Commodity and Credit Cycles in Resource-rich Economies[1]

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[1] The views expressed in the paper are those of the author and do not necessarily reflect the official position of the Bank of Russia.

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Urgency

- Key **risk** for resource-rich economies is creating the **boom** on national credit markets during the episodes of **high commodity prices**
- Reversal of commodity prices entails the significant **deleverage** and the difficulties in servicing the **liabilities in foreign currency**
- The paper is aimed to assess the impact of terms of trade (ToT) shocks on credit cycles in resource-rich economies

Urgency

The rise of commodity prices contributes to ...

- Foreign currency inflow
- Credit expansion
- Amplification of FX loans and external financing
- Improvement of economic and credit activity

The unexpected reversal of commodity prices entails...

- Deterioration of the solvency of economic agents
- Worsening of the bank credit portfolio
- Risks of default of external debt and foreign loans
- Rise of financial market volatility or even financial crisis

Related Literature

- Rise of crude oil prices increases aggregate output and its components [Bergholt, Larsen, 2016]
- Decline of crude oil prices results in credit contraction and the worsening of bank credit portfolio [Agarwal et al., 2017] and ...
- ... the upsurge of the dollarization of bank credit and deposit, the NPL share and the probability of banking crisis [Kinda et al., 2016]
- Complementation of monetary policy by MMP instruments helps to alleviate the credit activity during the expansion of financial cycle [González et al., 2015; Bruno et al., 2015]
- MPP remains effective especially in developing economies [Cerutti et al., 2017; Gambacorta, Murcia, 2017; Richter et al., 2018]

Related Literature (about Russia)

- Increase in crude oil prices contributes to the rise of GDP [Malakhovskaya, Minabutdinov, 2017; Polbin, 2017]
- Positive ToT shock entails the upsurge of credit volume and external debt of corporate sector [Lomivorotov, 2015; Pestova, Mamonov, 2016]

Related Literature (conclusions)

1. Close relationship between the dynamics of the commodity and credit cycle indicators in resource-rich economies
2. Sizeable sensitivity of financial cycle parameters to global commodity market development
3. Financial system risks' accumulation in response to the decline of commodity prices
4. EMEs are mostly prone to negative external shocks
5. MPP is essential!

Methodology

The vector autoregression (VAR) model with m variables и p lags:

$$Y_t = B_{const} + B_1 Y_{t-1} + B_2 Y_{t-2} + ... + B_p Y_{t-p} + \varepsilon_t,\ \varepsilon_t \sim N(0,\Sigma),$$

where $Y_t = (y_{1t}, y_{2t}, ..., y_{mt})'$ – the vector of endogenous variables with dimension of m $(t = 1,...,T)$, $B_{const} = (b_1, b_2, ..., b_m)'$ – the vector of constants with the dimension of m, B_l – the matrix of autoregressive coefficients $m \times m$, where l – the number of a lag from 1 to p

After transformation $B = [B_{const} B_1 ... B_p]'$ and $X_t = [1 Y'_{t-1} ... Y'_{t-p}]'$ VAR in the reduced form:

$$Y_t = B' X_t + \varepsilon_t$$

Methodology

- Structural identification – Cholesky decomposition
- The identification of shocks in a small open economy (SOE):
  - *External sector variables* (volatility of global markets, commodity prices, global GDP)
  - *Domestic macroeconomic variables* (aggregate output, inflation)
  - *Domestic financial variables* (external debt, interest rate, credit risk indicator, monetary base, exchange rate, risk premium)

Methodology

Bayesian regularization is necessary due to the «curse of dimensionality»!

The Bayes formula supposes:

$$p(B,\Sigma|Y) = \frac{p(B,\Sigma)p(Y|B,\Sigma)}{p(Y)}$$

where $p(B,\Sigma|Y)$ – the posterior density function; $p(B,\Sigma)$ – the prior distribution, $p(Y|B,\Sigma)$ – the likelihood function, $p(Y)$ – the probability density function.

$$posterior\_distribution = prior\_distribution \times data$$

Methodology

- Prior distribution: Independent Normal – Inverse Wishart distribution
- Every element of the covariance matrix of model's coefficients [Blake, Mumtaz, 2017]:

  $(\sigma_i \lambda_4)^2$ for constants

  $(\frac{\lambda_1}{l^{\lambda_3}})^2$ for $i = j$

  $(\frac{\sigma_i \lambda_1 \lambda_2}{\sigma_j l^{\lambda_3}})^2$ for $i \neq j$

Methodology

Choice of hyperparameters [Demeshev, Malakhovskaya, 2016; Pestova, Mamonov, 2015]:

- $\lambda_1 = 0.1$ (total «tightness» of the prior distribution)
- $\lambda_2 = 0.5$ (Bayesian cross-regularization parameter)
- $\lambda_3 = 1$
- $\lambda_4 = 100$ (relative «tightness» of the distribution of a constant)

Data

Six time series models for countries (AEs and EMEs) with the sizeable share of commodity export:

Country	**Key export category**	**2017**
Chile	Copper	58%
Russia	Crude oil and oil products	42%
Colombia	Crude oil and oil products	35%
Australia	Coal	16%
Canada	Crude oil	13%
Brazil	Iron ore	9%

Source: Bloomberg

Data (variables)

1. *External sector variables:*
   - implied volatility of the US stock exchange index S&P 500 (VIX)
   - commodity price (Brent crude oil, copper, coal, iron ore)
   - real GDP of US or EU
2. *Domestic macroeconomic variables:*
   - real GDP or industrial production
   - consumer price index CPI
3. *Domestic financial variables:*
   - interest rate
   - monetary base (wide definition)
   - credit risk indicator
   - nominal exchange rate of the US dollar to national currency
   - sovereign risk premium (5-year credit default swap (CDS) spread)

Data (variables)

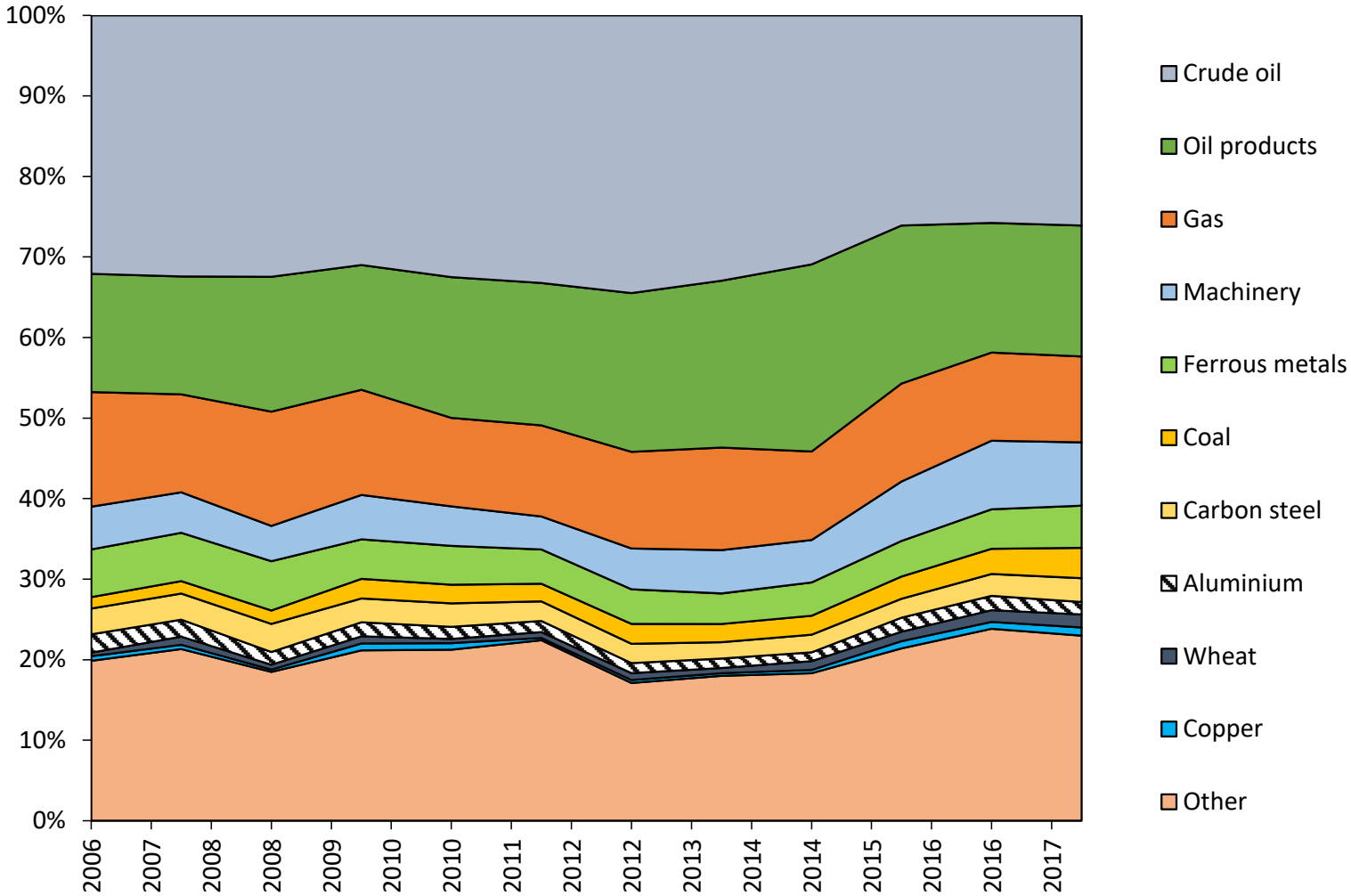
Credit risk indicators:

- growth rate of total credit
- growth rate of households and enterprise credit
- growth rate of credit in national and foreign currency
- NPL ratio
- dollarization coefficient
- growth rate of external debt
- credit-to-GDP ratio

Elasticities' calculations are based on the impulse response function (IRF) analysis. The elasticity of the level of X implies that the acceleration of the annual commodity price growth rate by 1 p.p. entails the increase in the credit cycle indicator by X p.p.

