Macroeconomic Costs of Deleveraging in a Low Interest-rate Environment

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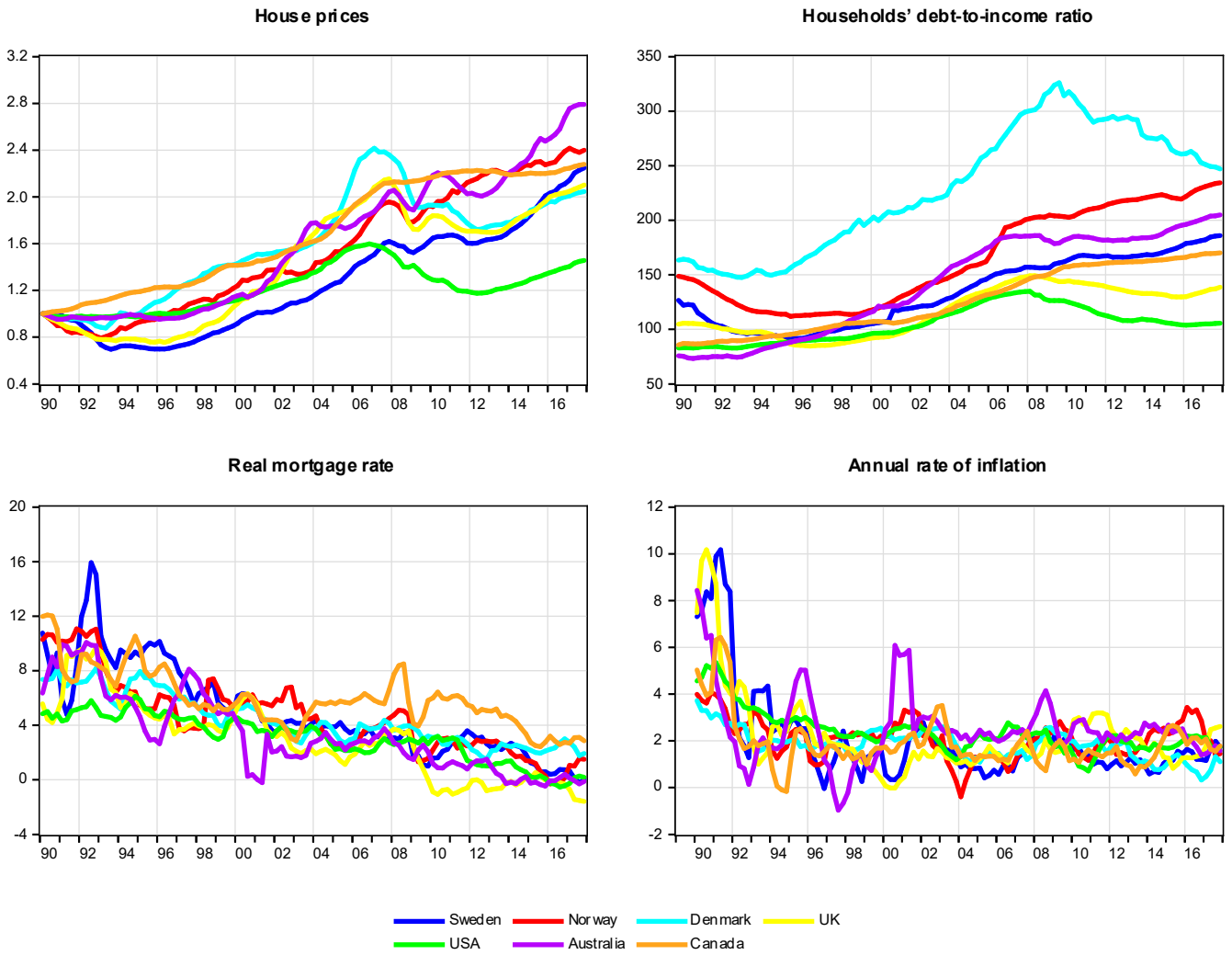
Household indebtedness have risen to unprecedented levels

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...



▶ Residential Investment

Research question: MPP, MP and ZLB

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

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

"Better" = Less output loss for a given debt reduction

(minimum "debt-sacrifice ratio")

What we do

- 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.

