

Macroeconomic Costs of Deleveraging in a Low Interest-rate Environment

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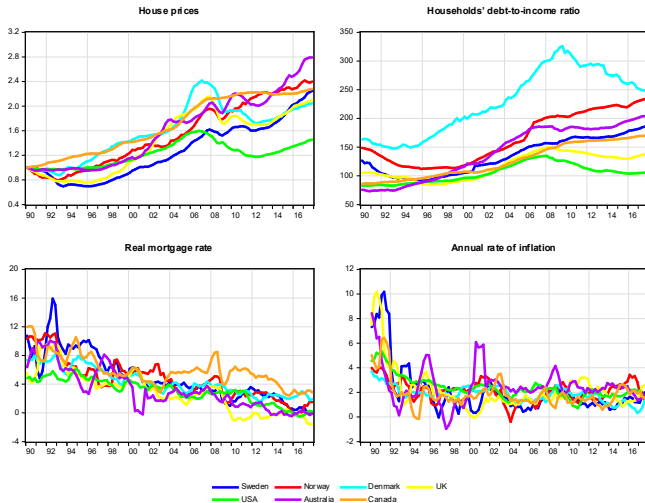
Fourth Annual ECB Macprudential Policy and Research Conference

Household indebtedness have risen to unprecedented levels

Raises concerns about their vulnerability to normalized interest rates...

- Elevated household debt and house prices could pose risks for financial stability.
- Low interest rates keep the debt-service-to-income ratio at sustainable levels.
- But, low nominal rates also mean less room for monetary interventions.
- Various macroprudential policies (MPP) have been put forward to stem the elevated vulnerabilities.

A phenomenon that is shared among many countries...



Are some macropru instruments *better* than others
in a low-interest rate environment?

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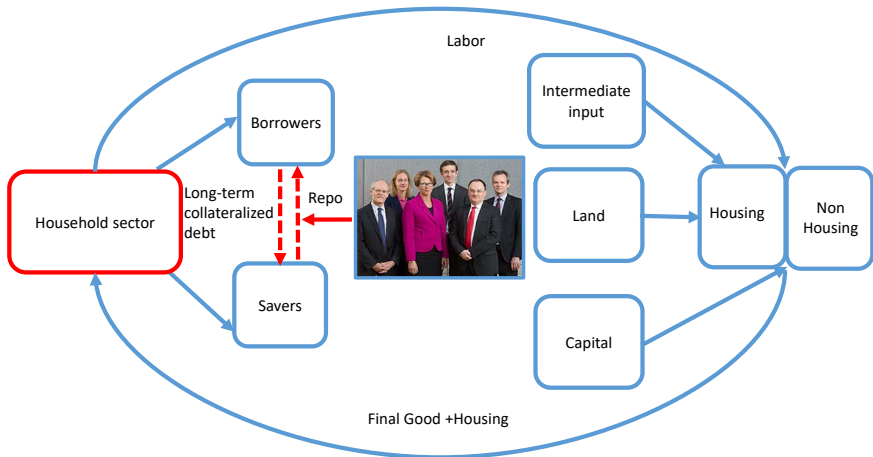
“Better” = Less output loss for a given debt
reduction
(minimum “debt-sacrifice ratio”)

- Quantify **short-run** and **long-run** macroeconomic effects of MPP in a low-real interest rate/high-debt environment.
- Compare contractionary effects of tightening various MPP tools when central bank can **not** provide accommodation:
 - Loan-to-value (LTV)
 - Loan-to-income (LTI)
 - Debt-service-to-income (DSTI)
 - Mortgage interest deductibility (MID) removal
 - ...i.e. only **borrower-based measures**.
- Welfare analysis: MPP tightening beneficial in the long run.

- **Housing and the macroeconomy:** Iacoviello (2005), Iacoviello and Neri (2010), Justiniano Primiceri and Tambalotti (2015).
- **Monetary policy transmission mechanism and HH debt:** Garriga et al. (2017), Gelain et al. (2017), Pietrunti and Signoretti (2018), Hedlund et al. (2017), Calza et al. (2013), Cloyne et al. (2018), Flodén et al. (2018).
- **Interaction between MP and MPP:** Lambertini et al. (2013), Angelini et al. (2014), Alpanda and Zubairy (2017), Gelain and Ilbas (2017), De Paoli and Paustian (2017).
- **MPP at the ZLB:** Ferrero et al. (2018), Rubio and Yao (2018), Mendicino et al. (2019), Korinek and Simsek (2016), Farhi and Werning (2016).