Results

Russia



Source: Federal Customs Service of Russia

Russia (elasticities)

Credit cycle indicator	Elasticity	Maximum effect
Consumer credit (national currency)	0.2236	15 m
Consumer credit (foreign currency)	0.2424	22 m
NPL share of consumer credit (national currency)	-0.0138	15 m
NPL share of consumer credit (foreign currency)	-0.0714	21 m
Enterprise credit (national currency)	0.0782	27 m
Enterprise credit (foreign currency)	0.2136	7 m
NPL share of enterprise credit (national currency)	-0.0165	18 m
NPL share of enterprise credit (foreign currency)	insignif.	

Russia (elasticities)

Credit cycle indicator	Elasticity	Maximum effect
Total credit (national currency)	0.0872	26 m
Total credit (foreign currency)	0.1851	7 m
Total credit	0.0857	30 m
Dollarization of consumer credit	0.0359	18 m
Dollarization of enterprise credit	0.0284	21 m
Total dollarization	0.0339	20 m
External debt of the corporate sector	0.1194	2 q
Credit-to-GDP ratio	-0.2119	5 q

Source: author's calculations

Russia

The improvement of the global energy markets is accompanied by ...

- decrease in the money market interest rates (recent introduction of inflation targeting, countercyclical fiscal policy and MPP framework)
- accumulation of external debt of the corporate sector
- rise of the growth rates of consumer and enterprise loans
- increase in the dollarization rate
- decline of NPL share

Macroprudential policy in Russia

Macroprudential policy in Russia

Three main episodes of MPP instruments' implementation [Danilova, Elizarova, 2017; FSR, 2014; FSR, 2016]:

1. 2007-2008:
   - strong private capital inflow
   - rise of the share of foreign debt in the banking sector' liabilities up to 20%
   - growth of reserve requirements from 4,5% in January, 2008 to 8,5% at the beginning of September, 2008
   - effectiveness: accumulation of additional 400 bln rub in the banking sector

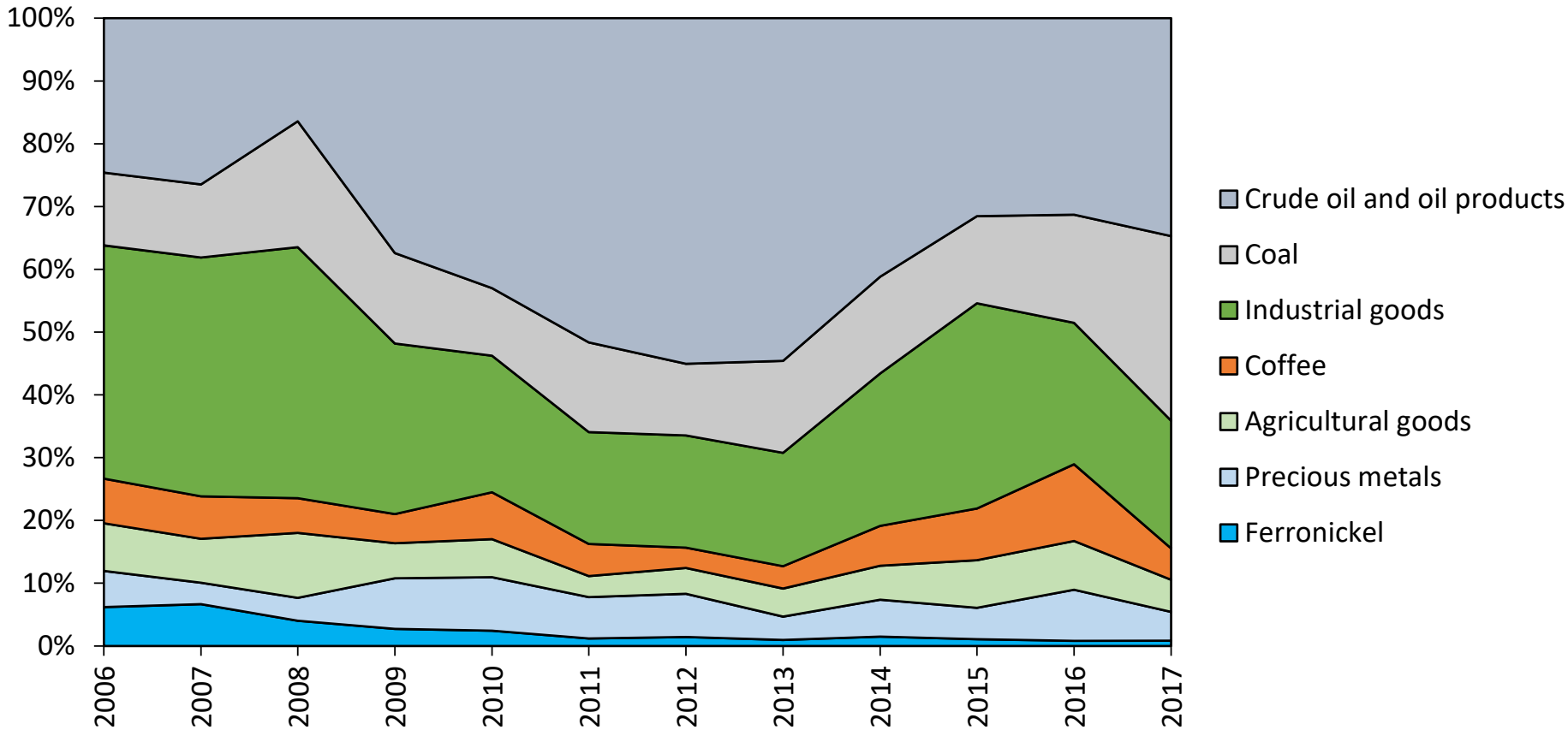
Macroprudential policy in Russia

2. 2013-2014:
   - growth rate of consumer lending was 60% that exceeded the similar indicator to enterprise growth rate (24,4%) (2011-2012)
   - Bank of Russia raised loan-loss provisions for unsecured consumer loans and risk weights
   - effectiveness:
     - consumer lending growth rate decreased to 27% (1st April, 2014)
     - decline of risky loans' share
     - rise of coverage ratio of banks (specialized in unsecured consumer lending) from 1,9% (1st January, 2013) to 4,3% (1st January, 2015)

Macroprudential policy in Russia

3. 2016:
   - spike in market volatility
   - high level of dollarization of banks' assets and liabilities
   - rise of the volatility of the credit institutions' required ratios and the total credit risk
   - Bank of Russia introduced the increased risk weights for foreign currency claims on households and corporate entities with insufficient foreign exchange earnings
   - effectiveness:
     - dollarization of banking sector deposits fell by 5,9 pp to 18,8%

Colombia



Source: National Administrative Department of Statistics of Colombia

MPP index in commodity exporters

Country	03	04	05	06	07	08	09	10	11	12	13
Angola	0	0	0	0	1	1	1	1	3	3	3
Australia	1	1	1	1	1	1	1	1	1	1	1
Brazil	2	2	2	2	2	2	2	2	2	2	2
Canada	3	3	3	3	3	5	5	5	5	5	5
Chile	6	6	6	6	6	6	6	6	6	6	6
Colombia	6	6	6	6	7	7	7	7	7	7	7
Kazakhstan	1	1	1	1	1	1	1	1	1	1	2
Norway	1	1	1	1	1	1	1	3	3	3	4
Russia	1	1	1	1	1	1	1	1	1	1	1
Saudi Arabia	1	1	1	2	2	2	2	2	2	2	2
UAE	2	2	2	2	2	2	2	2	3	3	3
USA	3	3	3	3	3	3	3	3	3	3	3

Source: Cerutti et al., 2017

Colombia

Credit cycle indicator	Elasticity	Maximum effect
Total credit	0.0683	31 m
Total NPL share	insignif.	
Consumer credit	0.1197	20 m
NPL share of consumer credit	-0.0037	2 m
Enterprise credit	0.0564	33 m
NPL share of enterprise credit	insignif.	
External debt of the private sector	-0.1078	9 m
Credit (private non-financial sector)-to-GDP ratio	-0.0362	3 q
Loans in foreign currency	-0.4804	2 q