Literature review

- **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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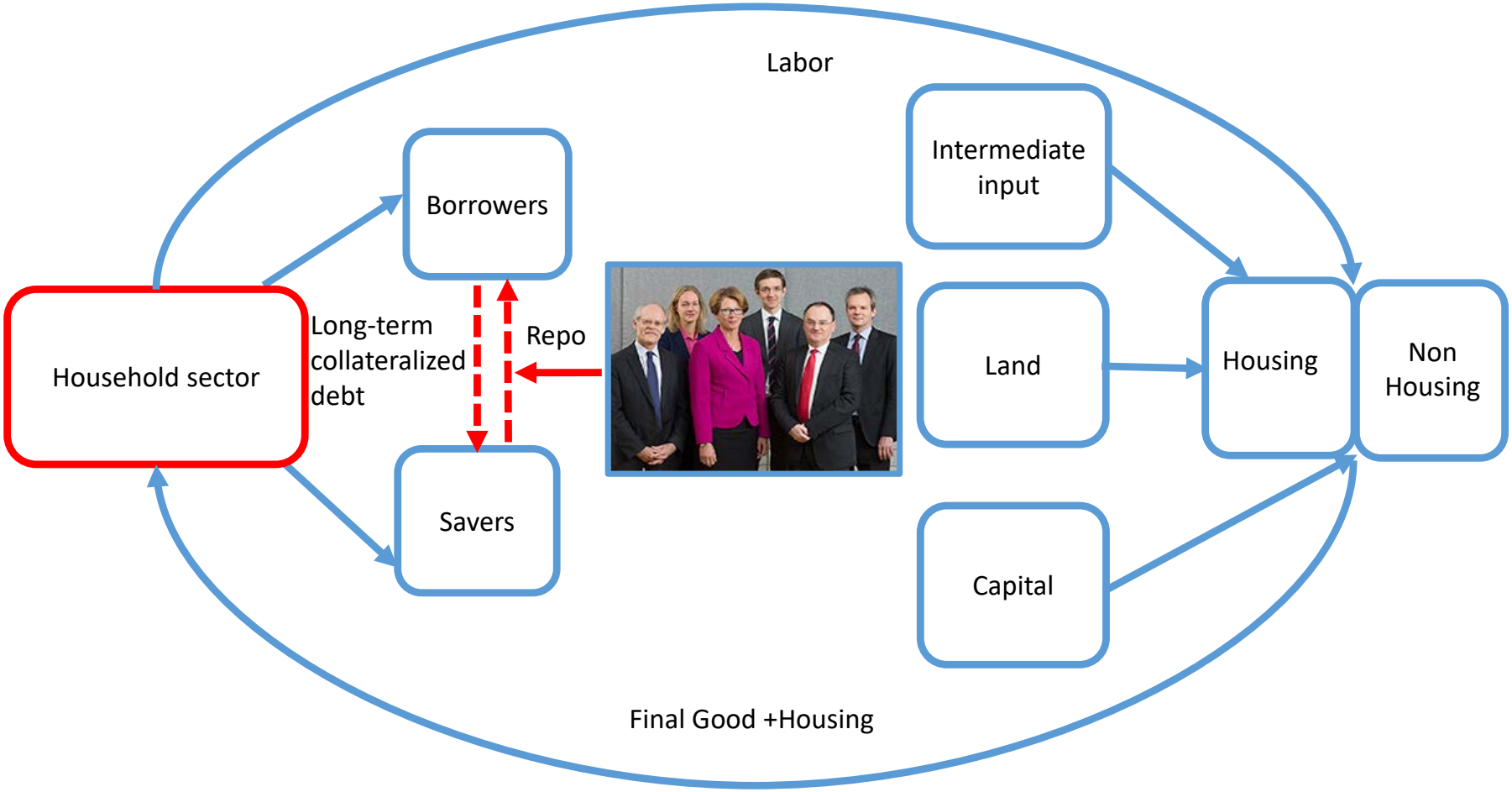

Key extensions: housing transaction costs and long-term debt

1. Housing transaction costs
   - Make housing an illiquid asset
     $\Rightarrow$ 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

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

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

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

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

Monetary and macroprudential policy

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

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

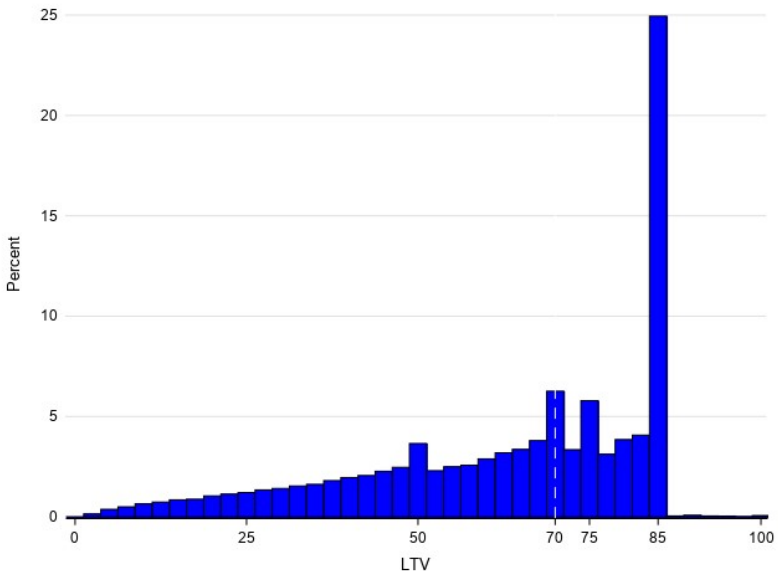
  - Subject to a ZLB constraint

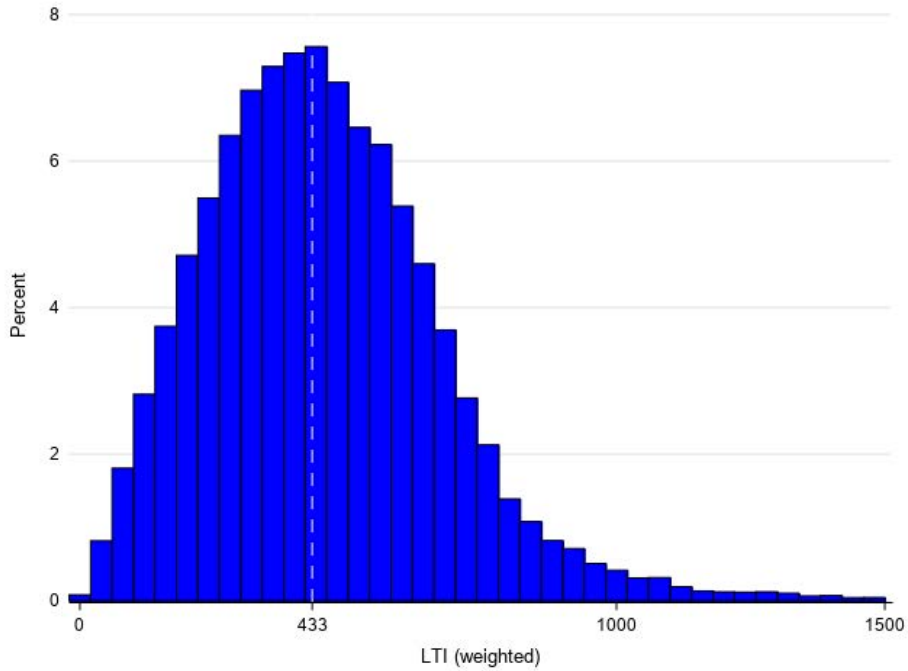
$$R_t = \max\left\{1, \hat{R}_t\right\}$$

