

Does Mortgage Regulation Stabilize Household Consumption?

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Motivation

- Surge in borrower-based macroprudential regulation
 - Loan-to-Value (LTV) restrictions implemented in a broad range of countries
- Key purpose of LTV restrictions: dampen negative externalities due to high leverage
 - Aggregate demand externalities (Korinek & Simsek 2016, Fahri & Werning 2016)
 - Debt deleveraging, house price drops, ...

This paper: Micro-level evidence on

- (i) how household adjust balance sheets in response to LTV restrictions
- (ii) explore implications for the response of consumption demand to shocks



Data

1. Administrative tax data from Statistics Norway
 - Balance sheet and income statement items for all individuals
 2. Housing transaction data from the Land Registry
 - All housing transactions in Norway
 3. Consumption data from the payments provider NETS ($\approx 80\%$ of card payments in Norway)
 - 26 consumption categories
- Period: 2004 - 2018
 - Aggregate data to household level
 - Exclude self-employed



Regulation

Date	Regulation
2010 - March	LTV-cap of 90% Voluntary DTI-cap of 300% Amortization requirement for "high-LTV" mortgages Potential for "substantial interest rate increases"
2011 - December	LTV-cap of 85% Voluntary DTI-cap removed Amortization requirement for loans with LTV > 70% introduced Potential for five percentage points interest rate increase

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In this presentation: Focus on December 2011 change.





LTV restrictions and household balance sheets

LTV restrictions and balance sheet adjustments

Three steps to the analysis

1. Obtain treatment indicator

- Predicted LTV-ratios in years with no reform
 - Regress LTV ratio of homebuyers on current demographics, current and lagged income variables and lagged wealth variables
 - **Treated households have a predicted LTV above the regulatory caps**

2. Estimate extensive margin effect in diff-in-diff setup

- Impact on house purchase probabilities

3. Estimate intensive margin effect in diff-in-diff setup

- Impact on household balance sheets conditional on purchase



Extensive margin

House purchase probabilities decline for treated households

	(1)	(2)	(3)	(4)
	House Purchase	House Purchase	House Purchase	House Purchase
$L\hat{T}V^{high} \times Post^{2010}$	-0.0776 (0.0599)	-0.1095* (0.0559)		
$L\hat{T}V^{high} \times Post^{2012}$			-0.3364*** (0.0519)	-0.3643*** (0.0523)
N	4,352,860	6,583,923	4,508,483	6,788,070
Clusters	430	431	430	431
Mean	4.66	4.66	5.20	5.22
Sample period	2009-2010	2009-2011	2011-2012	2011-2013
Year FE	Yes	Yes	Yes	Yes

Table. Extensive margin effects.



Intensive margin effects

Households reduce leverage and liquidity

	(1)	(2)	(3)	(4)	(5)
	LTV	Debt	Int.Expenses	House price	Liquid assets
$L\hat{T}V^{high} \times Post^{2012}$	-2.365*** (0.181)	-41,833*** (4,321)	-1,894*** (201.5)	-43,508*** (5,850)	-4,656*** (1,737)
N	222,156	222,156	222,156	222,156	222,156
Clusters	433	433	433	433	433
Mean	73.59	385,650	12,073	510,708	44,771
Year FE	Yes	Yes	Yes	Yes	Yes

