The Credit Channel Through the Lens of a Semi-Structural Model

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The views and conclusions presented in this paper are exclusively those of the authors and do not necessarily reflect the position of the Central Bank of Chile or any of its Board members

What we do

- In this paper we present a macroeconomic model that incorporates the dynamics of the banking sector.
- We part from the the semi-structural model used at the Central Bank of Chile (MSEP) for macroeconomic projections, and incorporate a set of equations that reflect credit dynamics.
- We use Chilean data from 2005 to 2019 to estimate our results. We estimate the role of the banking sector and use this to quantify the impact of non-conventional monetary policy in Chile.

Motivation

- One of the key channels through which monetary policy impacts the economy is the banking sector.
  - Need for tools that allow to observe and quantify the role of this sector.
- Non-conventional monetary policy through the credit sector has been key in gauging the COVID-19 pandemic.
  - Need for tools that estimate their impact.
- **Goal:** develop a banking sector extension for traditional semi-structural models. The idea is to capture the dynamics of the credit sector from a monetary policy point of view.

Literature

- An increasing body of literature stresses the importance of macro-financial linkages in monetary policy analysis: Vlcek and Roger (2012); Bernanke et al. (1999) and Iacoviello (2005).
- For Chile we have Medina and Soto (2005) and García-Cicco et al. (2014).
- We use a model that accounts for the interaction between a standard macroeconomic configuration and some key financial variables. This approach is largely used in literature over the last years Laxton et al. 2006; Samano (2011); Ehrenbergerová and Malovaná, 2019 and Nuguer et al , 2016.

Model: Semi-Structural approach

- The (gap) model presented here can be summarized in two parts: the macroeconomic block and the financial block.
- The first one captures the typical dynamics seen in New Keynesian models:
  1. **IS Curve** follows Arroyo-Marioli et al 2020

$$\Delta y_t = -a_1(y_{t-1} + y_{t-2}) - a_2(y_{t-1} - y_{t-2}) - a_3(r_t - rn_t + r_{t-1} - rn_{t-1})$$

$$+a_4(y_t^{em} + y_{t-1}^{em}) + a_5(y_t^{ad} + y_{t-1}^{ad}) + a_6 rer_{t-1} + a_7 tot_t + a_8 \hat{cr}_t - a_9 LLP_t + \nu_t^y .$$

  2. Phillips Curve
  3. UIP
  4. Taylor Rule
- The financial block feeds the macroeconomic block through the IS curve. The macroeconomic block feeds back into the financial block through income and interest rates, generating an **acceleration effect**.

Model: Financial Block

- We consider a financial sector, characterized by the intermediation of resources between borrowers and lenders at a cost, the spread *SPR*.

$$SPR_t = i_t^{Loan} - i_t \tag{1}$$

- Equation (2) describes the dynamics of the interest rate for loans.

$$i_t^{Loan} = \eta_1(i_t - i_n) + \eta_2 LLP_t + \eta_3 CAR_t + \varepsilon_t^{iLoan} \tag{2}$$

- Credit dynamics are represented in equation (3) where $\hat{cr}_t$ is credit growth.[1]

$$\hat{cr}_t = \theta_1 \hat{cr}_{t-1} + \theta_2 y - \theta_3 SPR_t + \varepsilon_t^{\hat{cr}} \tag{3}$$

- Provisions Expenses depend on expected economic activity and credit.

$$LLP_t = \vartheta_1 LLP_{t-1} - \vartheta_2 \left(\frac{\sum_{i=1}^{4} y_{t+i}}{4} \right) + \vartheta_3 \hat{cr}_{t-1} + \varepsilon_t^{LLP} \tag{4}$$

[1] This is defined as $\hat{cr}_t = CR_t - \bar{CR}_t$. The equations make clear that changes on credit growth as deviation of its trend.

Data and Metodology

Data

The data is in quarterly frequency with information from 2005Q1 to 2019Q1[2]. The data comes from the Central Bank of Chile, except for the expense in provisions and the capital adequacy index which is from the Financial Market Commission (FMC).

