BANK FOR INTERNATIONAL SETTLEMENTS

BIS Research Network on "Incorporating financial stability considerations into central bank policy models"
Overview and policy exercise

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Overview

The initial state (1)

- Financial stability considerations have been always a concern. Different approaches to tackle this issue:
  1) "Canonical" (all-in-one) models: no one (yet) there.
  2) Modifications of existing models.
  3) Minor modifications to models to answer specific questions.
  4) Satellite models: eg macro stress-testing models.

What do we need?

- Model the feedback between financial and real sectors (financial frictions, financial intermediaries)
- Generate endogenous financial booms and busts (financial frictions, departures from rational behaviour and from representative agent models, persistent deviations from market clearing).
- Introduce alternative policy instruments.

What do we have?

- 8+ models useful for policy analysis, tailor-made for each particular economy.
- Also, they are contributions to the economic literature.
- Current focus is in the feedback between real and financial sectors and the use of some alternative instruments (eg capital requirements, LTV, reserve requirements).
- Some of them estimated for their respective economies.

Main characteristics of the models – real sector

Main characteristics of the models

Table 1

	Argentina	Brazil	Canada	Chile[1]	Colombia	Mexico[2]	Peru[3]	US[4]
Type	Semi-structural	DSGE	DSGE	DSGE	DSGE	DSGE	DSGE	DSGE
Open/Closed economy	Open	Closed	Open	Open	Open	Open	Open	Open
Nominal rigidities / indexation	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Commodity sector	n.a.	No	No	Yes	Yes	No	Yes	No
Housing	n.a.	Yes	Yes	No	No	No	Yes	No
Banking sector financing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimated /calibrated	Estimated	Estimated	Calibrated	Estimated	Estimated	Estimated	Calibrated	Calibrated

[1] Modified version of the model presented at the conference (GK + BGG). Model augmented to include reserve requirements in the intermediary sector (Areosa and Coelho -2013) and non-ricardian households to match consumption dynamics more realistically. [2] Reduced version of the model presented at the conference. Removed from that version housing, impatient (debtors) households, and working capital in production. The model was re-estimated. [3] Model as presented at the conference. With some changes in the calibration to put giher emphasis on credit (replicate credit/GDP ratio, also high labour's share of output -capturing informality- and low LTV in the non-tradable sector -capturing low financial access). [4] It uses the SIGMA model as in Erceg, Guerrieri and Gust (2006), extended with the BGG financial accelerator.

Main characteristics of the models – financial sector (1)

- Different frictions in both sides of banks' balance sheet:

Financial frictions

Banks' balance sheet

Table 2

	Assets	Liabilities
Argentina	Spread (based on delinquency rates)	
Brazil	Borrowing constraints (households), BGG (firms)	Adj. Costs (balance sheet allocation)
Canada	Monitoring costs (based on entrepreneurs leverage)	Monitoring costs (based on bank's leverage)
Chile	BGG[1]	GK
Colombia	BGG[1] (T/NT sectors)	
Mexico	Collateral constraints (entrepreneurs)	
Peru	Collateral constraints (T/NT)	
United States	BGG[1]	

[1] BGG: Bernanke, Gertler, and Gichrist's (1999) financial accelerator. GK: Gertler and Karadi (2011) model.

Main characteristics of the models – financial sector (2)

- Other characteristics include:
  - BR: regulated lending rates, time-varying debt-to-income ratios.
  - CA: long-term loans, risk taking channel.
  - MX: monopolistic competition in banking and interest rate stickiness.

Some takeaways

- The new models can help policymakers assess the transmission mechanisms of alternative instruments to monetary policy.
- Limitations of the current generation of models include the inability to implement welfare analysis (eg analysis of the effects of instruments on economic distortions) or optimal policy.
- How to capture (in a feasible way) the nonlinearities embedded in the transmission channels between the financial sector and the real economy? (smaller scale satellite models?)

The policy exercise: "How effective are macroprudential policies?: a credit boom analysis"

The policy exercise

- Question: how macroprudential policy (MPP) can be used to tame a credit boom?
- Credit boom: cyclical component of bank credit increases by at least 1.65 times its historical standard deviation. (Mendoza and Terrones (2012) methodology).
  - Some considerations to calculate cyclical component: high inflation periods, valuation effects in foreign currency credit.
- Simulations:
  - Only Monetary Policy (MP)
  - MP + MPP (reaction to credit or spreads). Calibrated to generate a 50% reduction in the credit boom after 6 periods.
  - Counterfactual model: as in a) without financial frictions.

Drivers of Credit booms

- Different types of drivers:
  - Easing of bank funding conditions (credit supply shocks);
  - Aggregate demand / terms-of-trade improvements (credit demand shocks).