The model - an extension of Iacoviello and Neri (2010)

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Key extensions: housing transaction costs and long-term debt

1 Housing transaction costs

- Make housing an illiquid asset
⇒ Generates reasonable consumption responses of borrowers (Target: Cloyne et al., 2018)

2 Long-term debt (Alpanda and Zubairy, 2017):

- Realistic
- Generates gradual debt responses to MP shocks
- Stock of debt evolution: $D_t = (1 - \kappa) D_{t-1} + L_t$

The various borrowing constraints

$$\textcircled{1} \text{ LTV : } \underbrace{L_t}_{\text{New loans}} \leq \theta_t^{\text{LTV}} \underbrace{q_t^N IH_t}_{\text{Housing collateral}} + HEW_t$$

$$HEW_t = \gamma[q_t^N(1 - \delta_h)H_{t-1} - (1 - \kappa)D_{t-1}]$$

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- ② $LTI : L_t \leq \theta_t^{LTI} \underbrace{w_t N_t}_{\text{Labor income}} + HEW_t$

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$$\textcircled{2} \quad LTI : L_t \leq \theta_t^{LTI} \underbrace{w_t N_t}_{\text{Labor income}} + HEW_t$$

$$\textcircled{3} \quad DSTI : L_t \leq \theta_t^{DSTI} \underbrace{\frac{w_t N_t}{(1 - \tau_t)r_t^F + \kappa}}_{\text{Labor income/Debt Service}} + HEW_t$$

$$HEW_t = \gamma[q_t^N(1 - \delta_h)H_{t-1} - (1 - \kappa)D_{t-1}]$$

• Monetary Policy

- Central bank reacts to inflation, the output gap and output growth.

$$\hat{R}_t = \left(\bar{R} \left(\frac{1 + \pi_t}{1 + \pi} \right)^{r_\pi} Y_{GAP,t}^{r_Y} \Delta Y_t^{r_{\Delta Y}} \right)^{(1-\rho)} R_{t-1}^\rho \exp(\varepsilon_{r,t})$$

- Subject to a ZLB constraint

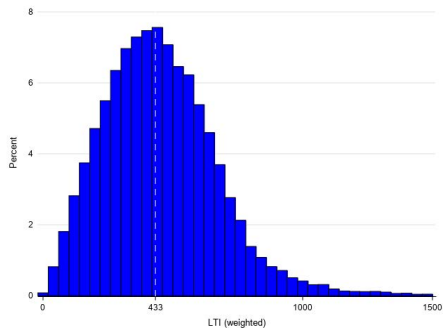
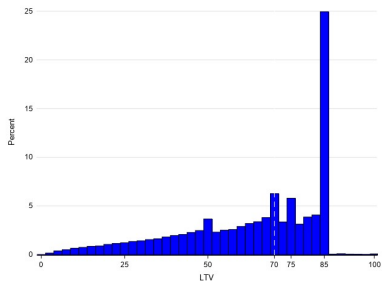
$$R_t = \max \{1, \hat{R}_t\}$$

• Macroprudential Policy Tools: LTV, LTI, DSTI and MID

- Interest rate deductions financed with lump-sum taxes paid by borrowers, period-by-period

$$T_t = \tau_t r_{t-1}^M \frac{D_{t-1}}{P_t}$$

Calibration: LTV vs. LTI



Data source: Swedish FSA Mortgage Survey, average 2015-2017

Drivers of increase in household debt

Low debt vs. High debt

	1990's	2010's	Resulting LTI increase
Real rate	3%	0.5%	54%
LTV	75%	85%	24%
HEW fraction	0.015	0.021	12%
Inflation	2.0%	1.5%	9%

Long-run equilibrium

	1990's	2010's
LTI borrowers	217%	433%
DSTI (after tax) borrowers	14.2%	19.1%
Interest (after tax)/income of borrowers	7.67%	6.08%
Non-residential investment /GDP	17.1%	20.9%
Residential investment /GDP	3.0%	5.2%
House prices (Δ from 1990's to 2010')		36.5%

► More

► LTV

Results: Long-term effects of MPP instruments (% change)

Constraint Tightening	2010's			
	LTV		LTI	DSTI
	LTV	MID	LTI	DSTI
LTI aggregate	-10.2	-10.2	-10.2	-10.2
Output	-0.32	-0.37	-0.56	-0.56
Consumption	-0.07	-0.08	-0.56	-0.56
Non-residential investment	-0.20	-0.24	-0.56	-0.56
Residential investment	-3.05	-3.56	-0.58	-0.58
House prices	-1.21	-1.41	-0.07	-0.07
DSTI (after tax) of borrowers	-10.2	2.09	-10.2	-10.2
Consumption of borrowers	0.98	1.11	-0.33	-0.33
Housing of borrowers	-7.94	-9.30	-0.27	-0.27
Hours worked of borrowers	-1.11	-1.27	-1.79	-1.79
Income of borrowers	-0.38	-0.44	-0.56	-0.56