Model estimation

We estimate the model with a Bayesian approach. Priors distributions were informed both by univariate regressions using OLS, as well as priors used in Becerra Carreno 2020 and Arroyo-Marioli 2020.We performed 200,000 iterations of *Metropolis-Hasting* algorithm to recover key moments of the posterior distribution.

[2]We decided to estimate up to 20Q1 to maintain comparability with the base model and not influence the estimates with noisy data. Thereafter, the model is used to filter and read the variables up to 20Q4.

Data and Metodology

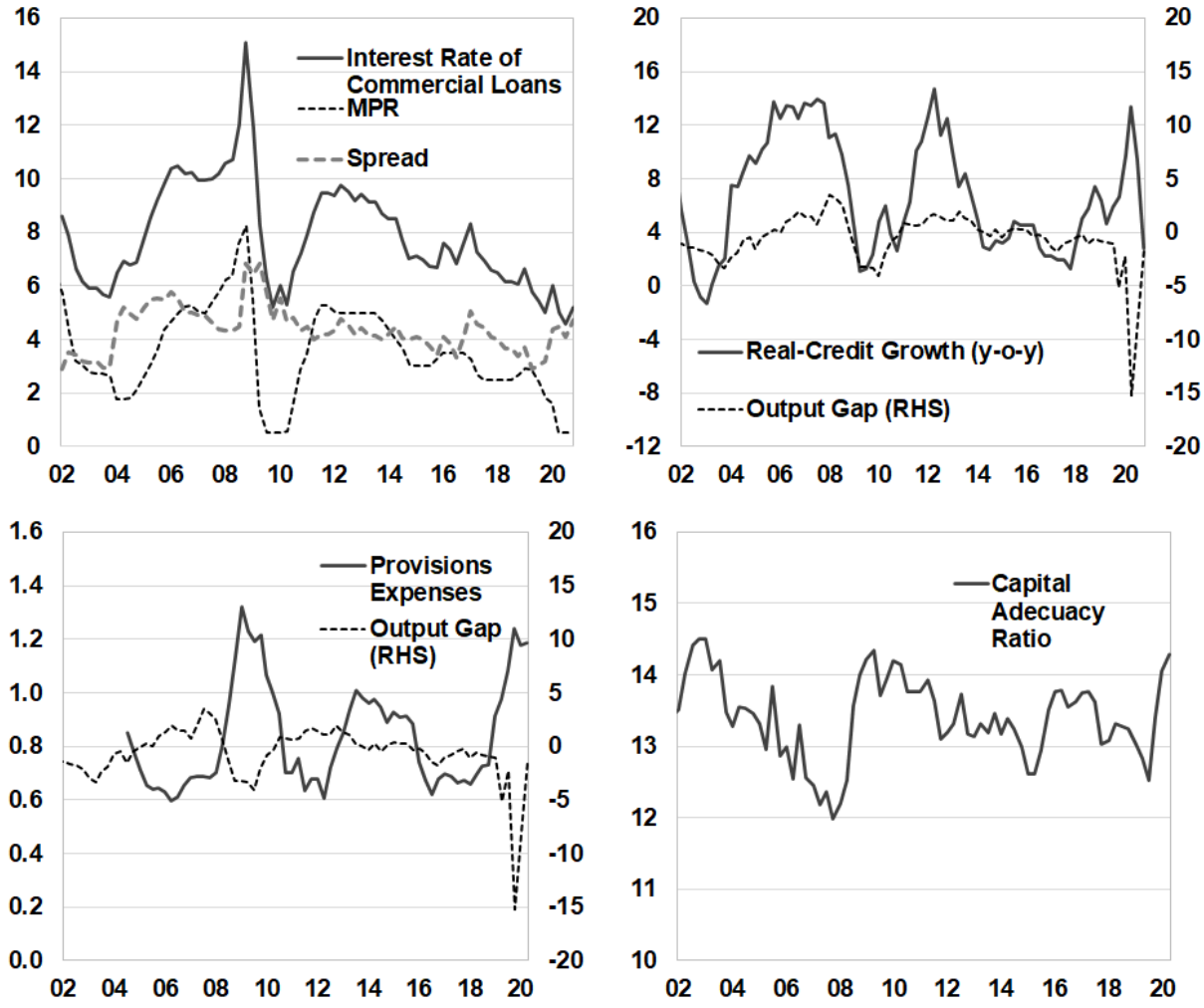
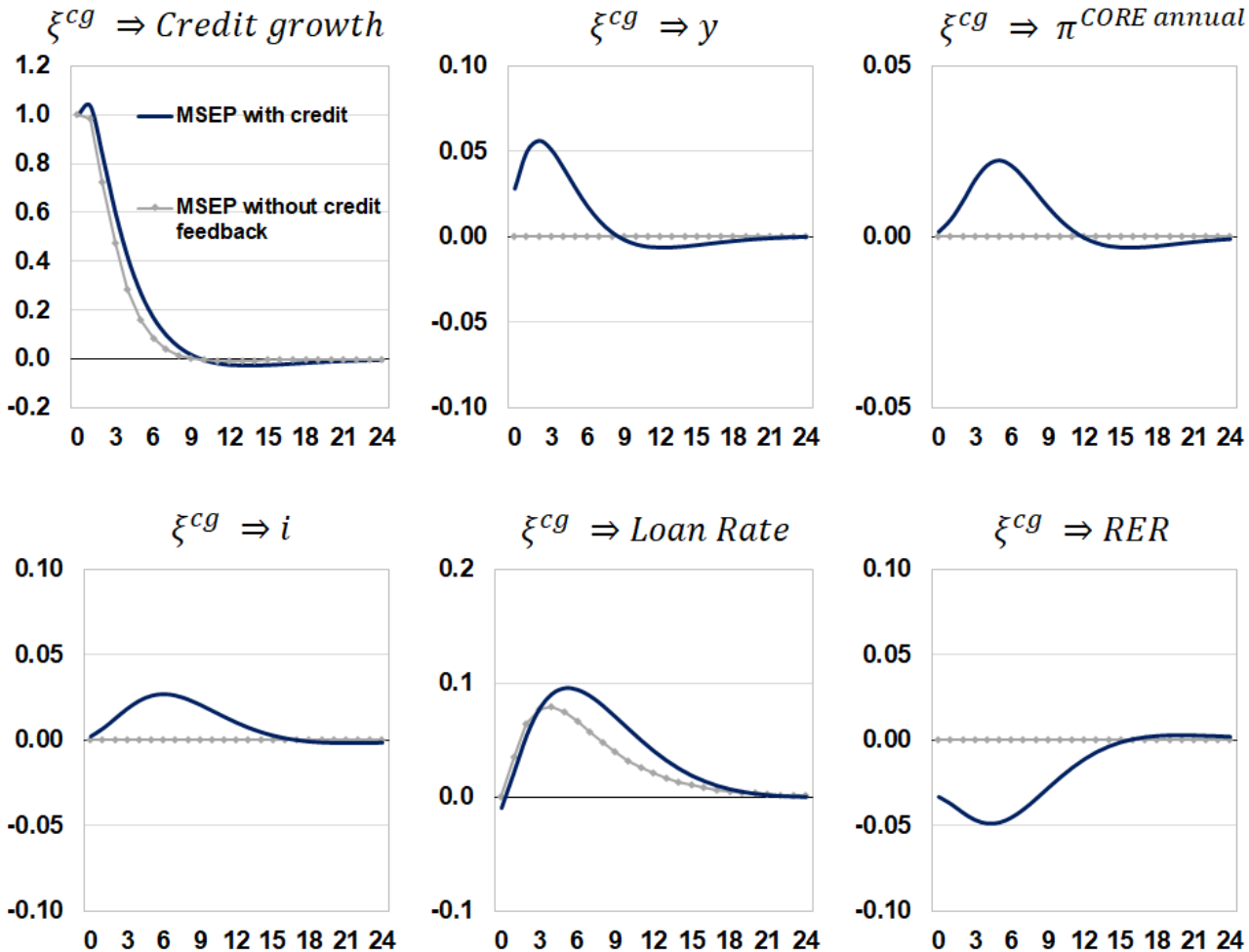


Figure: Observable variables from the financial block and Output Gap

Note: variables are shown in percentages. All are at level, except for credit growth, which is shown in annual variation.