Source: author's calculations

Colombia

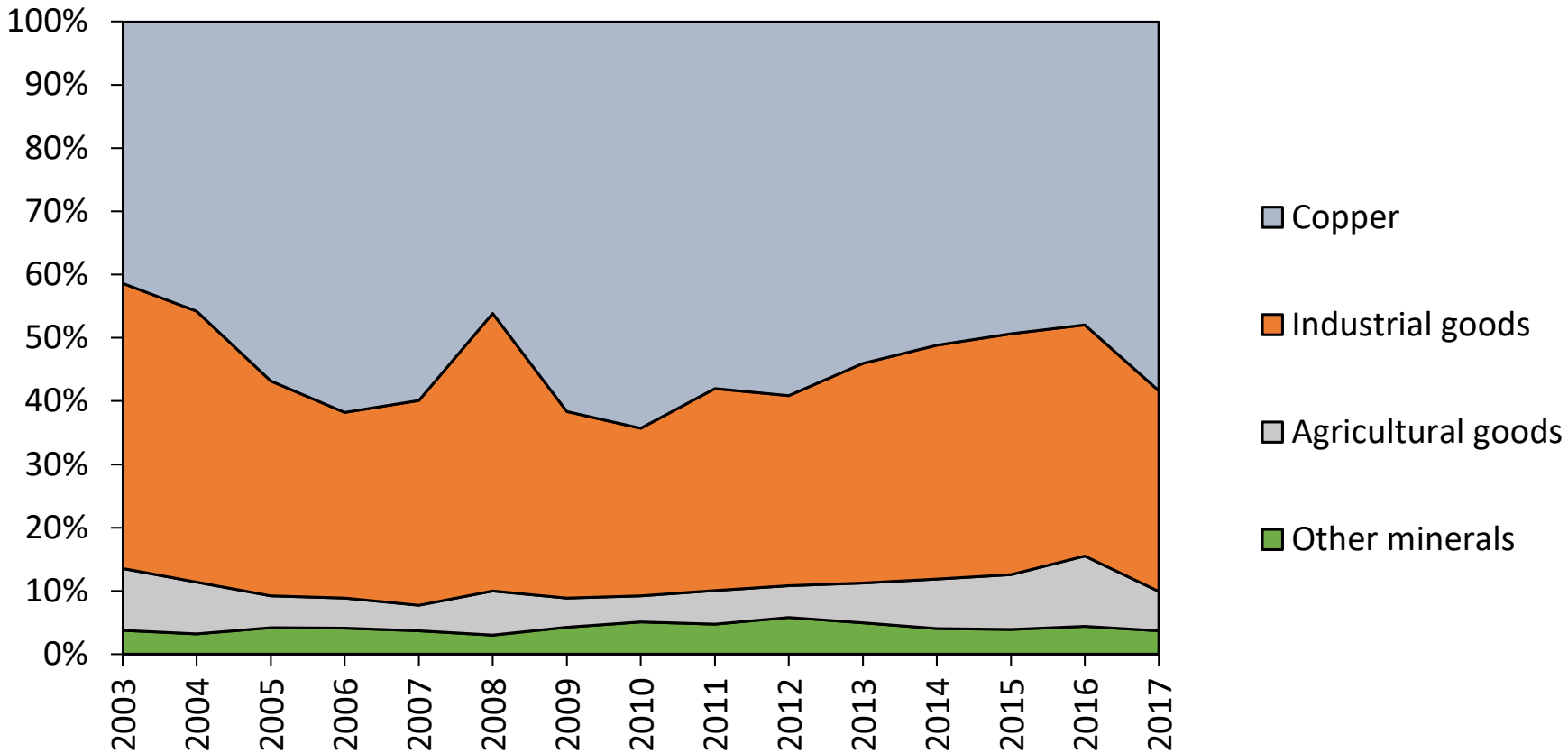
The Colombian economy is characterised by ...

- high level of MPP implementation [Cerutti et al., 2017]
- closeness (in terms of trade in GDP) [Vargas et al., 2017]
- importance of non-tradable sector

The increase in oil prices elicits:

- domestic financial conditions' tightening
- rise of consumer, enterprise and total credit
- decrease in external debt of the private sector and total foreign currency loans

Chile



Source: Central Bank of Chile

Chile

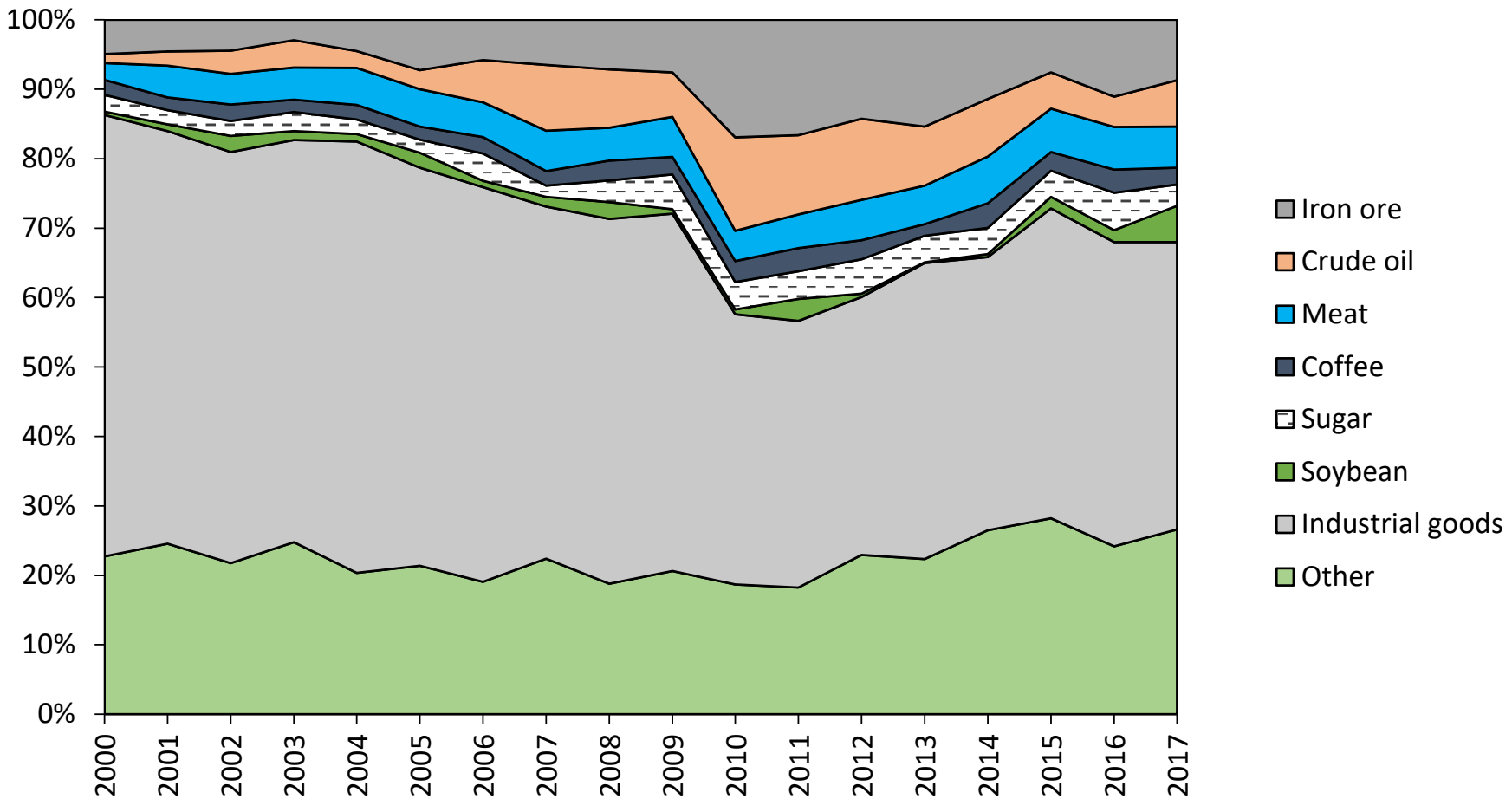
Credit cycle indicator		Elasticity	Maximum effect
Total credit		insignif.	
Consumer credit		0.0463	9 q
Enterprise credit		insignif.	
Total external debt		0.0481	3 q
Credit(non-financial sector)-to-GDP	private	-0.0687	7 q
Loans in foreign curerency		0.2942	10 q

Source: author's calculations

The improvement of ToT results in:

- increase in interest rates (high level of MPP usage [Cifuentes et al., 2017])
- responses of growth rates of total and enterprise loans remain insignificant