- **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)

	2010's			
Constraint	LTV		LTI	DSTI
Tightening	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

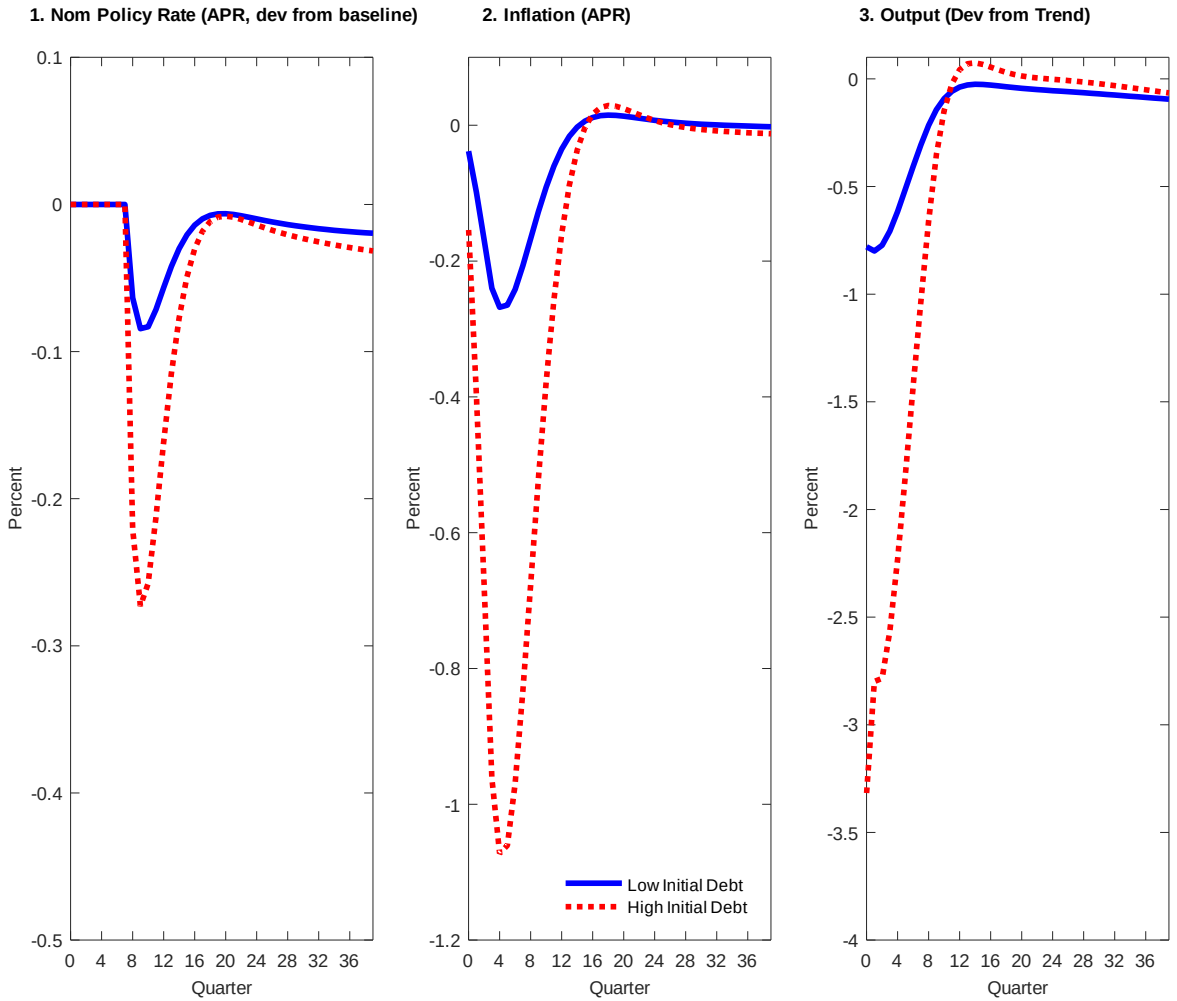
MPP in the short-run: simulations set-up

- 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:

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

Dynamic effects of MPP at the ZLB

Aggregate effects of LTV tightening in a liquidity trap

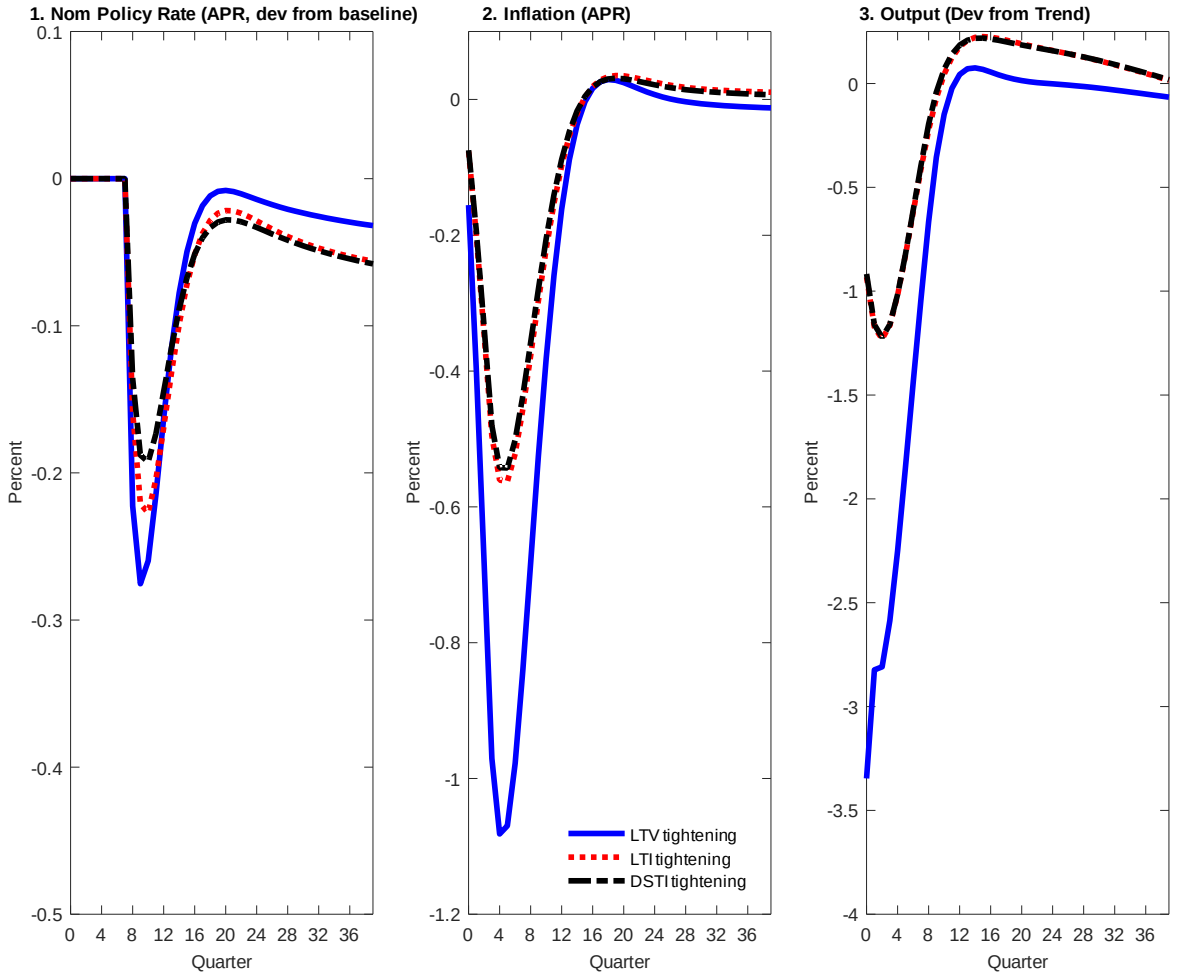


Dynamic effects of MPP at the ZLB