Main Results I: IRFs

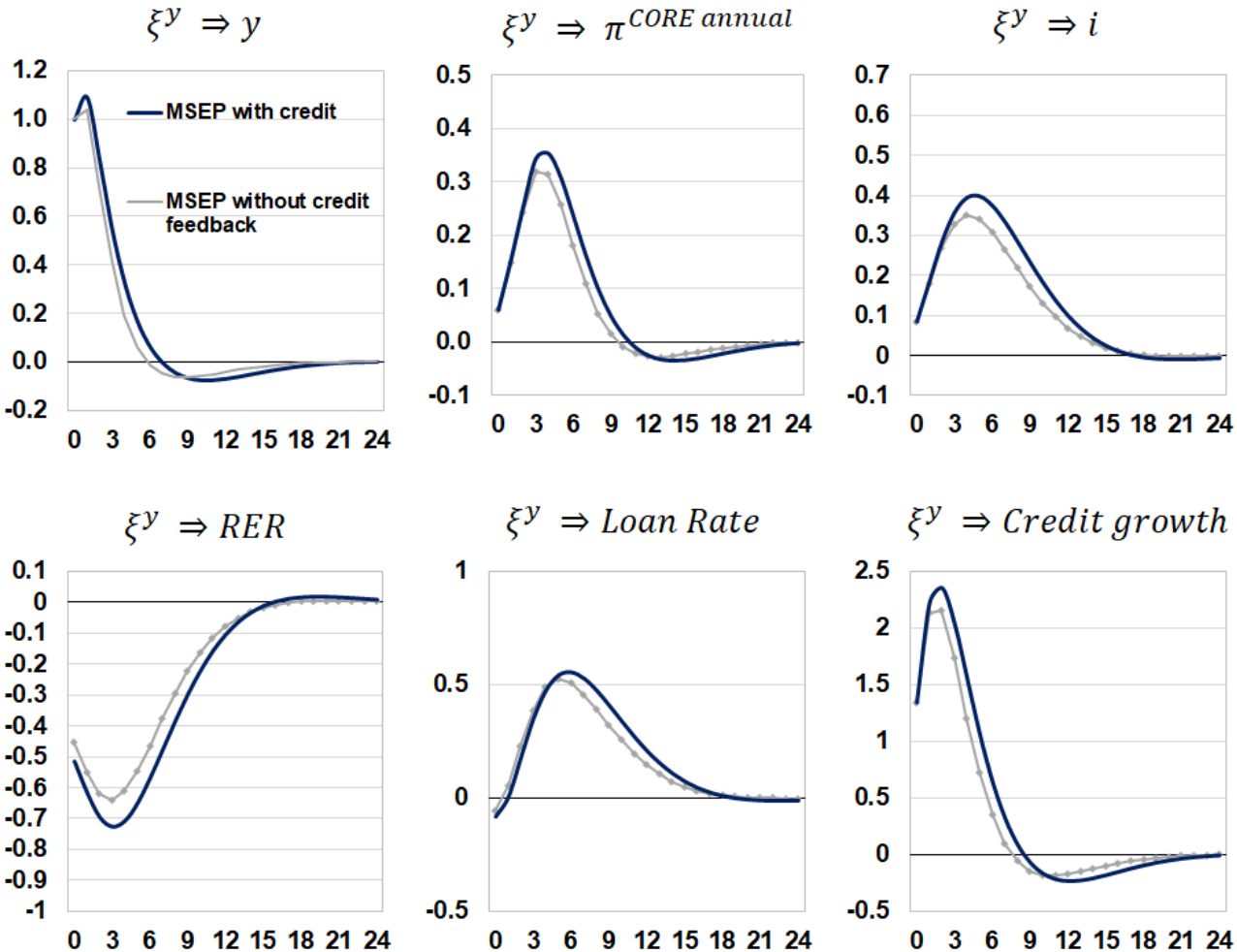
Figure: Credit Growth shock.