Brazil



Source: Ministry of Industry and External Trade of Brazil

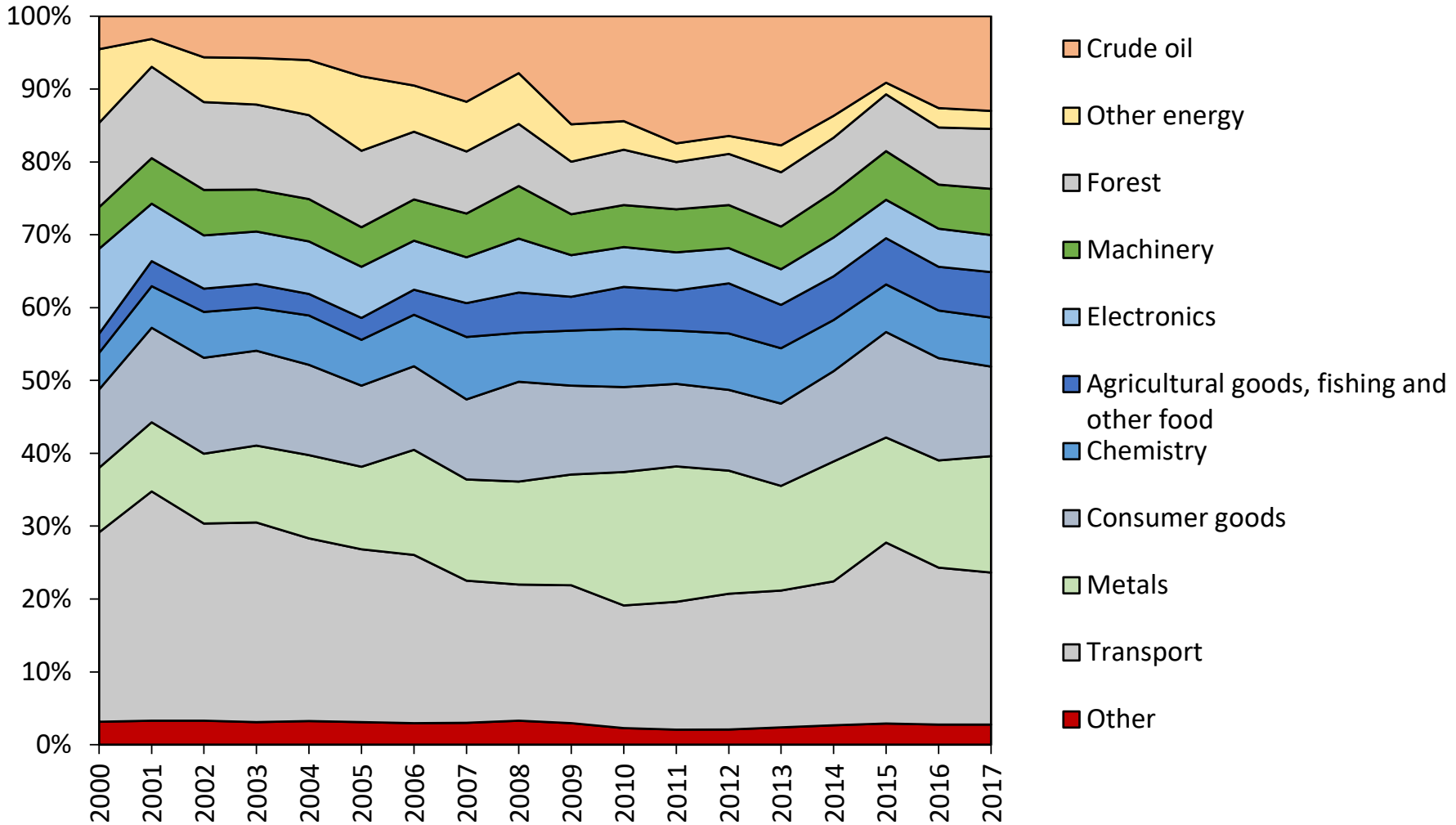
Brazil

Credit cycle indicator	Elasticity	Maximum effect
Total credit	0.0804	5 q
Consumer credit	insignif.	
Enterprise credit	0.1213	5 q
External debt of the private sector	-0.1290	13 q
Credit(private non-financial sector)-to-GDP	0.0898	13 q
Total loans in foreign currency	0.2178	2 q
The dollarization coefficient	0.1168	10 q

Source: author's calculations

The reaction of consumer lending is insignificant due to the regulation of car lending market

Canada and Australia



Source: Statistics Canada

Canada

Credit cycle indicator	Elasticity	Maximum effect
Total credit	-0.0453	4 q
Consumer credit	insignif.	
Enterprise credit	-0.0883	4 q
Mortgage outstanding	-0.0158	8 q
Total external debt	0.0509	1 q
Credit(private non-financial sector)-to-GDP	-0.0836	4 q
Total loans in foreign currency	insignif.	
Dollarization coefficient	-0.09826	2 q

Source: author's calculations

Australia

Credit cycle indicator	Elasticity	Maximum effect
Total credit	-0.0365	7 q
Consumer credit	-0.1444	7 q
Enterprise credit	-0.0392	6 q
External debt of the private sector	-0.0774	5 q
Credit(private non-financial sector)-to-GDP	-0.0628	5 q

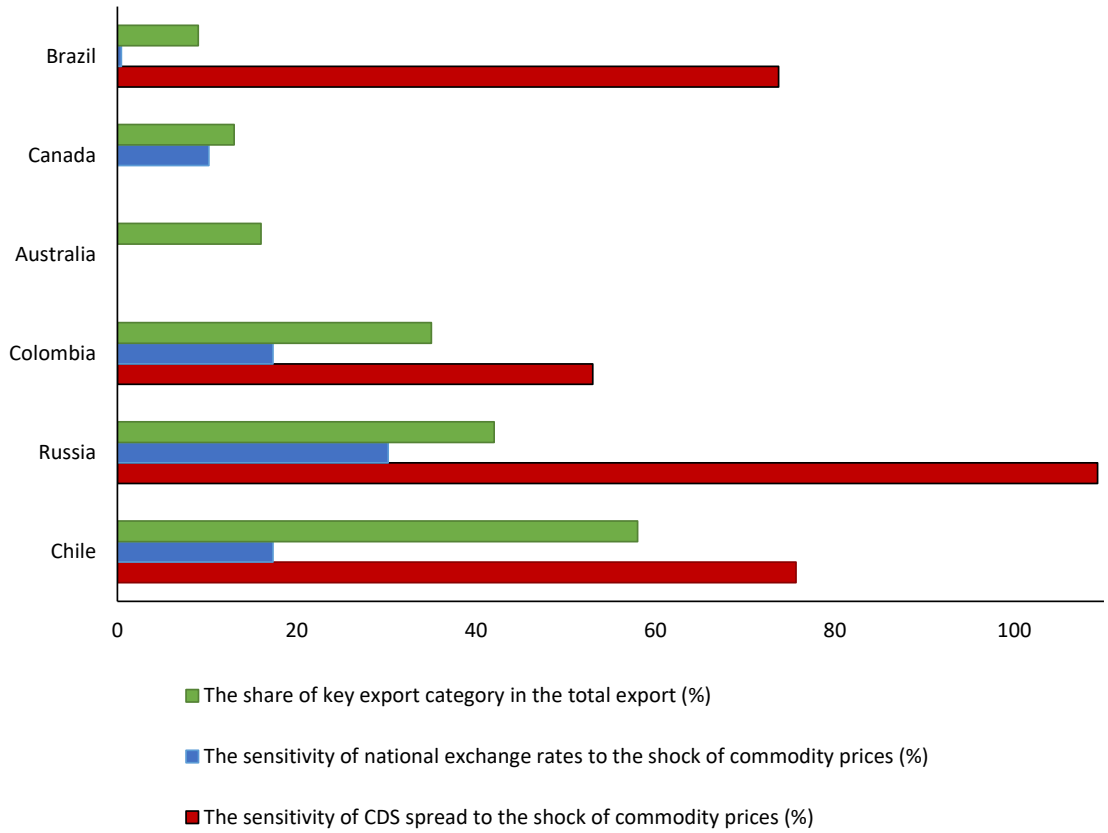
Source: author's calculations

Canada and Australia

- Central banks in developed countries have more opportunities to pursue countercyclical monetary policy in the historical perspective [Kaminsky et al., 2004]
- High level of MPP implementation in Canada [Cerutti et al., 2017; Allen et al., 2017]
- Wide national financial markets
- Saturation of credit markets
- Increase in commodity prices entails the rise of interest rates and the decrease in credit cycle indicators