Drivers of credit booms — Table 3

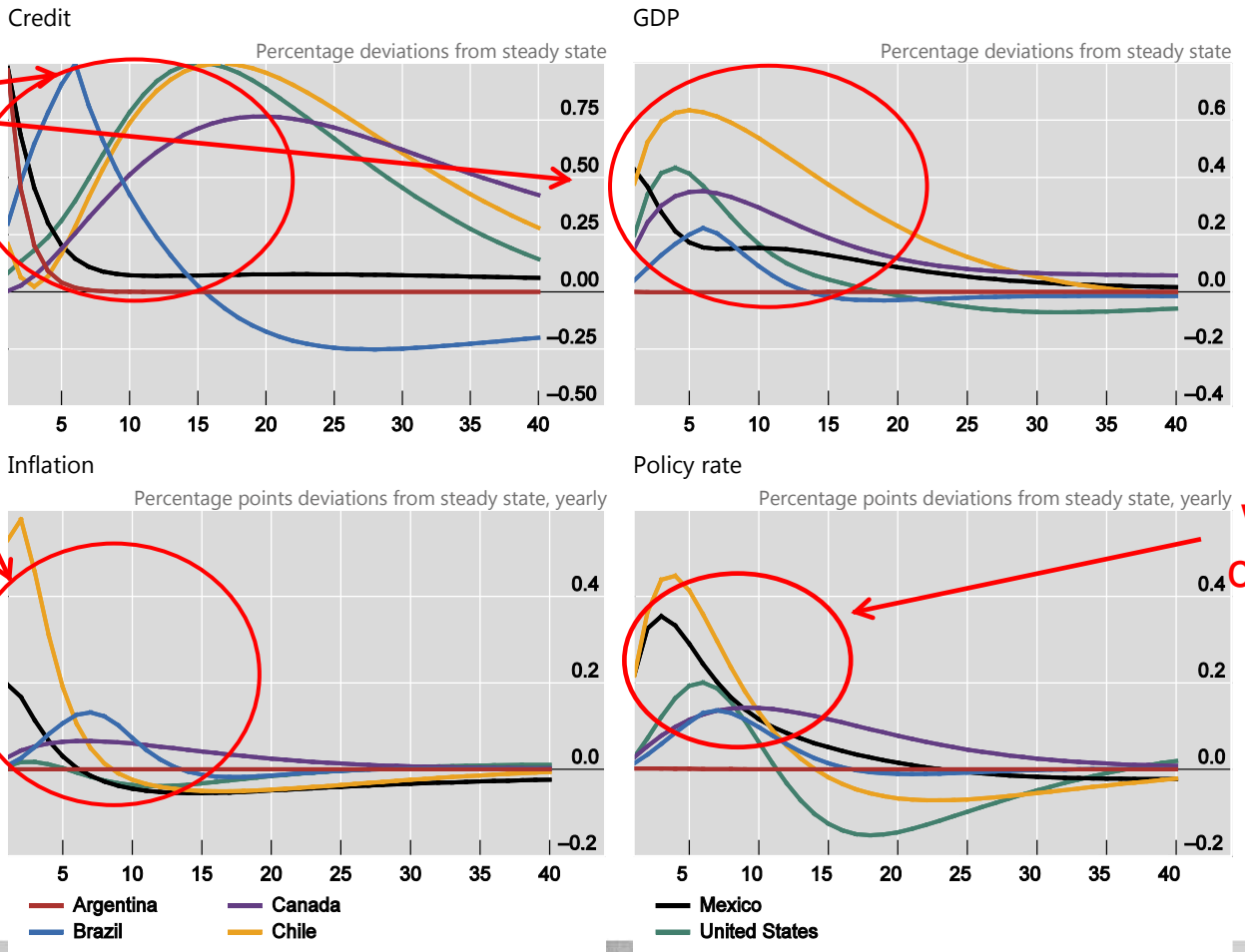
	Credit demand	Credit supply
Argentina		X
Brazil		X
Canada		X
Chile		X
Colombia		X
Mexico	X	
Peru	X	
United States		X