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



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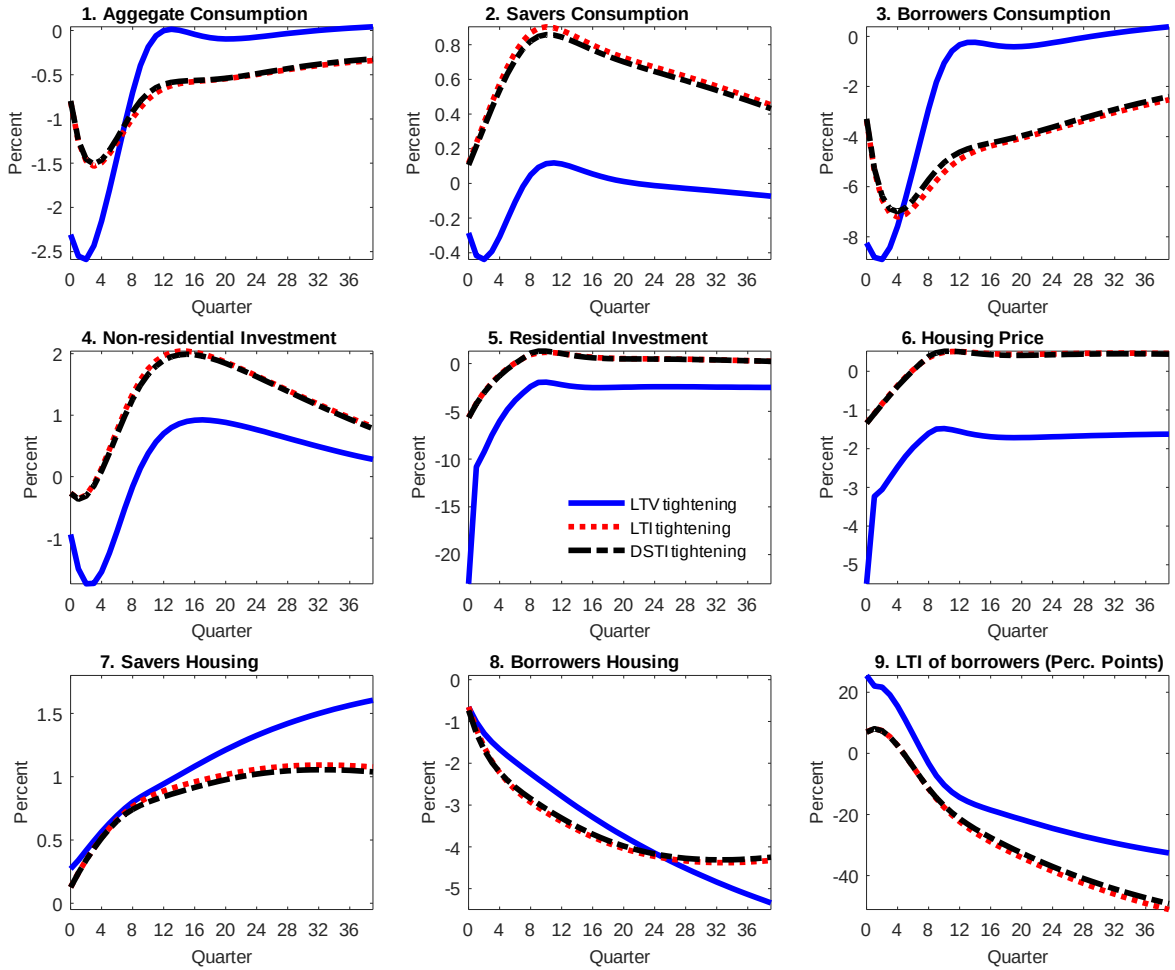
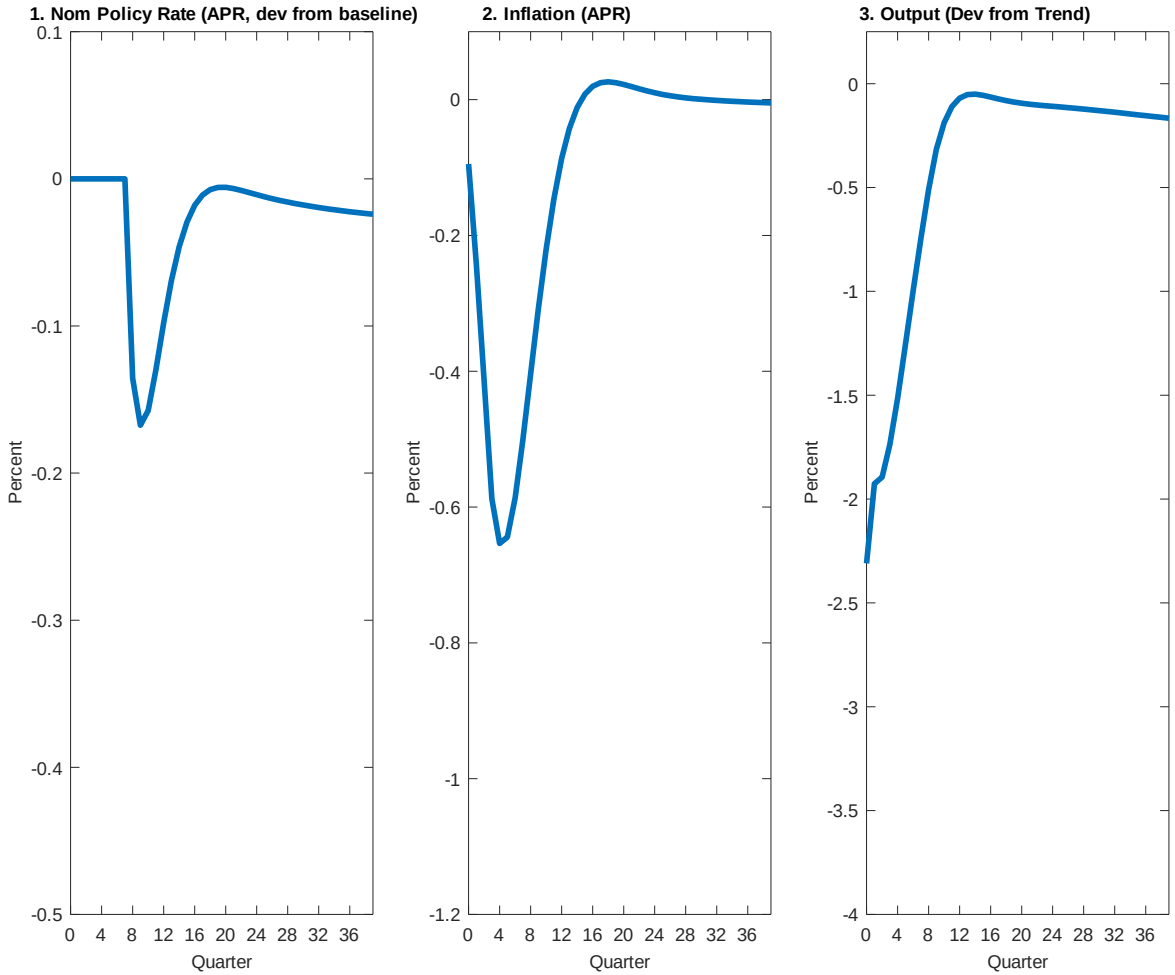