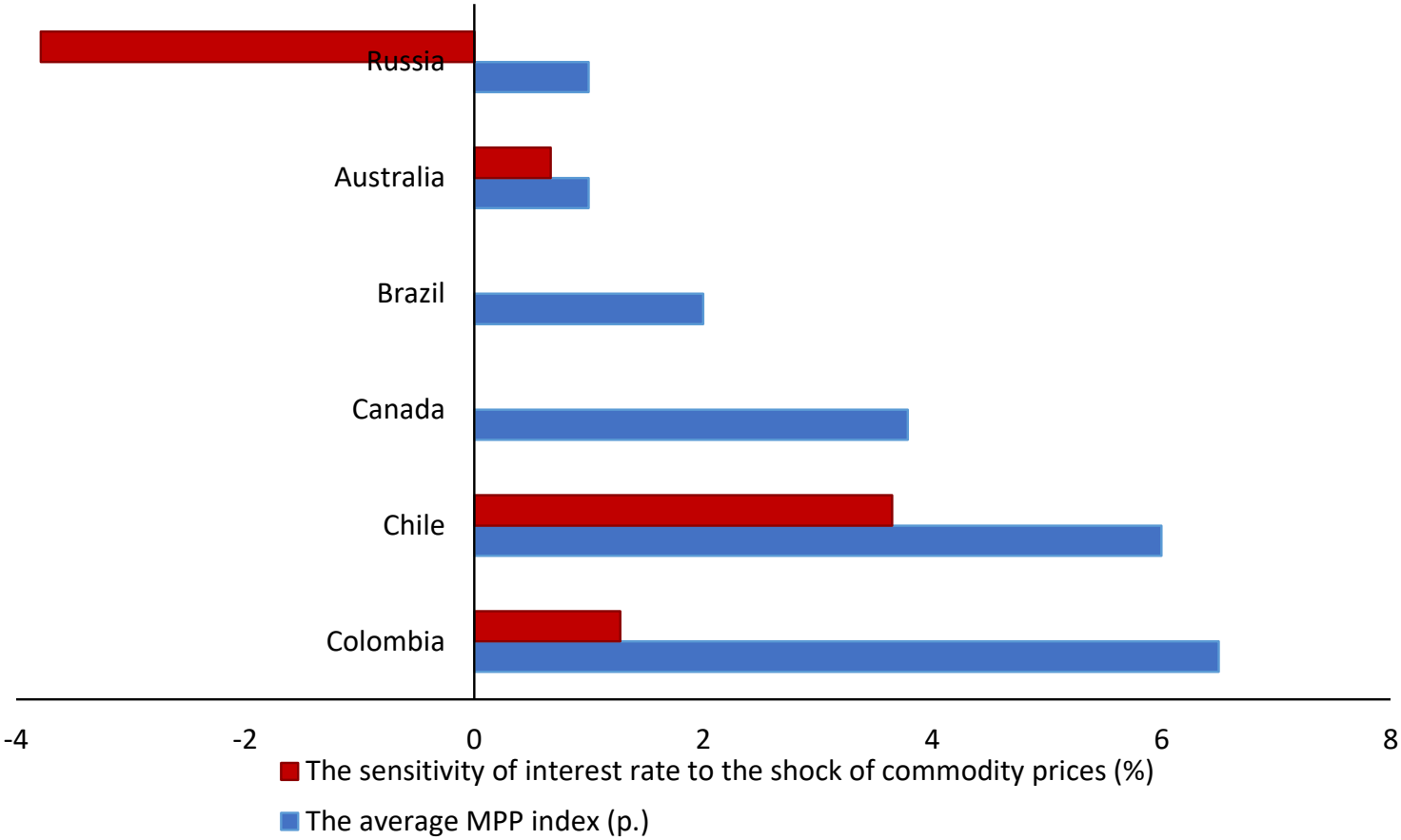
Results (1)

The increase in the share of the predominant commodity export category results in the rise of the sensitivity of sovereign risk premium and national exchange rate to commodity prices shocks. This dependency is higher in EMEs.



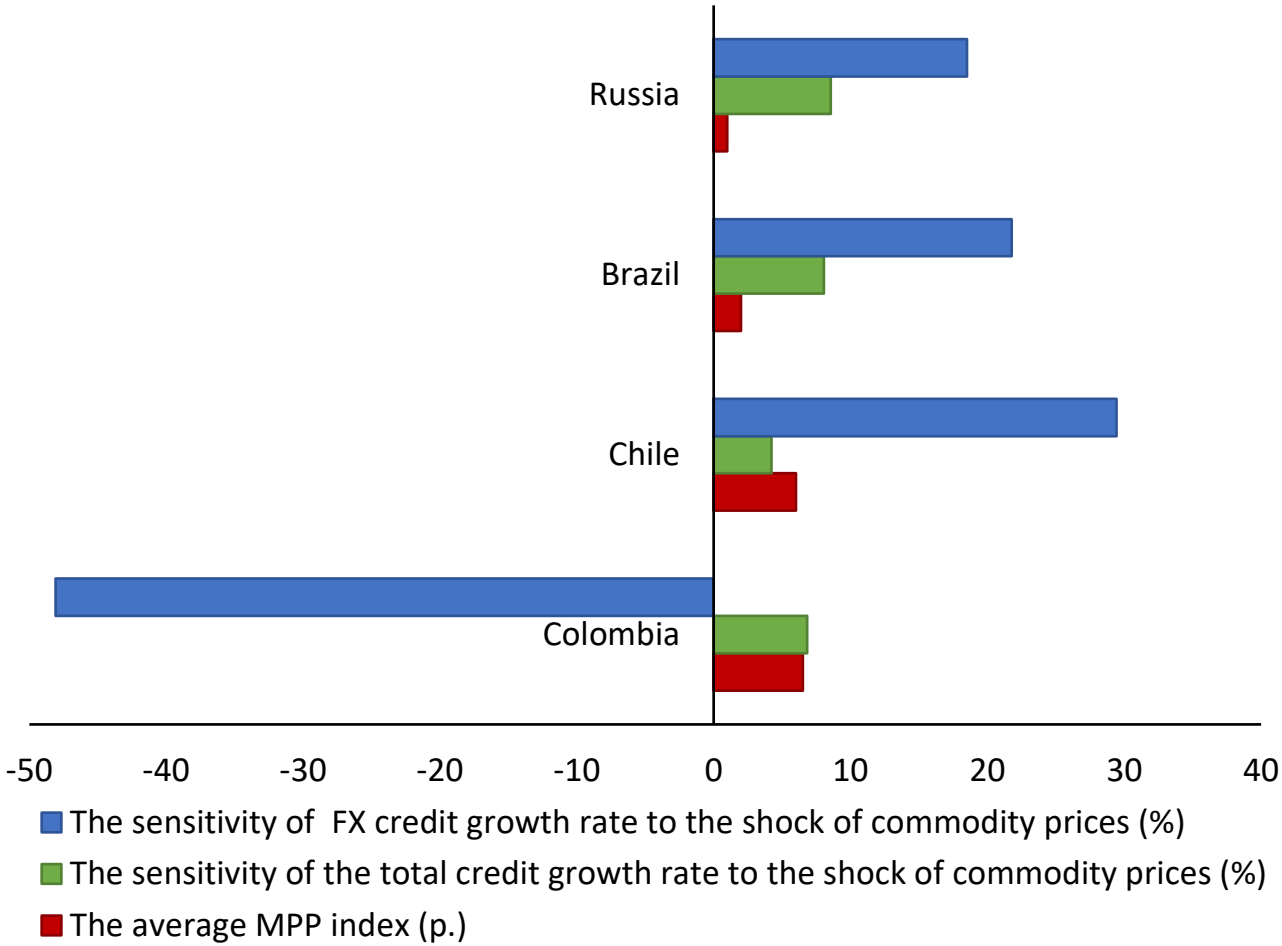
Results (2)

The market interest rates rise in response to positive ToT shocks in AEs. This tendency also exists in EMEs with high level of MPP implementation.



Results (3)

There is less exposure of total and foreign currency credit growth to commodity prices shocks in EMEs with high MPP score.



Conclusions

- Commodity prices' upsurge results in the increase in total credit growth rate, foreign currency credit growth rate and the rate of accumulation of external debt in most countries
- The improvement of the conditions of international trade contributes to the rise of dollarization and the decline of NPL in Russia
- Interest rates rise during the expansionary phase of commodity cycle in AEs and EMEs with high level of MPP implementation
- EMEs with active usage of MPP instruments are less exposed to external conditions' vulnerabilities
- Economic authorities in EMEs should develop national financial markets and pursue countercyclical MPP

Thank you for your attention!

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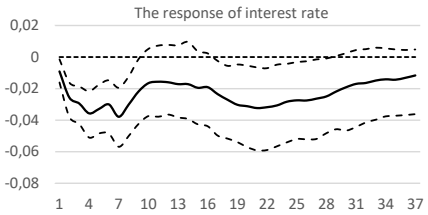
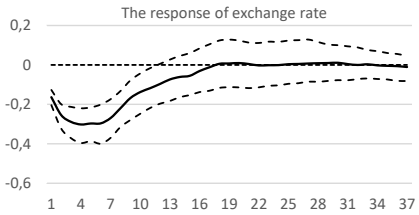
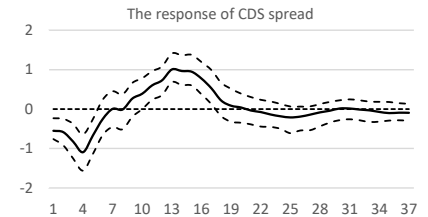
Appendix