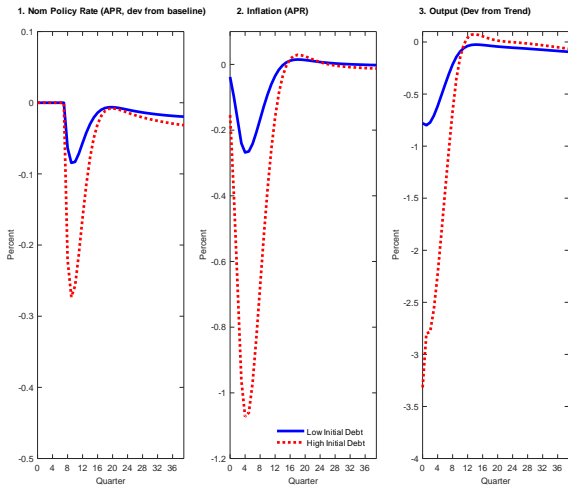
MPP in the short-run: simulations set-up

- We assume that the economy is driven to the ZLB by “a mix of adverse shocks”:
 - Perturbation setting: no need to specify which shocks, only the path of the shadow rate matters (Erceg and Lindé, 2014).
 - Assume that MPP actions not large enough to impact ZLB *duration*.
- Impulse responses are constructed as follows
 - **Baseline:** MP is constrained by the ZLB for 8 quarters.
 - **Scenario:** Add a macroprudential shock to the system.
 - The **IRFs** we plot are:

$$\text{IRF} = \text{Scenario-Baseline}$$

Dynamic effects of MPP at the ZLB

Aggregate effects of LTV tightening in a liquidity trap

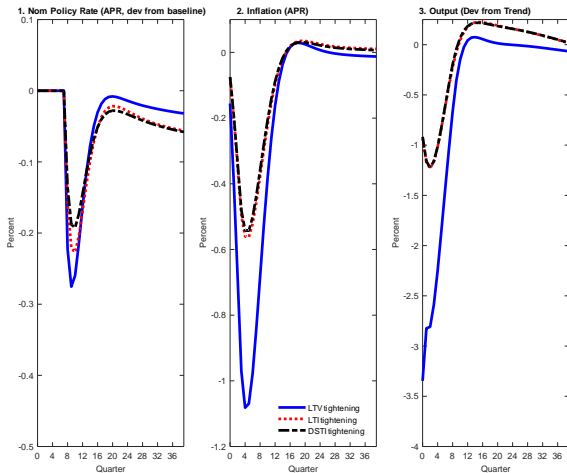


Dynamic effects of MPP at the ZLB

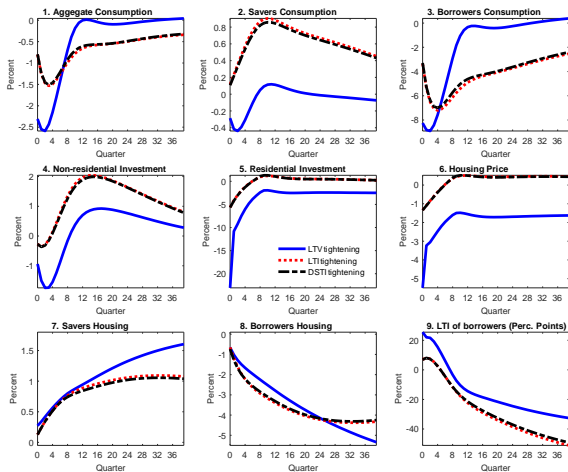
Effects of LTV tightening: dissecting the mechanism

- Effects of LTV tightening at the ZLB notably larger when **debt is high**
- Two mechanisms:
 - An MPP tightening in this setting is more contractionary and therefore requires a **larger dose of monetary accommodation**.
 - **Monetary policy more potent** and hence monetary constraints have larger adverse effects

Short-run effects of MPP tools: LTV, LTI and DSTI tightening



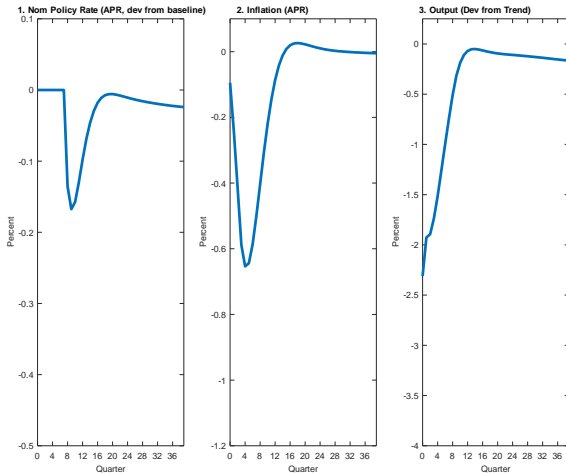
Short-run effects of MPP tools: LTV, LTI and DSTI tightening