Macroeconomic implications – Baseline model

Dynamic of main macroeconomic variables on base model

IRFs normalised by the size of the credit boom threshold

Graph 1a



Credit, GDP and inflation tend to move pro-cyclically

which implies countercyclical MP

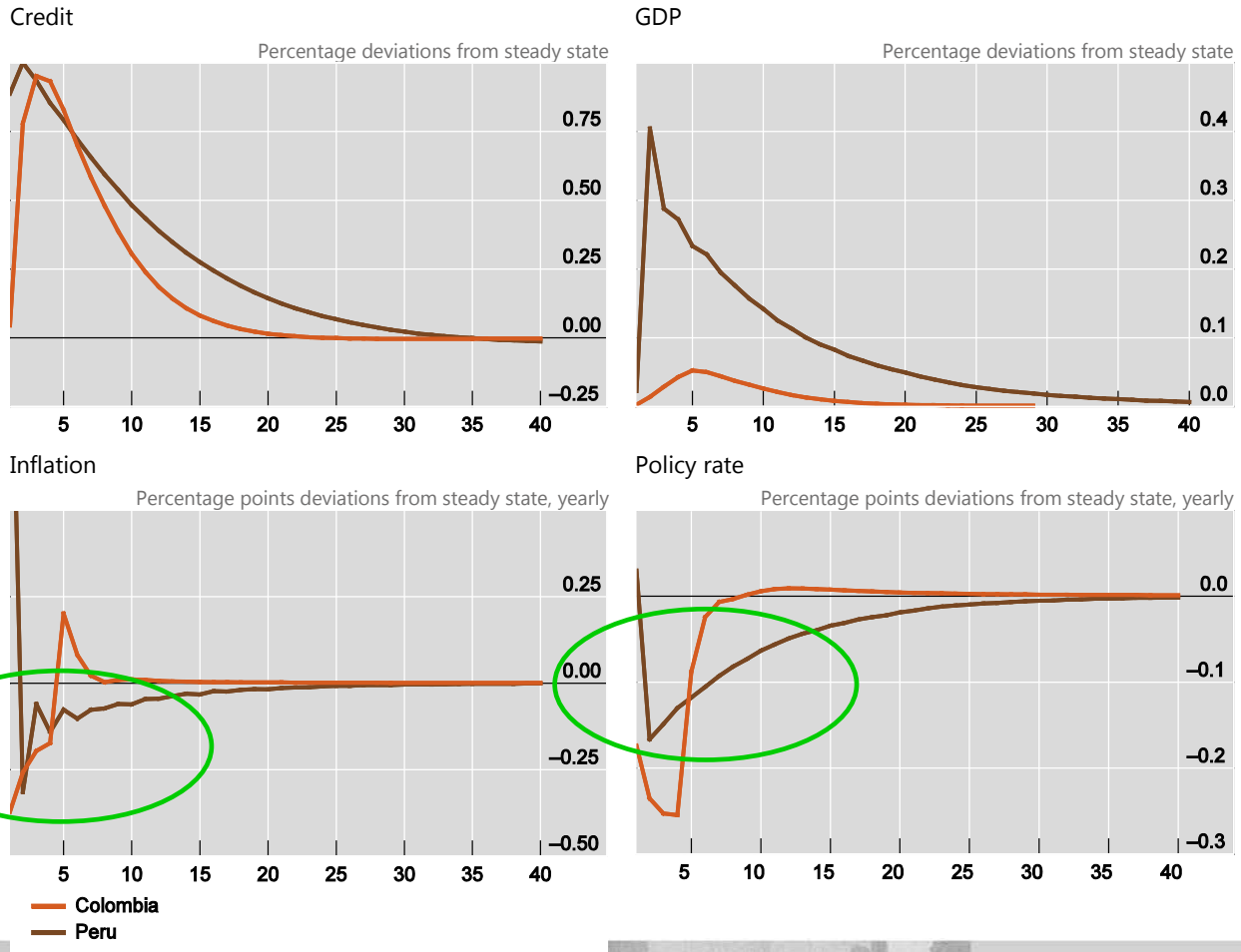
Source: Central banks' simulations; BIS calculations.

Macroeconomic implications – Baseline model

Dynamic of main macroeconomic variables on base model

IRFs normalised by the size of the credit boom threshold

Graph 1b



However in some cases a trade-off arises

and deflationary preassures may call for MP loosening

Source: Central banks' simulations; BIS calculations.