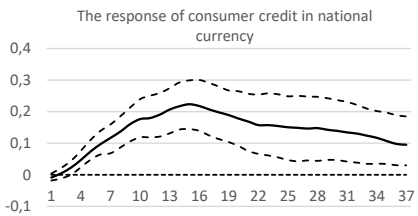
IRFs

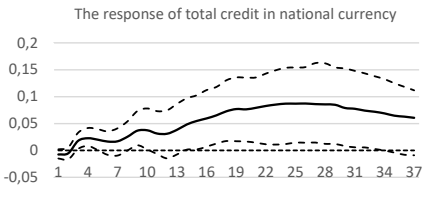
Russia

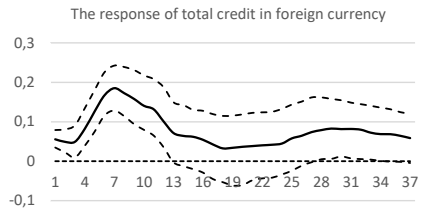

The response of interest rate

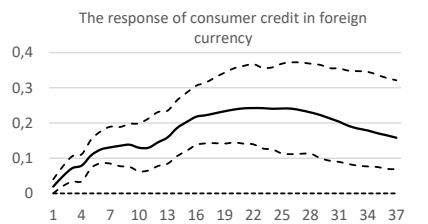

The response of exchange rate

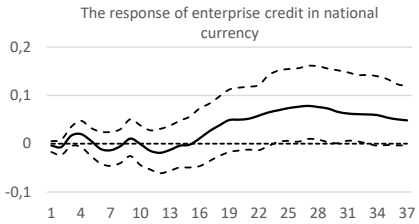

The response of CDS spread

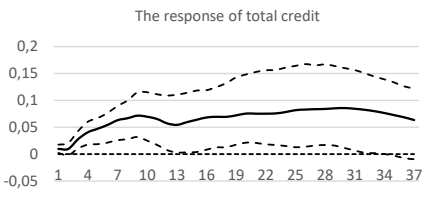

The response of consumer credit in national currency

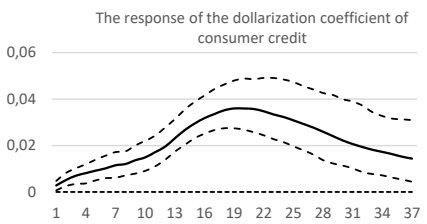

The response of total credit in national currency

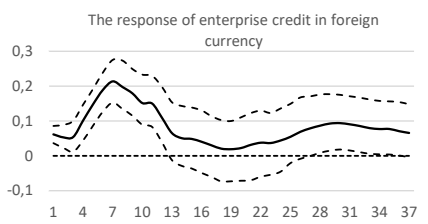

The response of total credit in foreign currency

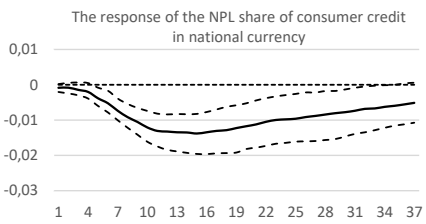

The response of consumer credit in foreign currency

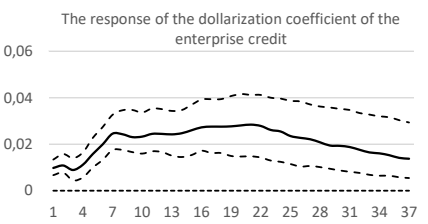

The response of enterprise credit in national currency

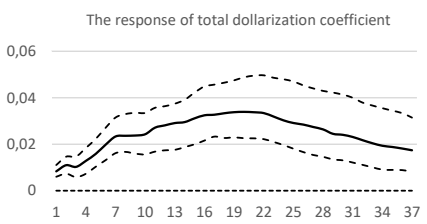

The response of total credit

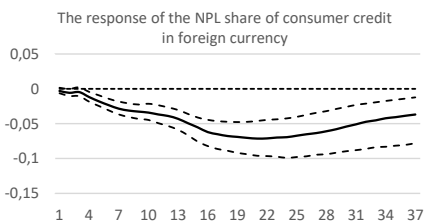

The response of the dollarization coefficient of consumer credit

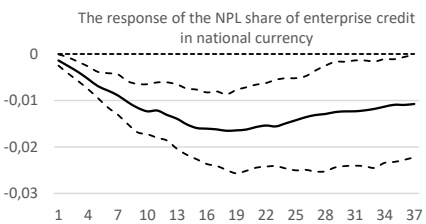

The response of enterprise credit in foreign currency


The response of the NPL share of consumer credit in national currency

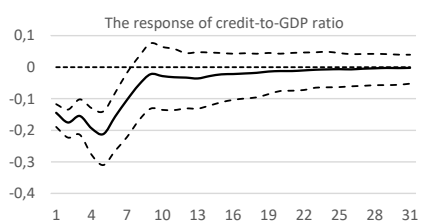

The response of the dollarization coefficient of the enterprise credit


The response of total dollarization coefficient

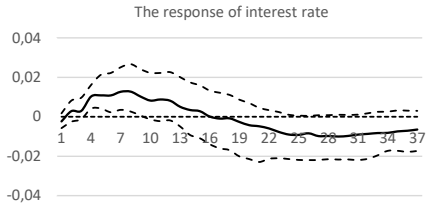

The response of the NPL share of consumer credit in foreign currency

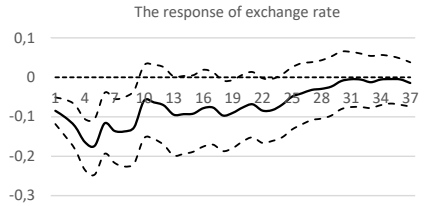

The response of the NPL share of enterprise credit in national currency

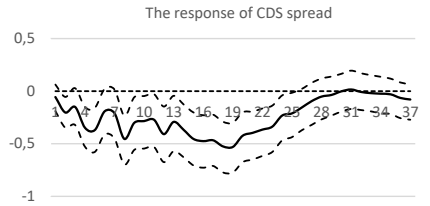

The response of external corporate sector debt

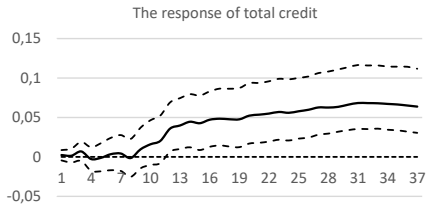

The response of credit-to-GDP ratio

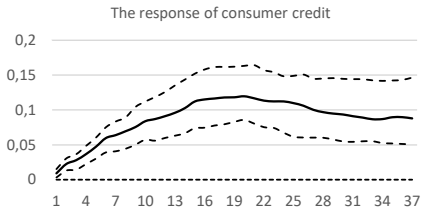
Colombia

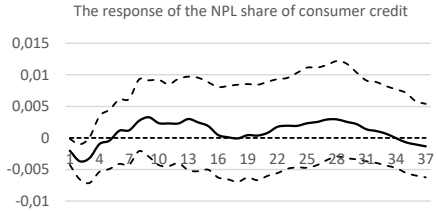

The response of interest rate
0,04
0,02
0
-0,02
-0,04
1 4 7 10 13 16 19 22 25 28 31 34 37

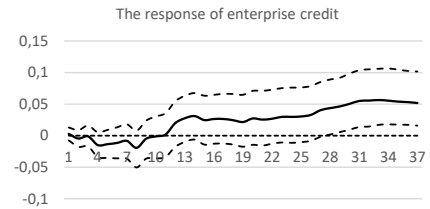

The response of exchange rate
0,1
0
-0,1
-0,2
-0,3
1 4 7 10 13 16 19 22 25 28 31 34 37

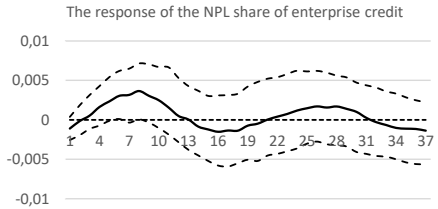

The response of CDS spread
0,5
0
-0,5
-1
1 4 7 10 13 16 19 22 25 28 31 34 37

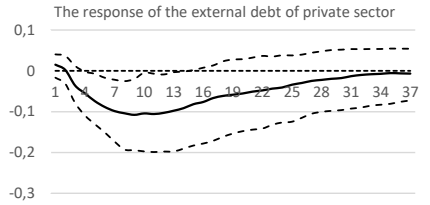

The response of total credit
0,15
0,1
0,05
0
-0,05
1 4 7 10 13 16 19 22 25 28 31 34 37

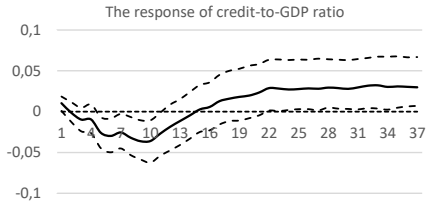

The response of consumer credit
0,2
0,15
0,1
0,05
0
1 4 7 10 13 16 19 22 25 28 31 34 37

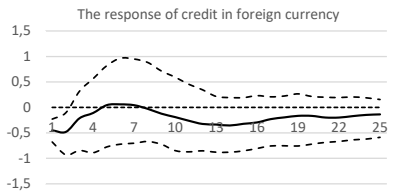

The response of the NPL share of consumer credit
0,015
0,01
0,005
0
-0,005
-0,01
1 4 7 10 13 16 19 22 25 28 31 34 37


The response of enterprise credit
0,15
0,1
0,05
0
-0,05
-0,1
1 4 7 10 13 16 19 22 25 28 31 34 37

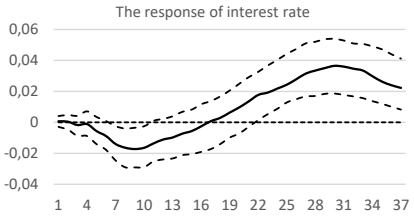

The response of the NPL share of enterprise credit
0,01
0,005
0
-0,005
-0,01
1 4 7 10 13 16 19 22 25 28 31 34 37