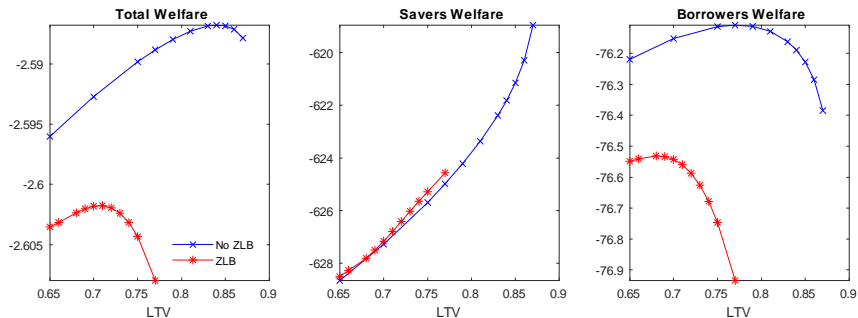
Short-run effects of various MPP tools

- In the short-run, LTV tightening more contractionary than LTI/DSTI:
 - Due to feedback through house prices:
 - The fall in house prices amplifies the contraction in borrowing capacity, which then further reduce borrowers' demand for both housing and other consumption

MID Removal: Aggregate effects - similar to LTV



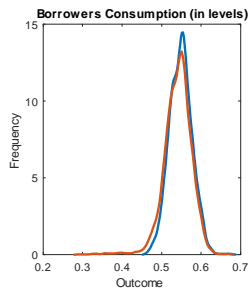
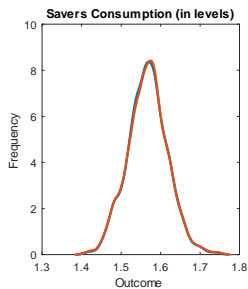
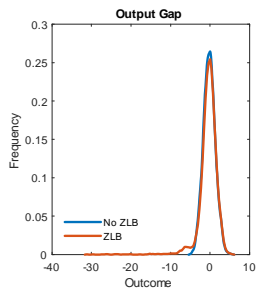
Welfare, LTV and the ZLB



Accounting for ZLB moves optimal LTV from 0.84 to 0.7
Fraction of periods at the $ZLB = 0.06$, for $LTV = 0.7$

ZLB yields skewed distribution

Simulation for $LTV=0.7$



MPP may be welfare enhancing

Restricting debt ex-ante is optimal in this class of models

In our model, two externalities motivate the use of MPP to curb household debt:

1 Pecuniary (Lorenzoni, 2008)

- Effects of house prices on collateral constraints not internalized by atomistic agents.
- Relies on the existence of a borrowing constraint.

2 Aggregate Demand (Farhi and Werning, 2016, Korinek and Simsek, 2016)

- Households take financial decisions based on *private* rather than *social* marginal utilities.
- Changes in the distribution of wealth affect demand but this is not internalized by atomistic agents.
- The key friction is a constraint on monetary policy (ZLB).

Conclusions

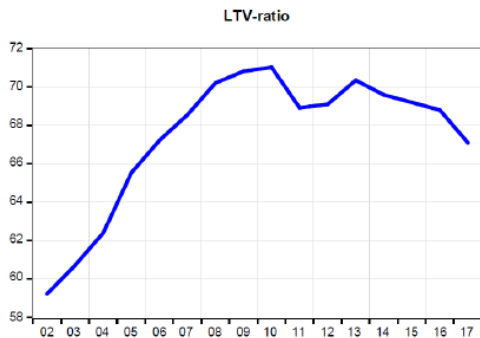
- Established plausible factors that doubled LTI ratio in recent decades
 - Mainly the fall in the real mortgage rate and the increase in maximum LTV
- The current high household indebtedness and low interest rate makes macroeconomy sensitive to tightening of MPP
- In the **long-run**, similar *small* output effects of various MPP tools.
- In the **short-run**, contractionary effects from MPP can be substantial when the ZLB is binding
 - LTV or MID tightening is associated with large output costs:
 - Financial accelerator: negative feedback through house prices.
 - MID removal has similar effects as LTV even when nominal rates are low.
 - LTI/DSTI tightening is less contractionary:
 - Crucial mechanism: avoids negative feedback effects of housing prices via the collateral constraint.