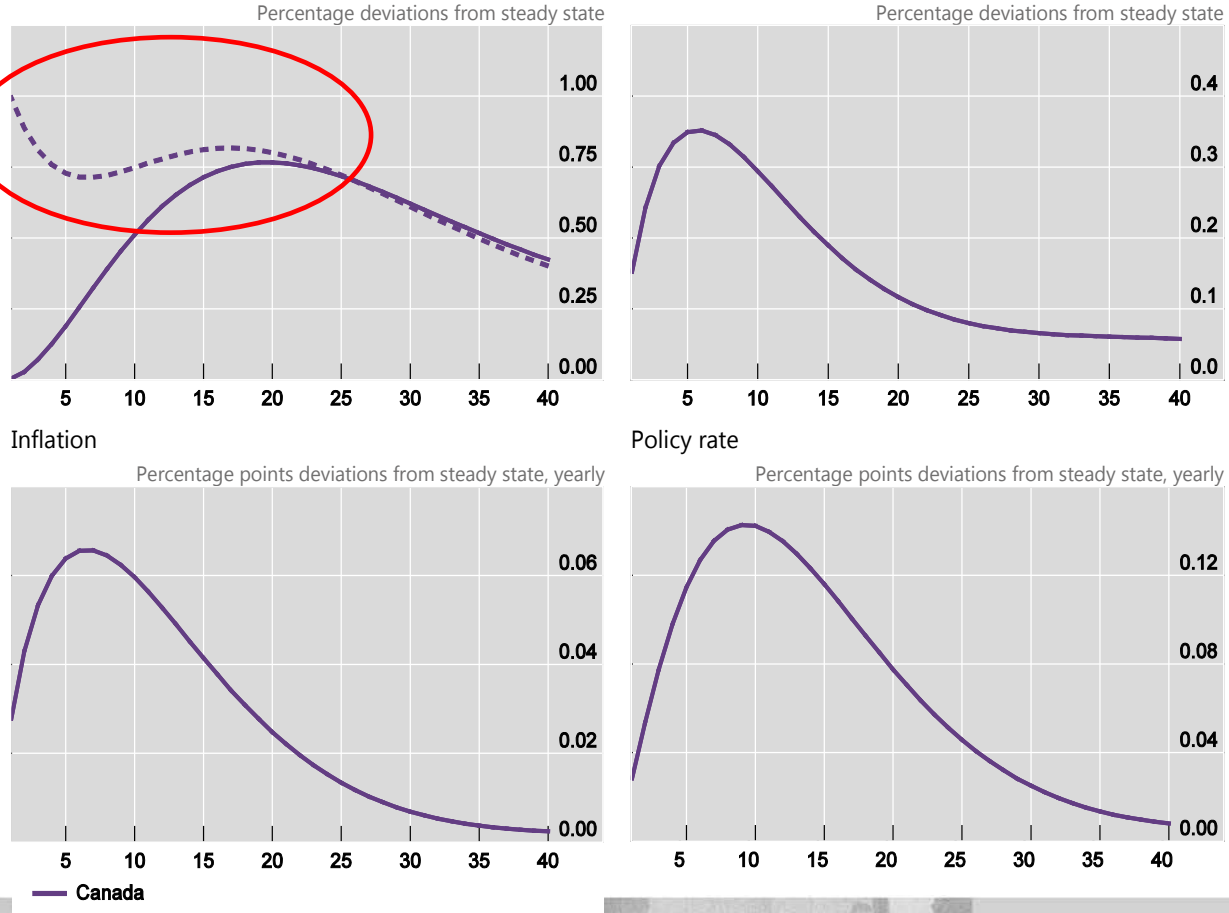
Macroeconomic implications – Baseline model

Dynamic of main macroeconomic variables on base model

IRFs normalised by the size of the credit boom threshold

Graph 1c

Book values vs market values: which is more important?



Source: Central banks' simulations; BIS calculations.

Shocks

- Size of the shocks to generate a credit boom need to be very large, eg:
  - 20pp decrease in foreign interest rate (Colombia).
  - 27pp reduction in credit spreads (Chile).
- (Missing) non-linearities of the financial transmission mechanism seem to be important.
- Exogenous shocks do not generate boom-bust cycles.
- Normal vs financial imbalances times: how to perform the analysis?

MPP instruments (1)

- Different instruments from the MPP toolkit were chosen:

MPP instruments

(classification by direct impact) Table 4.A

	Credit demand	Credit supply
Argentina		CR[1]
Brazil		CR[1]
Canada	LTV	CR[1]
Chile		RR[2]
Colombia		Regulation premium
Mexico	LTV	Tax
Peru	LTV, tax	
United States		CR[1]

[1] CR: capital requirements. [2] RR: Reserve requirements.

- Responding to either financial quantities (credit) or prices (spreads).

MPP instruments (2)

- In some cases the direct impact matches the source of the shock … in others not:

MPP instruments

(classification by direct impact) Table 4.B

	Credit demand	Credit supply
Argentina		CR[1]
Brazil		CR[1]
Canada	LTV	CR[1]
Chile		RR[2]
Colombia		Regulation premium
Mexico	LTV	Tax
Peru	LTV, tax	
United States		CR[1]

[1] CR: capital requirements. [2] RR: Reserve requirements.

MPP instruments work as complement to MP

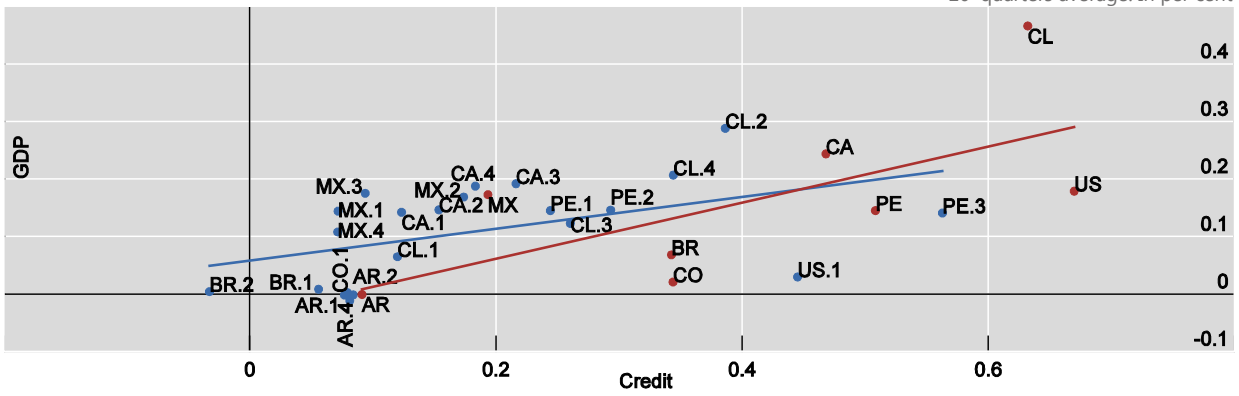
Reduction in credit with less impact on GDP