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Intensive margin effects

Liquidity effect is long-lived

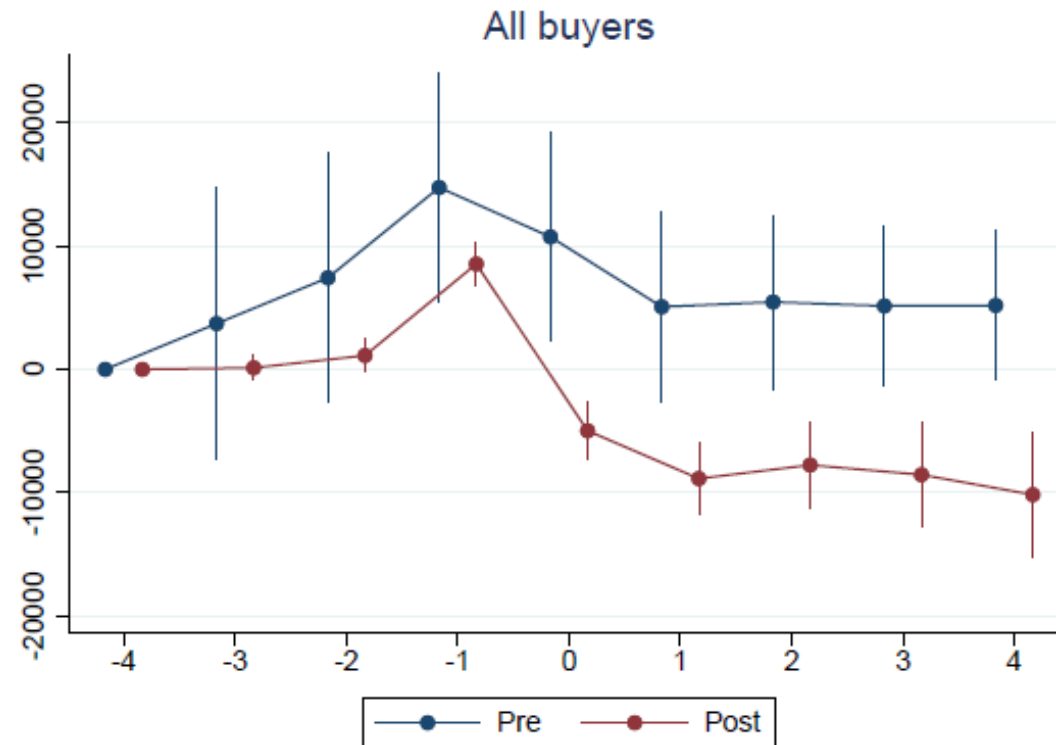


Figure. Bank deposits around house purchase. Pre and post.



Robustness

- Measurement error in treatment indicator
 - Two alternative measures: continuous treatment and semi-continuous
- Placebo tests
 - Extensive and intensive margin analysis in years without reform
- Additional controls
 - Dynamic effects of house price growth and interest rate changes





Implications for household consumption volatility

Does LTV restrictions dampen consumption responses to shocks?

- Existing literature
 - Lower leverage \Rightarrow lower response to wealth shocks
 - Lower liquidity \Rightarrow higher response to income shocks (Kaplan and Violante 2014, Fagereng, Holm and Natvik 2021)
 - Highlights a **leverage-liquidity tradeoff** of LTV restrictions
- Do we find evidence that reductions in liquidity and leverage affect household behavior?
 - Explore household responses to unemployment (income change) and wealth changes



Response to unemployment

- Estimate $\tilde{C}_{i,t} = \alpha_i + \delta_t + \beta T_i \times UYear_{it} + \gamma UYear_{it} + \epsilon_{i,t}$
 - Compare those who purchase right before vs. right after regulation
 - Unemployed in year following house purchase

	(1)	(2)	(3)
	Total consumption	Non-durable consumption	Durable consumption
$T_i \times U\text{-}Year_{i,t}$	-8129.5*** (1511.5)	-2181.1*** (552.5)	-5948.4*** (1353.6)
N	27359	27359	27359
Clusters	363	363	363
Mean	74063.1	35061.6	22949.0
Year FE	Yes	Yes	Yes
HH FE	Yes	Yes	Yes

Table. Consumption response to unemployment



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Table. Consumption response to unemployment

Consumption response **stronger** for affected households



Response to wealth shocks

- Estimate $\tilde{C}_{i,t} = \alpha_i + \delta_t + \beta T_i \times \Delta wealth_{i,t} + \gamma \Delta wealth_{i,t} + \epsilon_{i,t}$
- Where $\Delta wealth_{i,t}$ is either
 - $\Delta wealth_{i,t} = \Delta Value\ of\ primary\ residence_{i,t}$ or,
 - $\Delta wealth_{i,t} = stock\ wealth_{i,t-1} \times r_t$
 - $r_t =$ on the MSCI world index from $t - 1$ to t
- As before: compare homebuyers in right before vs. right after and the wealth change in the subsequent year



