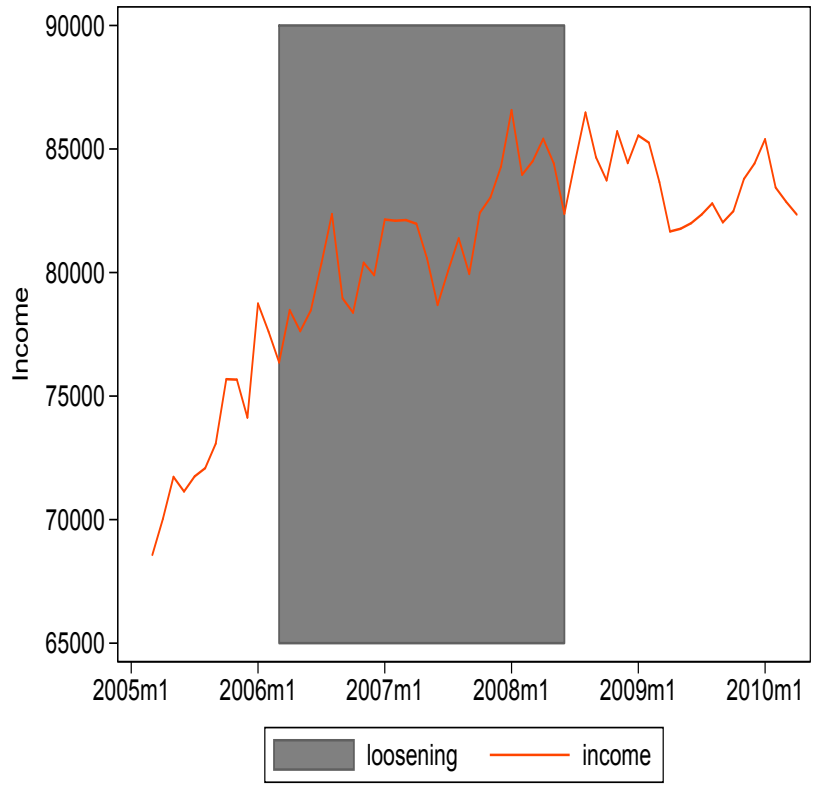


(a) Average TDS

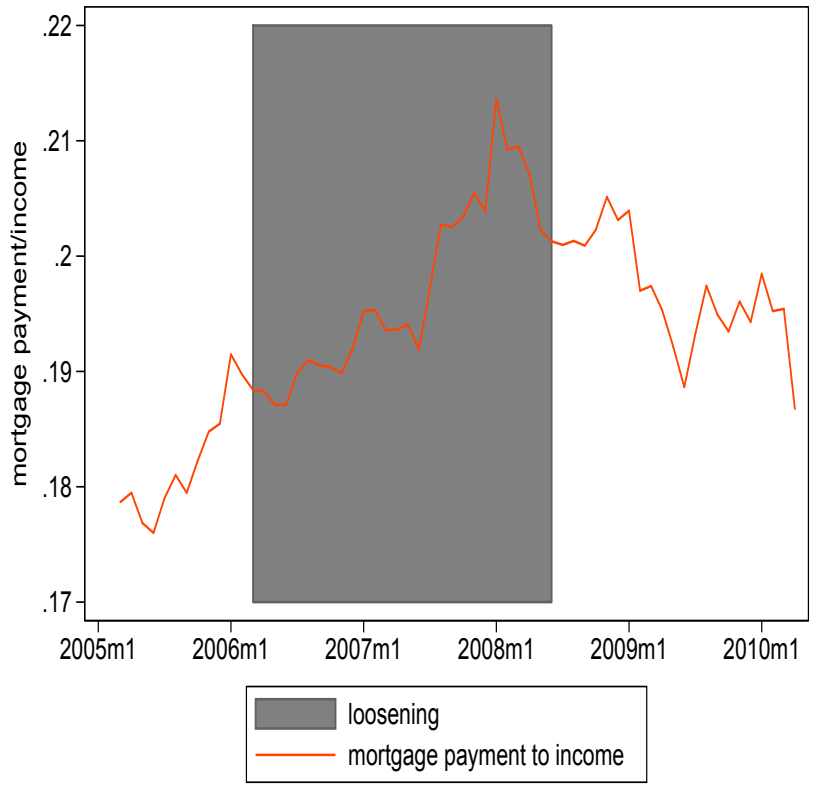


(b) Average LTV

Average household income and mortgage payment for first-time home-buyers



(a) Household income



(b) Average payment to income

Results: Impact of macroprudential changes on key borrower characteristics

$$y_{it} = \alpha + \beta X_{it} + \phi I(MP) + \theta_m + \gamma_l + \nu_b + \epsilon_{it}$$

- 10 separate regressions

	I(LTV≥95)	log(tds)	log(mp/inc)	log(HP)	rate
loose	0.043***	0.045***	0.106***	0.194***	0.695***
(2006-07) v '05	(0.003)	(0.006)	(0.003)	(0.007)	(0.004)

	I(LTV≥95)	log(tds)	log(mp/inc)	log(HP)	rate
tight	0.007***	0.002**	-0.044***	0.099***	-1.265***
(2008-10) v '06-'07	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)

- Increasing fraction of households at the LTV constraint
- Loan size constrained by LTV, not income (ambiguity in the income constraint)

Model

- Renters and Home-owners
- A three-stage approach is used to determine if a renter will be a FTHB in period t:

1. Determine whether a household is a potential FTHB.
2. Determine whether a potential FTHB qualifies for a mortgages.
3. Determine the down payment a household will make, and whether a qualified FTHB actually purchases a house.