Effects of macroprudential instruments

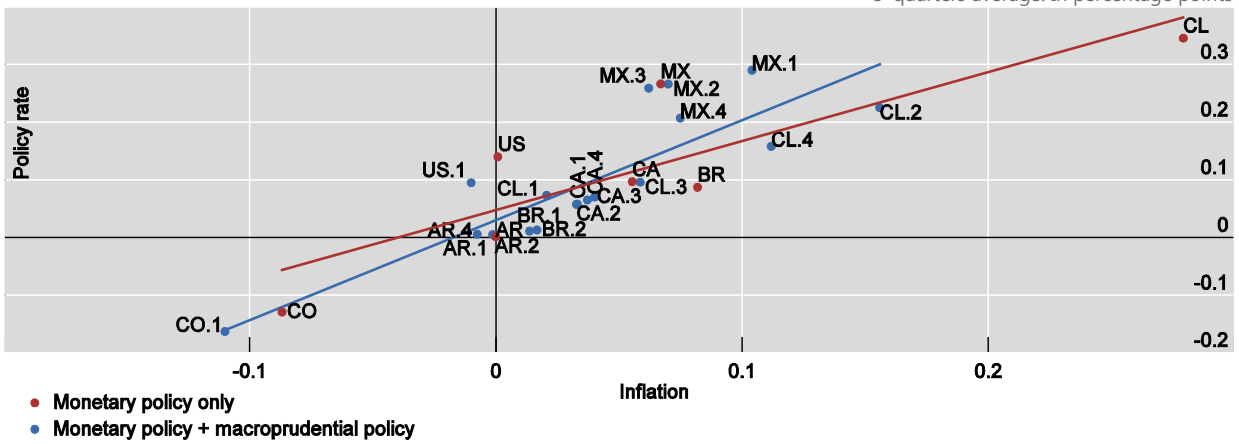
Average deviation from steady state

Graph 2

20–quarters average. In per cent



8–quarters average. In percentage points



Policy rate has to react less

Source: Central banks' simulations; BIS calculations.

How to measure effectiveness?

- A MPP multiplier:

GDP

$$A) = \left| \frac{\sum (GDP_{MPP+MP} - GDP_{MP})}{\sum MPP} \right|$$

Credit

$$B) = \left| \frac{\sum (GDP_{MPP+MP} - GDP_{MP})}{\sum MPP} \right|$$

- A GDP/Credit sacrifice ratio:

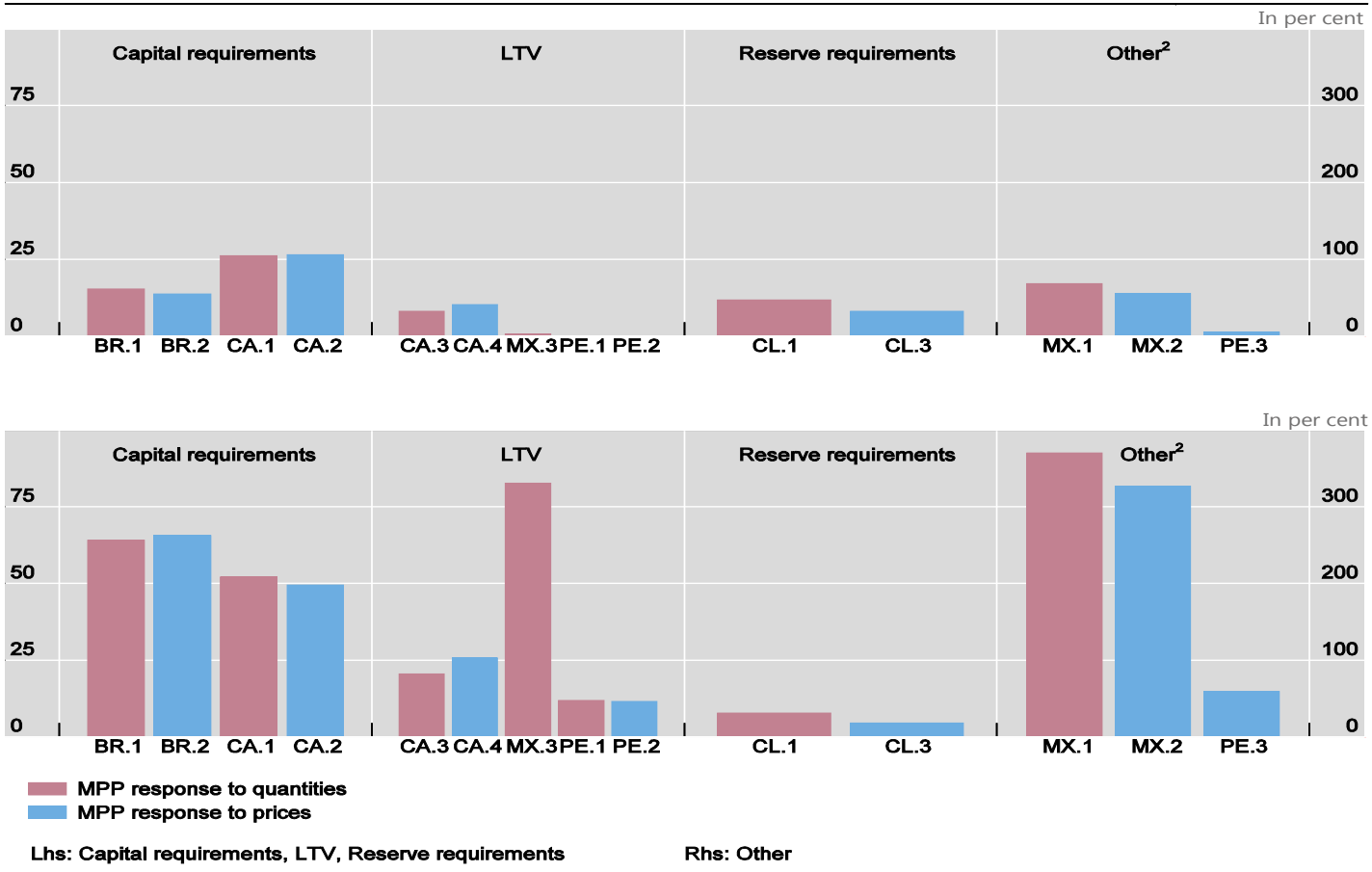
$$\frac{(\boldsymbol{A})}{(\boldsymbol{B})} = \frac{\sum (GDP_{MPP+MP} - GDP_{MP})}{\sum (CR_{MPP+MP} - CR_{MP})}$$

Effectiveness (1): the MPP multipliers

Impact varies by instrument

Responding to quantities vs prices: small differences.

MPP multipliers[1] Graph 3



[1] Calculated as $100 * \sum_{t=0}^{12}(Y_{MPP} - Y_{Base})/\sum_{t=0}^{12} MPP$, $Y \in \{GDP, Credit\}$. [2] Tax–instrument.

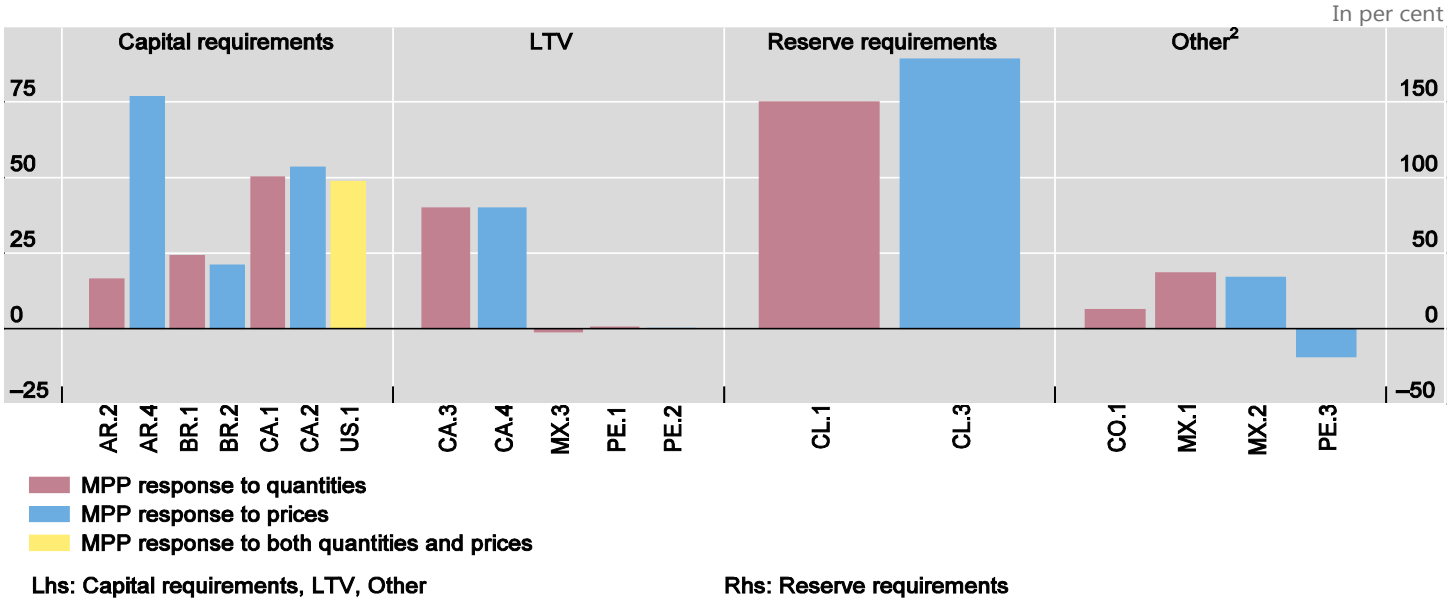
Source: Central banks' simulations; BIS calculations.