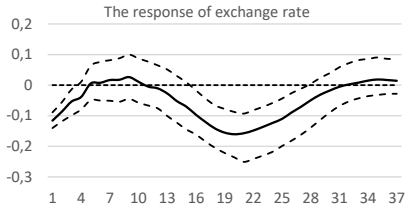

The response of the external debt of private sector
0,1
0
-0,1
-0,2
-0,3
1 4 7 10 13 16 19 22 25 28 31 34 37

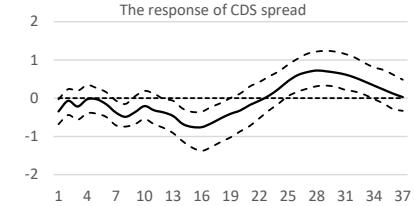

The response of credit-to-GDP ratio
0,1
0,05
0
-0,05
-0,1
1 4 7 10 13 16 19 22 25 28 31 34 37

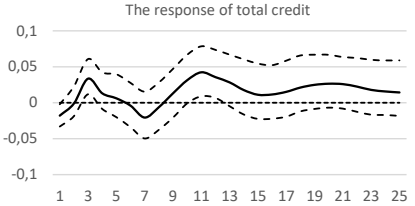

The response of credit in foreign currency
1,5
1
0,5
0
-0,5
-1
-1,5
1 4 7 10 13 16 19 22 25

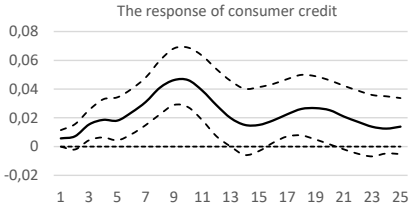
Chile

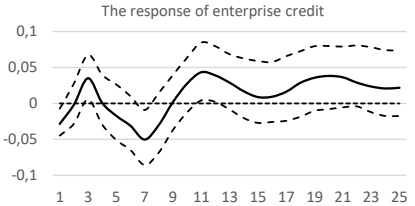

The response of interest rate
0,06
0,04
0,02
0
-0,02
-0,04
1 4 7 10 13 16 19 22 25 28 31 34 37

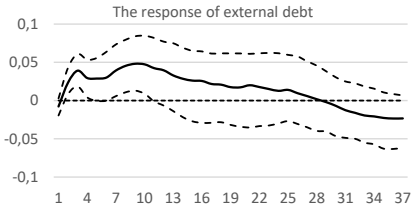

The response of exchange rate
0,2
0,1
0
-0,1
-0,2
-0,3
1 4 7 10 13 16 19 22 25 28 31 34 37

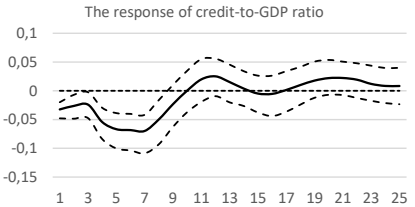

The response of CDS spread
2
1
0
-1
-2
1 4 7 10 13 16 19 22 25 28 31 34 37

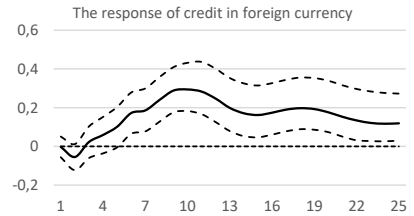

The response of total credit
0,1
0,05
0
-0,05
-0,1
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of consumer credit
0,08
0,06
0,04
0,02
0
-0,02
1 3 5 7 9 11 13 15 17 19 21 23 25

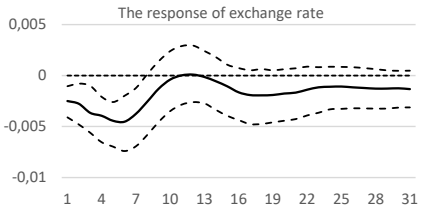

The response of enterprise credit
0,1
0,05
0
-0,05
-0,1
1 3 5 7 9 11 13 15 17 19 21 23 25

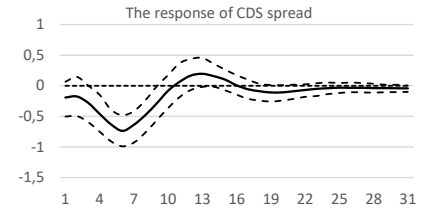

The response of external debt
0,1
0,05
0
-0,05
-0,1
1 4 7 10 13 16 19 22 25 28 31 34 37

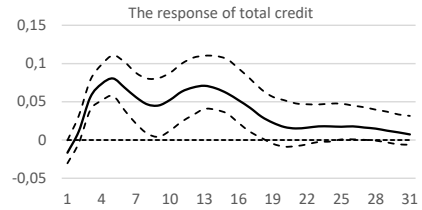

The response of credit-to-GDP ratio
0,1
0,05
0
-0,05
-0,1
-0,15
1 3 5 7 9 11 13 15 17 19 21 23 25

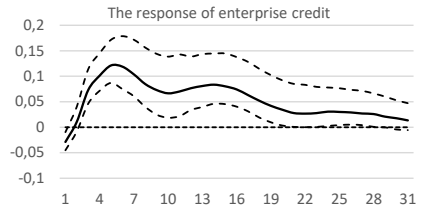

The response of credit in foreign currency
0,6
0,4
0,2
0
-0,2
1 4 7 10 13 16 19 22 25

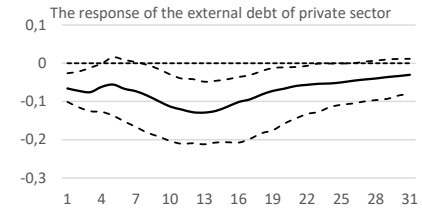
Brazil

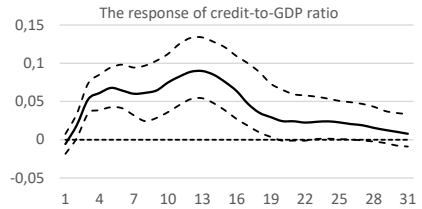

The response of exchange rate
0,005
0
-0,005
-0,01
1 4 7 10 13 16 19 22 25 28 31

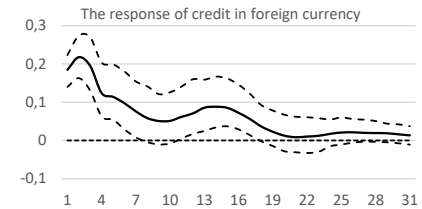

The response of CDS spread
1
0,5
0
-0,5
-1
-1,5
1 4 7 10 13 16 19 22 25 28 31

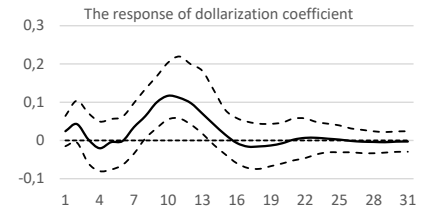

The response of total credit
0,15
0,1
0,05
0
-0,05
1 4 7 10 13 16 19 22 25 28 31


The response of enterprise credit
0,2
0,15
0,1
0,05
0
-0,05
-0,1
1 4 7 10 13 16 19 22 25 28 31

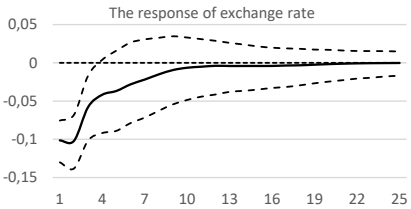

The response of the external debt of private sector
0,1
0
-0,1
-0,2
-0,3
1 4 7 10 13 16 19 22 25 28 31

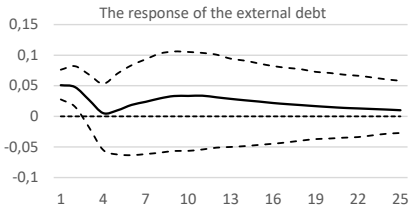

The response of credit-to-GDP ratio
0,15
0,1
0,05
0
-0,05
1 4 7 10 13 16 19 22 25 28 31

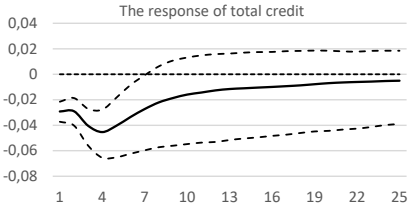

The response of credit in foreign currency
0,3
0,2
0,1
0
-0,1
1 4 7 10 13 16 19 22 25 28 31

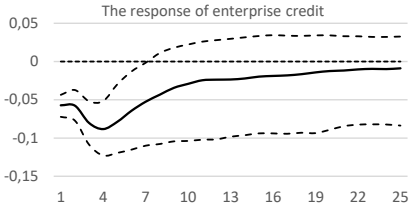

The response of dollarization coefficient
0,3
0,2
0,1
0
-0,1
1 4 7 10 13 16 19 22 25 28 31