Model: potential FTHB are renters in household survey data

Three conditions for a household to be a potential FTHB:

- must be under fifty years old
- must not currently own housing assets
- must be employed.

Key characteristics of potential FTHBs

Variables	2007-2008			
	mean	sd	p25	p75
Income	67,614	29,545	47,500	85,000
Age	35	7.9	28	42
Financial assets	29,224	58,254	1,500	27,550
Consumer debt/income	4.32	6.5	0	8.54

Model: Qualified FTHB

- All renters receive a preference mortgage payment shock:

$$\omega_i^{GDS} \sim N\left(\mu\left(x_{i,0}^{Y}\right), \sigma\right).$$

- For each preference shock there is a corresponding mortgage payment:

$$x_{i,t}^{MORT} = \omega_i^{GDS}\left[\frac{x_{i,t}^{Y}}{12}\right]\left[\frac{\left(\left(1+r_t/2\right)^{1/6}-1\right)\left(1+r_t/2\right)^{T*2}}{\left(1+r_t/2\right)^{T*2}-1}\right]$$

Model: Qualified FTHB

- (TDS constraint): Total household debt servicing must be below the total-debt-service threshold:

$$\omega_i^{GDS} + \frac{x_{i,t}^{CDPAY}}{x_{i,t}^{Y}} \leq \overline{TDS}$$

- (Down payment constraint): The down payment by household i must be above the regulatory minimum:

$$x_{i,t}^{DPMAX} \geq DP^{MIN}$$

- (Affordability constraint): Through a combination of down payment and servicing a mortgage, a household must be able to afford an entry level house:

$$x_{i,t}^{HPMAX} \geq HP_{Reg_i,t}^{STARTER}$$

Model: Buying FTHB and down payment decision

We assume that the probability that a qualified household will buy a house with down payment dp_k depends upon a household's maximum possible down payment as well as household income:

$$prob\left(dp_{i,t} = dp_k\right) = p\left(dp_k, x_{i,t}^{Y}, x_{i,t}^{DPMAX}\right)$$

If $dp_k > x_{i,t}^{DPMAX}$, then $p\left(dp_k, x_{i,t}^{Y}, x_{i,t}^{DPMAX}\right) = 0$. For the other probabilities we perform a one-step GMM calibration to match the joint distribution of income and down payments.

Model: Loan-level data calibration (2007-2008)

Income category ($)	Frequency (%)	mp/inc mean	LTV 100%	95%	90%	80%
0-24,999	0.5	18.1	9.9	49	25.1	16
25,000-34,999	2.8	18.2	12	45.7	23.4	19
35,000-44,999	7.3	18.9	14.5	41.4	25.1	19
45,000-54,999	11.7	18.9	14.5	39.3	27.2	19
55,000-59,000	6.8	18.7	14.7	39.8	26.4	19
60,000-69,999	14.5	18.6	14.9	39.1	27	19
70,000-84,999	19.0	18.1	14.4	40.2	28.4	17
85,000-99,999	14.2	17.6	13	37.6	27.5	22
100,000-119,000	11.3	16.6	12.2	36.7	28.0	23
120,000-149,999	7.2	15.3	10.7	34.9	29.4	25
150,000+	4.7	12.7	8.3	30.6	30	31

Results: Impacts of changes in macroprudential policy from the structural model

Experiment	Change in # of Qualified Households (%)	Change in in # of FTHBs(%)	Change in FTHB Mortgage Debt (%)
Tightening: Calibrated to 2007-2008 data			
Amortization decrease 40 to 35	-3.4	-2.1	-5.3
Amortization decrease 35 to 25	-11.2	-7.8	-16.7
Amortization decrease 40 to 25	-14.0	-9.6	-21.0
LTV decrease 100 to 95	-51.4	-7.9	-8.1

Conclusions

- Canada has substantial experience with macroprudential housing-finance tools
- The most recent experience highlights that FTHBs are sensitive to changes to LTVs.
  - Most of these consumers do not have much savings
- Changes to amortization impact high wealth, low income consumers
- HRAM combines micro-data with household survey data with a structural model to inform macroprudential policy

Results: Impacts of loosening in macroprudential policy from the structural model

Experiment	Change in # of Qualified Households (%)	Change in in # of FTHBs(%)	Change in FTHB Mortgage Debt (%)
Loosening: Calibrated to 2005 data			
Amortization increase 25 to 30	6.5	4.4	11.3
Amortization increase 30 to 35	4.2	2.6	7.5
Amortization increase 25 to 35	10.2	6.9	19.0
Amortization increase 35 to 40 and LTV increase 95 to 100	164.8	135.0	149.9