Note: IRFs use the posterior mode.

Main Results I: IRFs

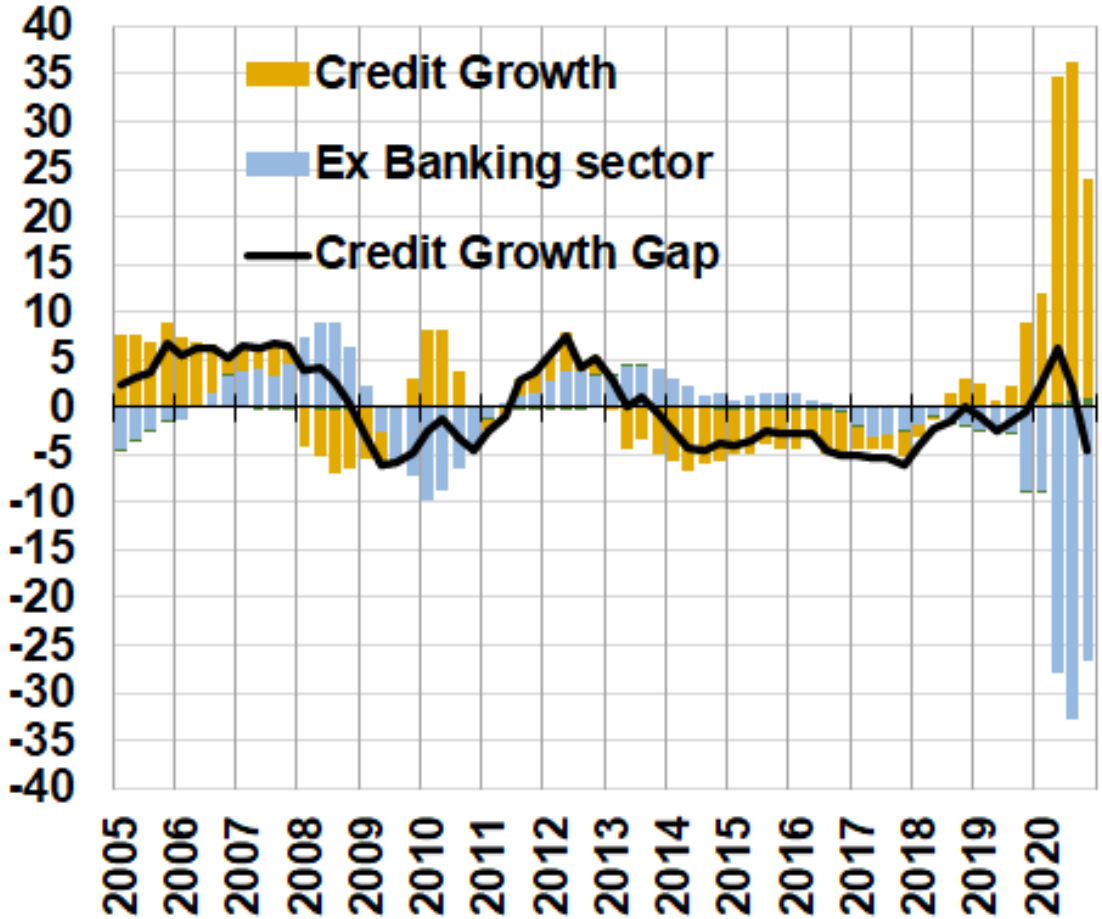
Figure: Activity shock.



Note: IRFs use the posterior mode.