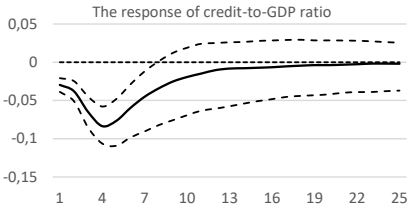
Canada

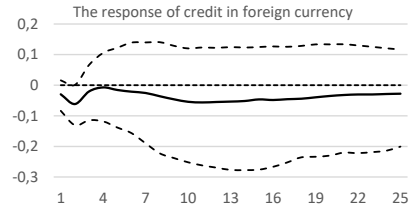

The response of exchange rate
0,05
0
-0,05
-0,1
-0,15
1 4 7 10 13 16 19 22 25

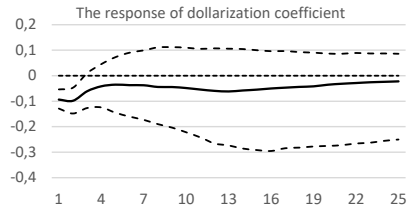

The response of the external debt
0,15
0,1
0,05
0
-0,05
-0,1
1 4 7 10 13 16 19 22 25


The response of total credit
0,04
0,02
0
-0,02
-0,04
-0,06
-0,08
1 4 7 10 13 16 19 22 25

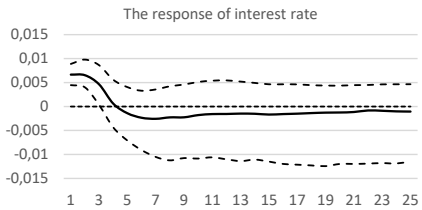

The response of enterprise credit
0,05
0
-0,05
-0,1
-0,15
1 4 7 10 13 16 19 22 25

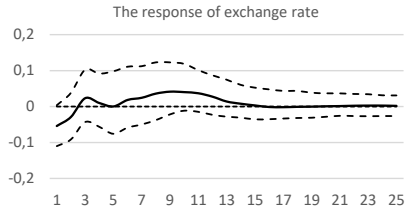

The response of credit-to-GDP ratio
0,05
0
-0,05
-0,1
-0,15
1 4 7 10 13 16 19 22 25

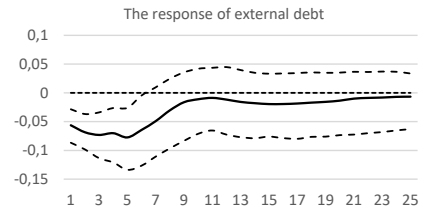

The response of credit in foreign currency
0,2
0,1
0
-0,1
-0,2
-0,3
1 4 7 10 13 16 19 22 25

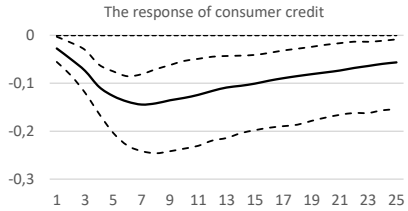

The response of dollarization coefficient
0,2
0,1
0
-0,1
-0,2
-0,3
-0,4
1 4 7 10 13 16 19 22 25

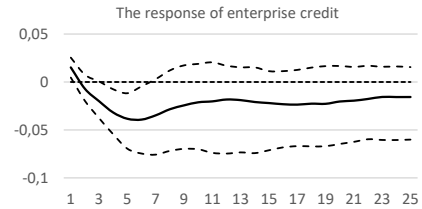
Australia

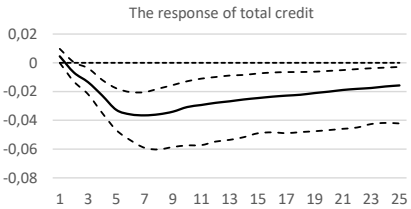

The response of interest rate
0,015
0,01
0,005
0
-0,005
-0,01
-0,015
1 3 5 7 9 11 13 15 17 19 21 23 25

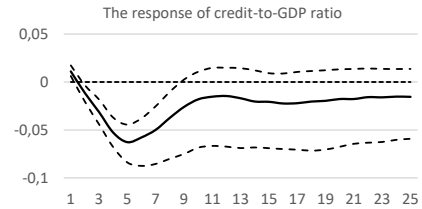

The response of exchange rate
0,2
0,1
0
-0,1
-0,2
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of external debt
0,1
0,05
0
-0,05
-0,1
-0,15
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of consumer credit
0
-0,1
-0,2
-0,3
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of enterprise credit
0,05
0
-0,05
-0,1
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of total credit
0,02
0
-0,02
-0,04
-0,06
-0,08
1 3 5 7 9 11 13 15 17 19 21 23 25


The response of credit-to-GDP ratio
0,05
0
-0,05
-0,1
1 3 5 7 9 11 13 15 17 19 21 23 25

Literature

1. Agarwal I., Duttagupta R., Presbitero A. (2017). International commodity prices and domestic bank lending in developing countries. *IMF Working Paper, no. 279.*

2. Allen J., Grieder T., Peterson B., Roberts T. (2017). The impact of macroprudential housing finance tools in Canada. *BIS Working Papers, no. 632.*

3. Barroso J., Gonzalez R., Doornik B. (2017). Credit supply responses to reserve requirement: loan-level evidence from macroprudential policy. *BIS Working Papers, no. 674.*

4. Bergholt D., Larsen V. (2016). Business cycles in an oil economy: lessons from Norway. *Norges Bank Research Working Paper, no. 16.*

5. Blake A., Mumtaz H. (2017). Applied Bayesian econometrics for central bankers. *Centre for Central Banking Studies.*

6. Bruno V., Shim I., Shin H.S. (2015). Comparative assessment of macroprudential policies. *BIS Working Papers, no. 502.*

7. Cerutti E., Claessens S., Laeven L. (2017). The use and effectiveness of macroprudential policies: new evidence. *Journal of Financial Stability, vol. 28, pp. 203–224.*

8. Cifuentes R., Claro S., Jara A. (2017). Macroeconomic and financial volatility and macroprudential policies in Chile. *BIS Working Papers, no. 94.*

9. Cizel J., Frost J., Wierts P. (2016). Effective macroprudential policy: cross-sector substitution from price and quantity measures. *IMF Working Paper, no. 94.*

10. Coulibaly B. (2012). Monetary policy in emerging market economies: what lessons from the global financial crisis? *Board of Governors of the Federal Reserve System International Finance Discussion Papers, no. 1042.*

11. Danilova E., Elizarova N. (2017). Macroprudential policy: theoretical aspects and practical experience of the Bank of Russia. *Russian Journal of Money and Finance, no. 6, pp. 5-17.* (In Russian)

12. De Moura M., Bandeira F. (2017). Macroprudential policy in Brazil. *BIS Working Papers, no. 94.*

Literature

13. Demeshev B., Malakhovskaya O. (2016). BVAR mapping. *Applied econometrics, vol. 43, pp. 118-141.* (In Russian)
14. Gambacorta L., Murcia A. (2017). The impact of macroprudential policies and their interaction with monetary policy: an empirical analysis using credit registry data. *BIS Working Papers, no. 636.*
15. Gómez E., Lizarazo A., Mendoza J., Murcia A. (2017). Evaluating the impact of macroprudential policies on credit growth in Colombia. *BIS Working Papers, no. 634.*
16. González A., Hamann F., Rodríguez D. (2015). Macroprudential policies in a commodity exporting economy. *BIS Working Papers, no. 506.*
17. Kaminsky G., Reinhart C., Vegh C. (2004). When it rains, it pours: procyclical capital flows and macroeconomic policies. *NBER Macroeconomics Annual, vol. 19, pp. 11-53.*
18. Kinda T., Mlachila M., Quedraogo R. (2016). Commodity price shocks and financial sector fragility. *IMF Working Paper, no. 12.*
19. Kolb B. (2016). Codes on Bayesian VARs using the Gibbs sampler.
20. Lomivorotov R. (2015). The identification of the main macroeconomic shocks in Russia, the estimation of its impact on the economy and conclusions for the monetary policy. *The dissertation for the candidate of economic sciences.* (In Russian)
21. Malakhovskaya O., Minabutdinov A. (2013). Dynamic Stochastic General Equilibrium model of the export-oriented economy. *Scientific Reports of the Laboratory for Macroeconomic Analysis NRU HSE, WP12 Series, no. 04.* (In Russian)
22. Menna L., Tobal M. (2018). Financial and price stability in emerging markets: the role of the interest rate. *BIS Working Papers, no. 717.*
23. Pestova A., Mamonov M. (2016). Estimating the influence of different shocks on macroeconomic indicators and developing conditional forecasts on the basis of BVAR model for the Russian economy. *Economic Policy, vol. 11, no. 4, pp. 56-92.* (In Russian)
24. Polbin A. (2017). Econometric estimation of the impact of oil prices shock on the Russian economy in VECM model. *The Issues of Economics, no. 10, pp. 27-49.* (In Russian)

Literature

25. Sinyakov A., Khotulev I. (2017). Optimal monetary, fiscal and macroprudential policy in oil exporting economy. *Russian Journal of Money and Finance, no. 9, pp. 58-66.*
26. Richter B., Schularick M., Shim I. (2018). The macroeconomic effects of macroprudential policy. *BIS Working Papers. 2018. No. 740.*
27. Vargas H., Cardoz P., Murcia A. (2017). The macroprudential policy framework in Colombia. *BIS Working Papers, no. 94.*
28. Financial Stability Review. (2014). *Informational and analytical materials, Bank of Russia. June 2014.*
29. Financial Stability Review. (2016). *Informational and analytical materials. Bank of Russia. Q2 – Q3 2016. No. 2.*