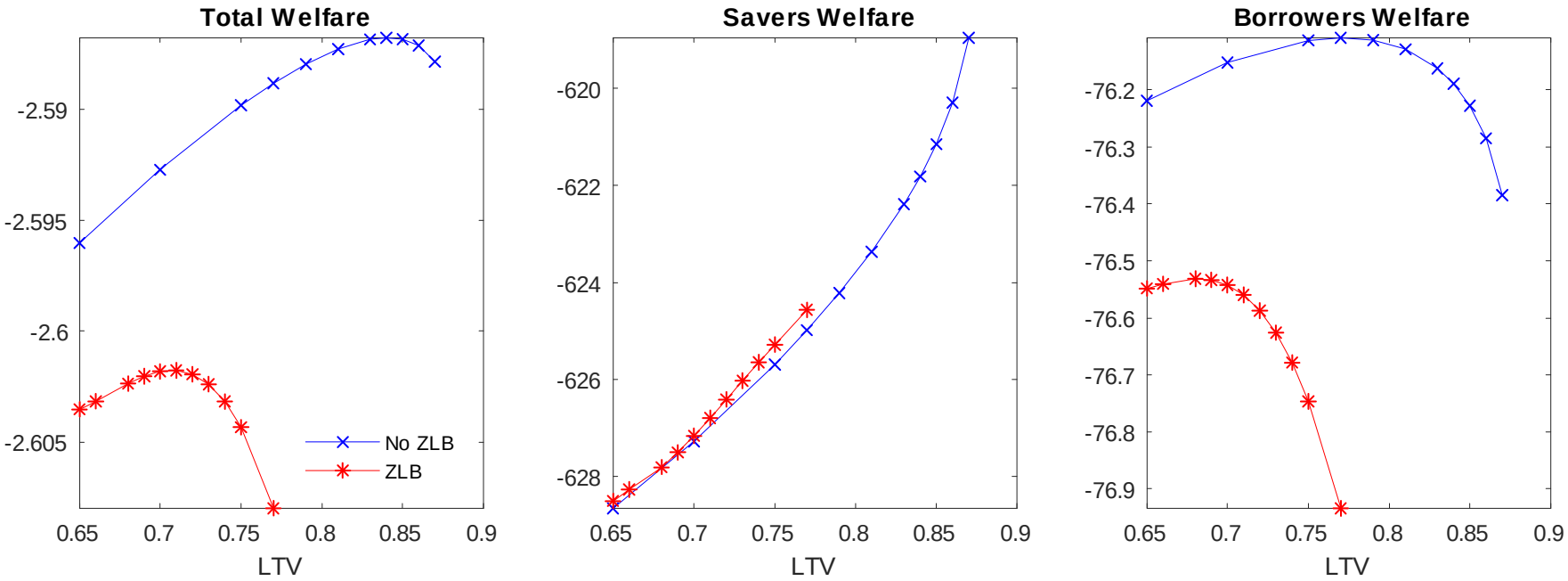
Short-run effects of various MPP tools

- 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



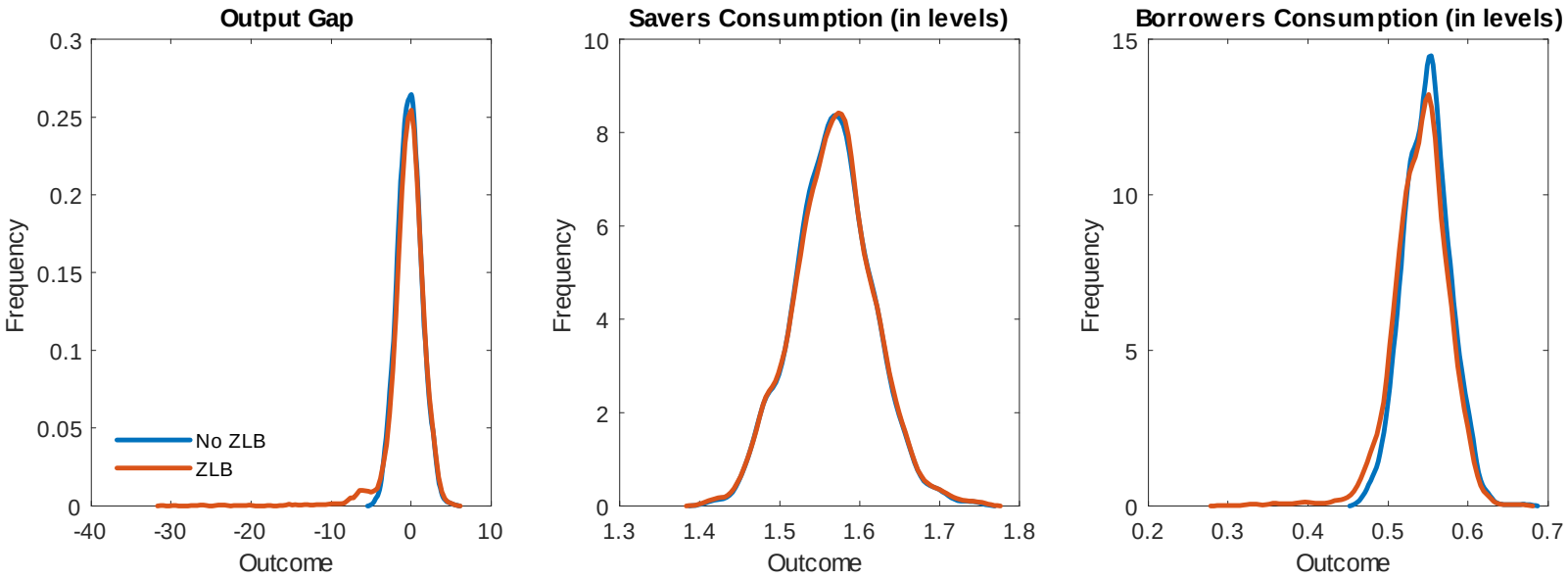
Welfare, LTV and the ZLB



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.

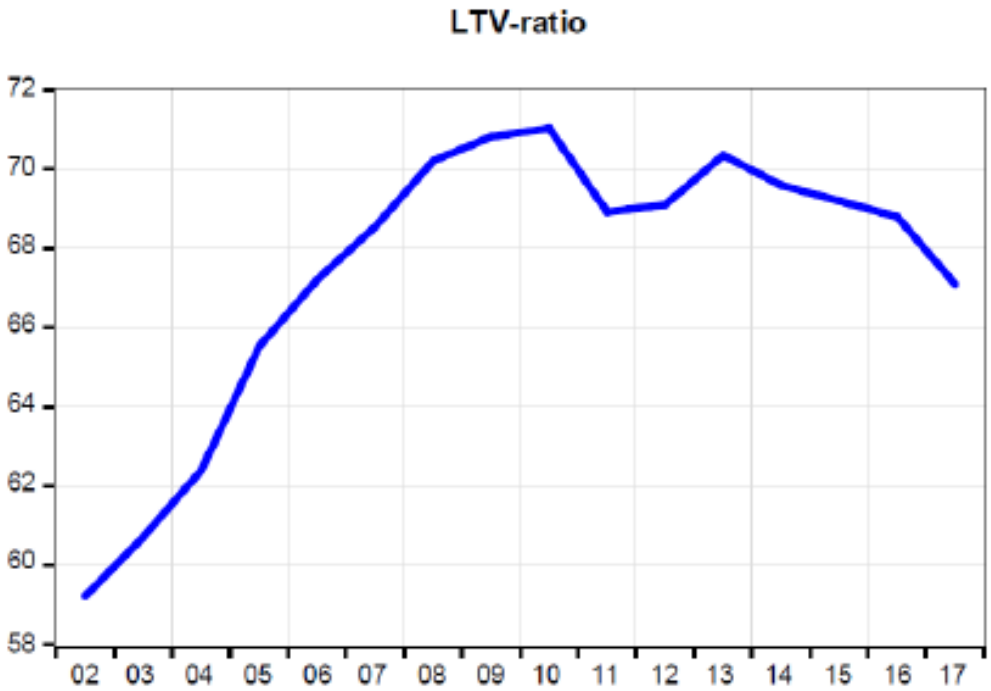
Conclusions (part II)