Effectiveness (2): the GDP/Credit sacrifice ratio

- Comparison across countries: LTV seem to have lower cost in terms of output (and Reserve requirements higher).
- In trade-off cases (CO,PE) the sacrifice ratio seems smaller.

GDP/Credit sacrifice ratio[1]

Graph 4



[1] Calculated as $100 * \sum_{t=0}^{12}(Y_{MPP} - Y_{Base})/\sum_{t=0}^{12}(Credit_{MPP} - Credit_{Base})$,. [2] For Colombia, *regulation premium*; for Mexico, tax-instrument.

Source: Central banks' simulations; BIS calculations.

The role of financial frictions

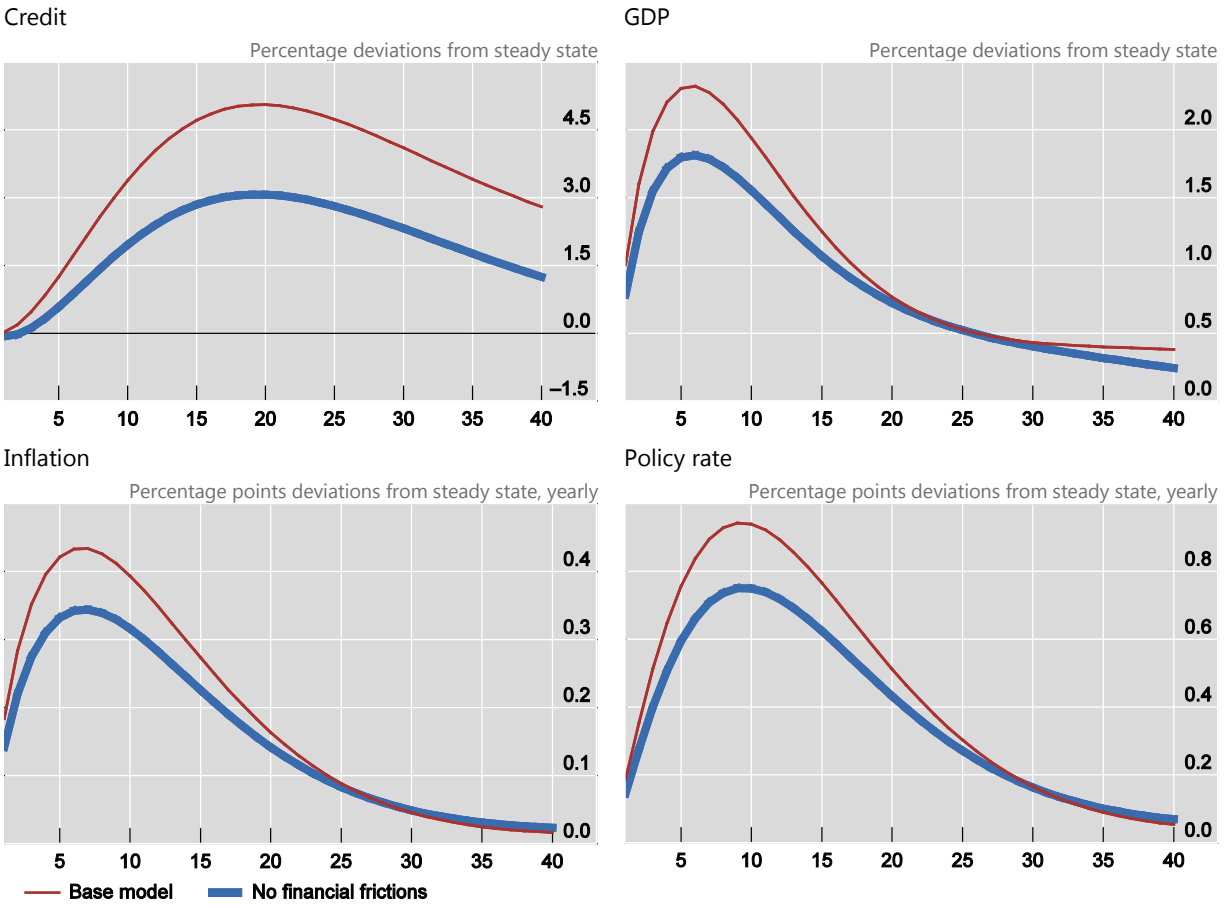
- A main role of MPP is to reduce overborrowing that could create financial distress.
- As a benchmark for MPP: baseline model without financial frictions.
  - Calibration of the reaction of MPP instruments is key.
  - If reaction is to strong, MPP could be curbing too much credit growth.