Response to wealth shocks

	(1)	(2)	(3)	(4)	(5)	(6)
	Total consumption	Non-durables	Durables	Total consumption	Non-durables	Durables
$T_i \times \text{stock wealth}_{i,t-1} \times r_t$	0.0602 (1.144)	0.757 (0.477)	-0.155 (0.822)			
$T_i \times \Delta \text{Value of primary residence}_{i,t}$				-0.00284 (0.0213)	-0.00976 (0.00968)	0.00693 (0.0168)
N	23758	23758	23758	23758	23758	23758
Clusters	361	361	361	361	361	361
Mean	59012.1	35160.1	23852.0	59012.1	35160.1	23852.0
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
HH FE	Yes	Yes	Yes	Yes	Yes	Yes

Table. Consumption response to wealth changes



Net impact on consumption volatility

Back-of-the-envelope

- Assume

$$\Delta c = \Delta y MPC^y + \Delta w MPC^w$$

- Consumption volatility is then given by

$$\sigma_{\Delta c}^2 = (MPC^y)^2 \sigma_{\Delta y}^2 + (MPC^w)^2 \sigma_{\Delta w}^2 + 2MPC^y MPC^w \sigma_{\Delta y} \sigma_{\Delta w} \rho_{\Delta w, \Delta y}$$



Net impact on consumption volatility

Back-of-the-envelope

- Effect of LTV caps

$$\begin{aligned}\frac{\partial \sigma_{\Delta c}^2}{\partial \text{LTV-caps}} &= 2 \frac{\partial MPC^y}{\partial \text{LTV-caps}} MPC^y \sigma_{\Delta y}^2 + 2 \frac{\partial MPC^w}{\partial \text{LTV-caps}} MPC^w \sigma_{\Delta w}^2 \\ &+ 2 \sigma_{\Delta y} \sigma_{\Delta w} \rho_{\Delta w, \Delta y} \left(\frac{\partial MPC^y}{\partial \text{LTV-caps}} MPC^w + \frac{\partial MPC^w}{\partial \text{LTV-caps}} MPC^y \right) \\ &+ 2 MPC^y \frac{\partial \sigma_{\Delta w}}{\partial \text{LTV-caps}} (MPC^y \sigma_{\Delta w} + MPC^w \sigma_{\Delta y} \rho_{\Delta w, \Delta y})\end{aligned}$$



Net impact on consumption volatility

Back-of-the-envelope

- Effect of LTV caps

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- Use own and existing estimates to explore effects on MPCs



Net impact on consumption volatility

Back-of-the-envelope

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- Estimate the impact on house price volatility
 - Across-region comparison



Putting it all together

MPC-estimates	Volatility	Volatility-response	$\frac{\partial \sigma_c^2}{\partial \text{LTV-cap}}$	
			Home buyers	Full sample
From paper	Micro-data	None	0.00 (0.1%)	0.00 (0.00%)
From paper	Macro-data	None	0.00 (0.0%)	0.00 (0.00%)
From literature	Micro-data	None	0.03 (3.1%)	0.00 (0.0%)
From literature	Macro-data	None	0.00 (0.0%)	0.00 (0.0%)
From paper	Micro-data	Equation (13)	-0.01 (-1.2%)	-0.01 (-0.1%)
From paper	Macro-data	Equation (13)	-0.00 (-0.3%)	0.00 (0.0%)
From literature	Micro-data	Equation (13)	0.02 (1.8%)	-0.01 (-0.1%)
From literature	Macro-data	Equation (13)	0.00 (-0.3%)	-0.00 (-0.0%)

Table. Implications for consumption volatility



Conclusion

- LTV restrictions affect household balance sheets in multiple ways
 - Leverage-liquidity tradeoff
- Lower liquidity amplifies consumption response to unemployment
- Limited (and potentially) negative impact on consumption volatility
- Other aspects: distributional concerns, other goals of the policy, ...