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

Calibration

- 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

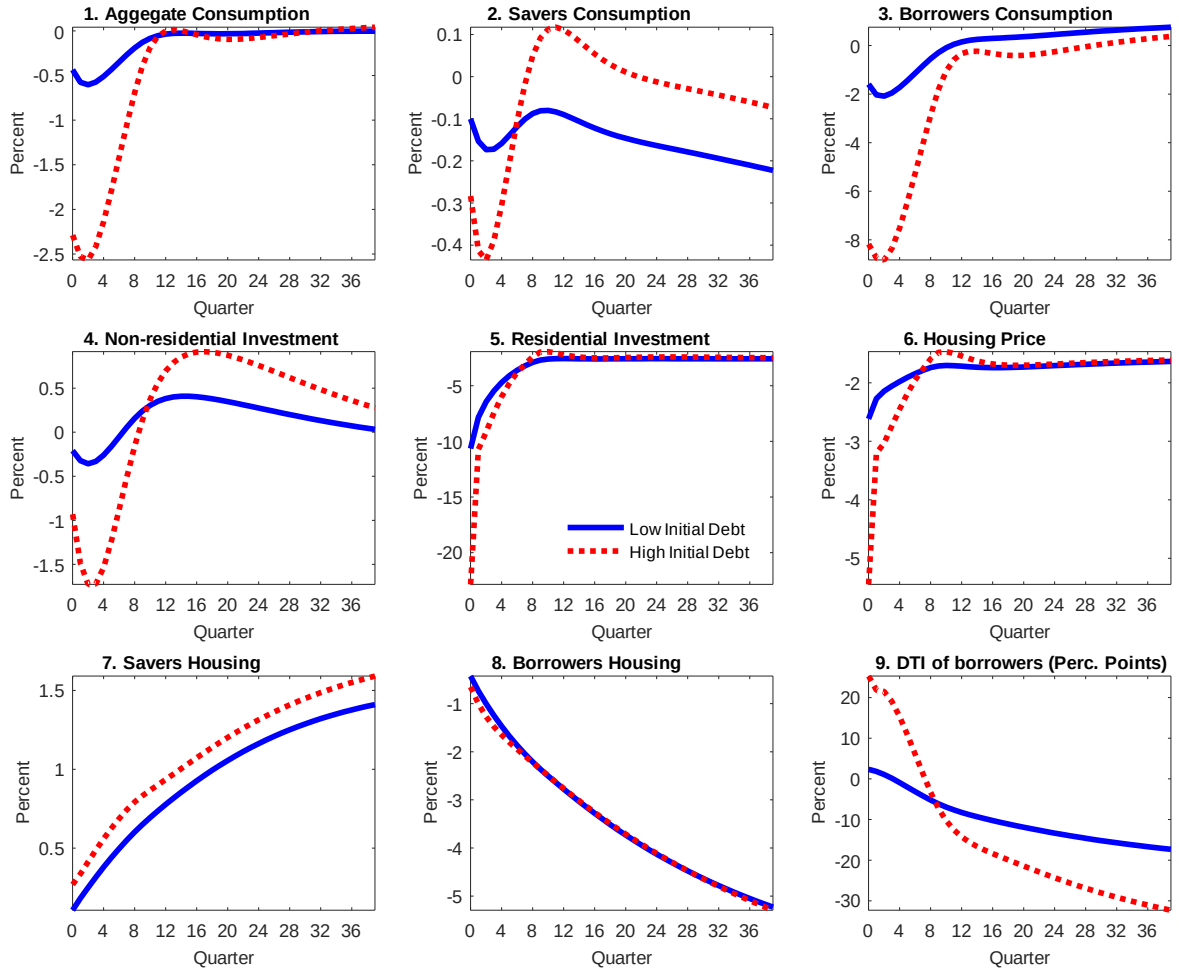
Back

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

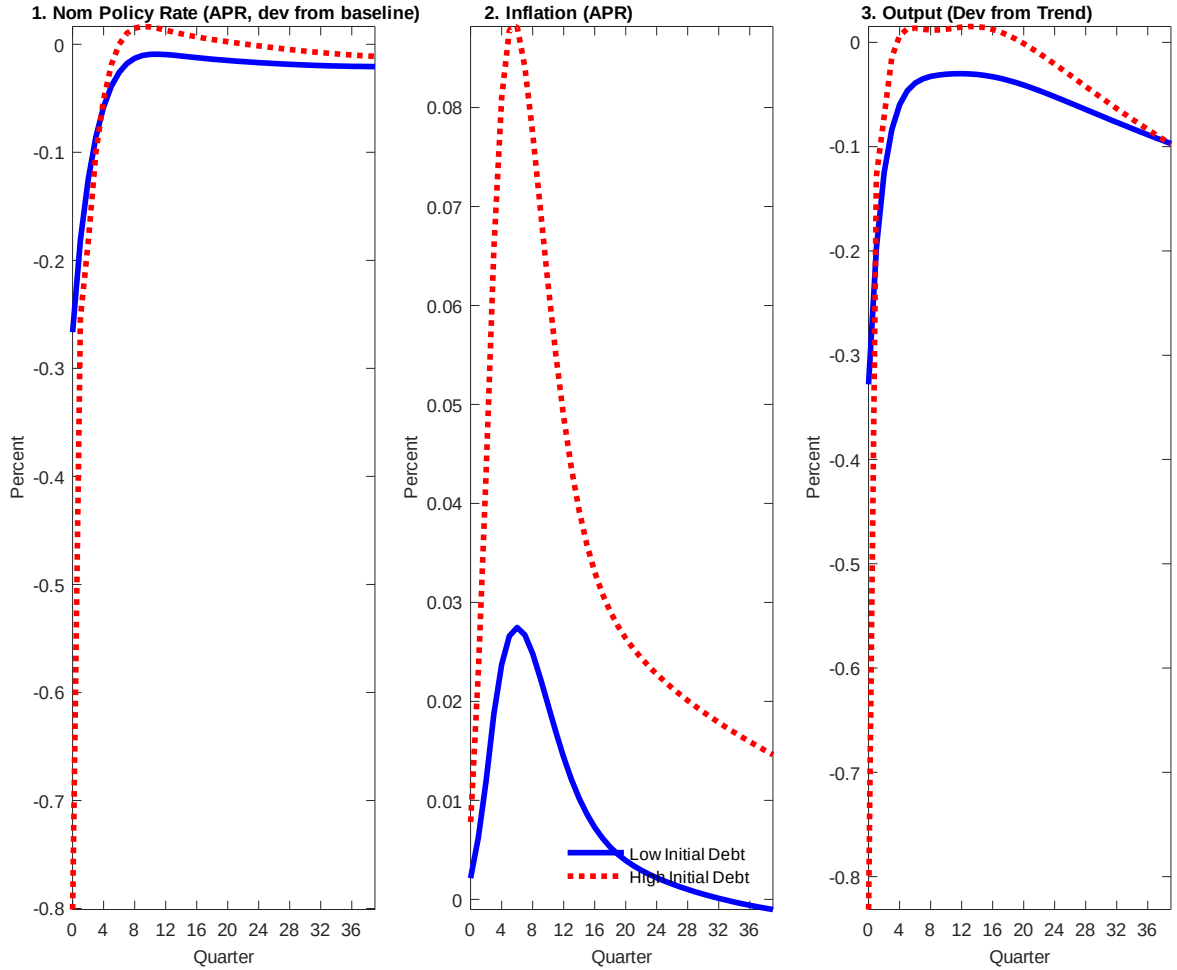