Example Canada: baseline vs no financial frictions

Canada. Dynamic of main macroeconomic variables

IRFs to a risk–appetite shock

Graph 5a



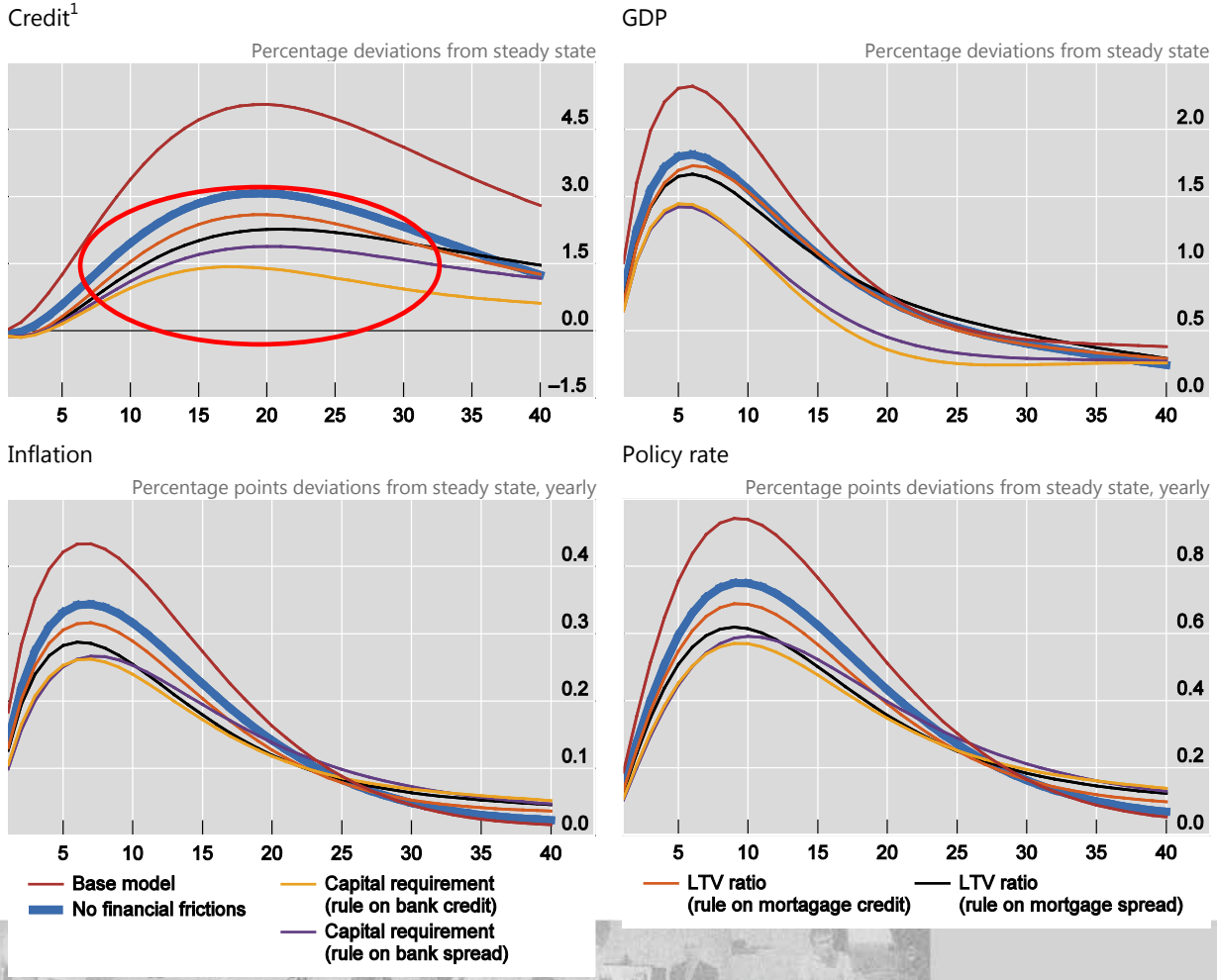
Source: Central banks' simulations; BIS calculations.

Example Canada: calibration of MPP is key.

Too strong MPP response would reduce credit growth below the optimum

Canada. Dynamic of main macroeconomic variables

IRFs to a risk–appetite shock — Graph 5b



Source: Central banks' simulations; BIS calculations.

Conclusions and open issues

- A policy trade-off between inflation stabilisation and financial stability may arise when the drivers of a credit boom also generate exchange rate appreciation. MPP instruments are useful to reduce this policy trade-off.
- When to use each type of MPP instrument? (credit demand/supply shocks).
- What signals to respond to?(financial quantities vs prices).
- How properly calibrate the instruments?
- Amplification mechanisms embedded in non-linear models are needed to understand financial cycles.