Key policy messages:

- Need to think carefully about monetary constraints and initial debt levels when designing MPP.
- The macroeconomic costs of MPP tools could differ substantially in the short-run.
- Welfare analysis is in favor of restricting debt
 - The presence of the ZLB matters for optimal LTV
 - High household debt and ZLB a toxic combination

Thank you!

Calibration: LTV Ratio



▶ Back

- Take most parameters from Iacoviello-Neri
- Four parameters set to match moments:

Parameter explanation		Value	Moment matched
Housing preference weight, savers	j_P	0.1235	Residential investm. / GDP
Housing preference weight, borrowers	j_I	0.2316	LTI of borrowers 1990's
Housing adjustment costs	ϕ_h	10	C-response of borrowers to MP shock
HEW fraction 2010's	γ	0.021	Doubling of LTI 1990's to 2010's

Calibration - remaining housing parameters

Description	Symbol	Value
Amortization rate on HH loans	κ	0.0075
Share refinancing every quarter	Φ	0.3

Sources: Swedish credit registry data, Swedish FSA Mortgage Survey

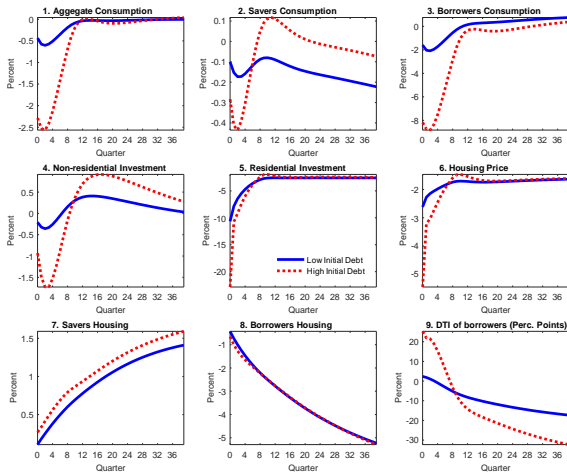
▶ Back

Steady state very similar across models

	2010's		
	LTV	LTI	DSTI
LTI borrowers	433	433	433
DSTI (after tax) borrowers	19.1	19.1	19.1
Interest (after tax)/income of borrowers	6.08	6.08	6.07
Non-residential investment /GDP	20.9	20.9	21.0
Residential investment /GDP	5.2	4.4	4.4
House prices (% Δ from 1990's to 2010')	36.5	34.4	34.4

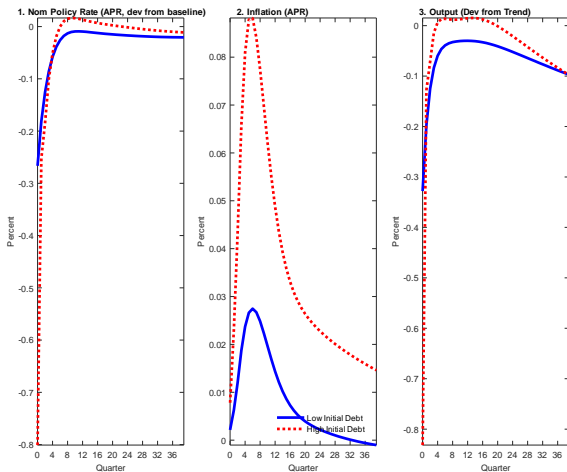
Dynamic effects of MPP at the ZLB

Effects of permanent LTV tightening: digging deeper



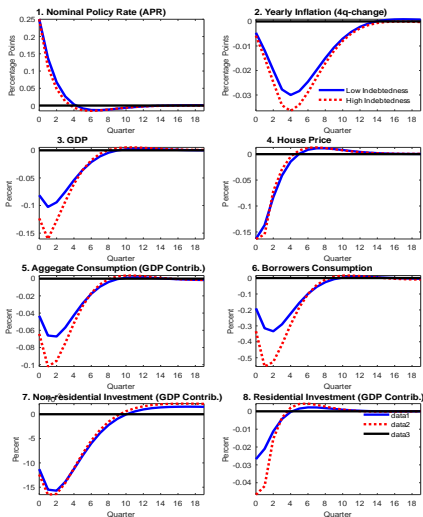
Explanation 1: LTV tightening needs more accommodation

Aggregate effects of an LTV tightening in alternative debt environments when monetary policy is unconstrained



Explanation 2: Strength of MP depends on debt level

Effects of a contractionary MP shock



Residential Investment