Dynamic effects of MPP at the ZLB

Effects of permanent LTV tightening: digging deeper



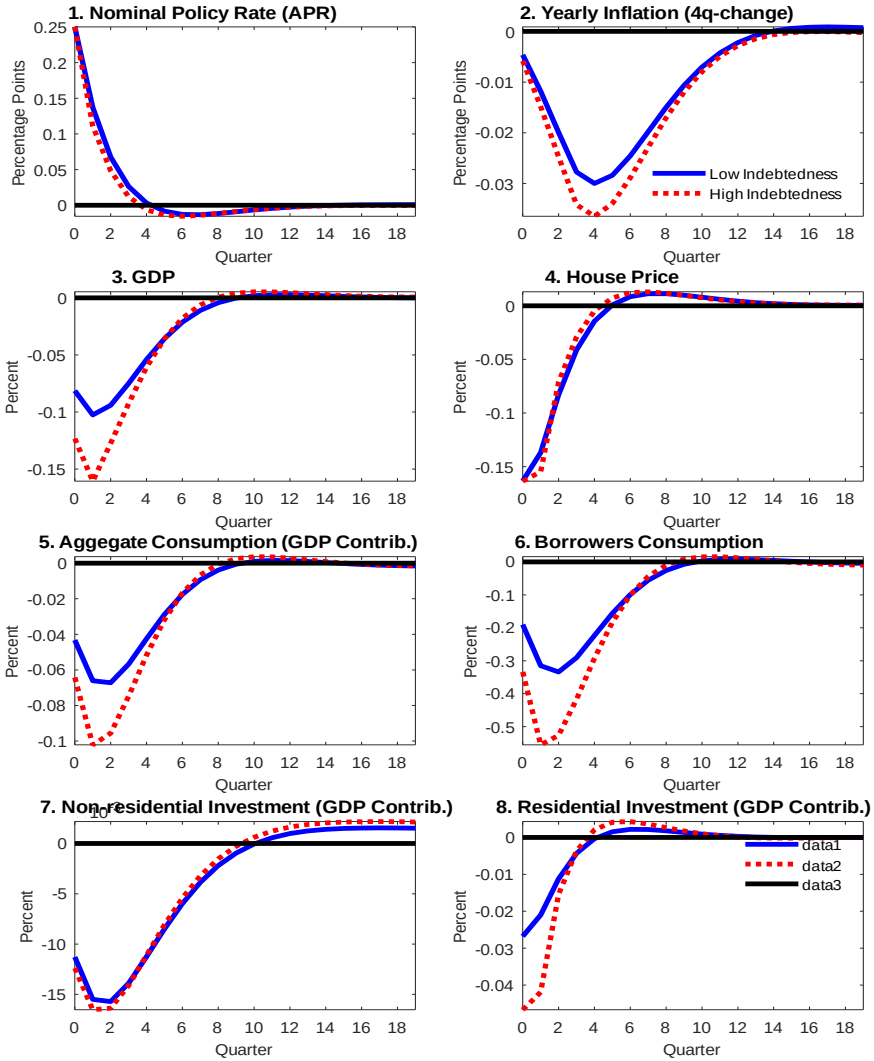
Explanation 1: LTV tightening needs more accommodation

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