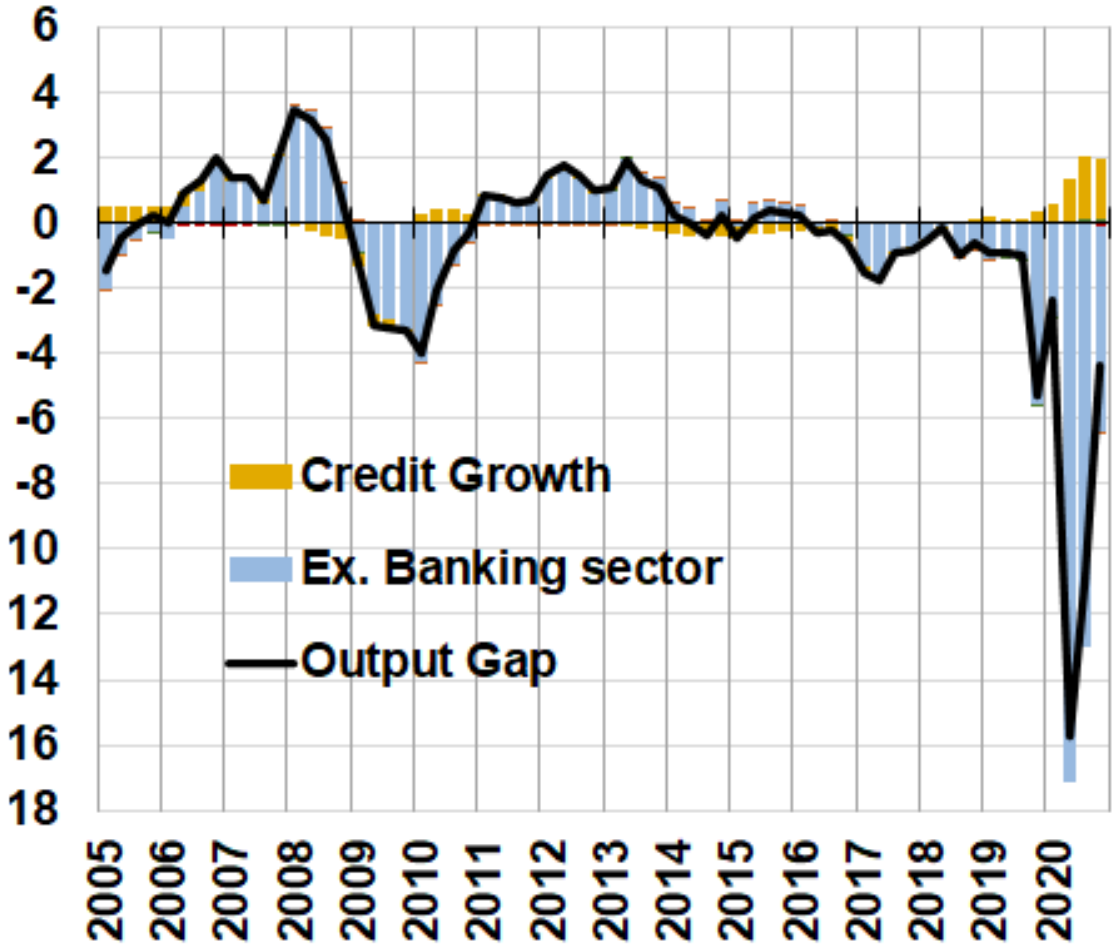
Main Results II: Historical Decomposition

Figure: Credit Growth. (annual var. (%), demeaned)



Main Results II: Historical Decomposition

Figure: Output Gap. (%)



Conclusions

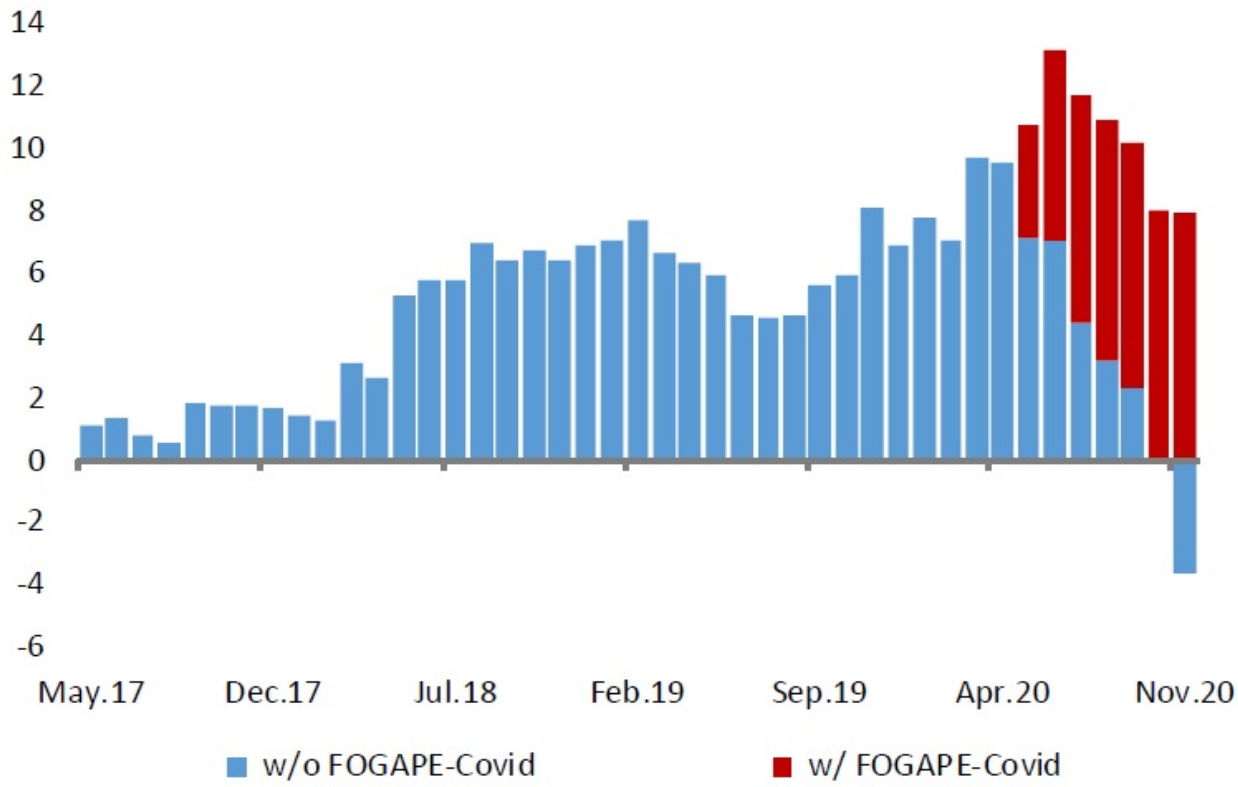
- We incorporate the banking sector into the Central Bank of Chile's semi-structural model MSEP.
- We find that the banking sector plays an acceleration role in the business cycle: a 1% demand shock accelerates by 0.13%. Also, a 1% credit growth translates into 0.06% additional GDP.
- Historically, this sector plays a much more relevant role during crisis: up to 1.9 pp vs 0.3 pp historical average of total output gap variation
- The model can be used to estimate the impact of non-conventional monetary policy: in Chile, our estimation is that these policies had an impact of 2% of GDP in 2020. This result is promising considering two major credit programmes added up to 20% of GDP.

Fogape

- FOGAPE is an instrument for the funding of SMEs.
- Its size and scope were broadened significantly during the second quarter of 2020, with guarantees of US$3 billion that could be levered up to $24 billion in new credits. This represented a ten-fold increase in the programme (reaching 10 % of GDP in potential new credits),

Fogape

FIGURE 3B GROWTH OF COMMERCIAL LOANS (REAL ANNUAL CHANGE, %)



Source: Central Bank of Chile and FMC.

FCIC (1-2-3)

- This is a four-year lending facility at the monetary policy rate at its effective lower bound (ELB), which is assessed to be 0.5%. To incentivise uptake even if banks expect the ELB to be revised downward, a clause for automatic refinancing at a lower rate was included.
- FCIC1 was implemented in March 2020, and saw an uptake in bank funding of close to 10% of GDP.
- FCIC2 was implemented in June 2020 but had a much more muted reception, likely due to the higher perceptions of risks outstanding. The third line (FCIC3) was recently announced in January 2021 and aims at facilitating the funding of refinancing operations of well-performing or already-guaranteed loans.