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ABSTRACT

During the Global Financial Crisis, banks suffered losses on a scale not witnessed since the Great Depression, partly due to two major structural developments in the banking industry; deregulation combined with financial innovation. In the aftermath of the financial crisis, the regulatory response concentrated on the Basel III recommendations, raising core capital requirements for banking institutions, which affected their business models and funding patterns. Consequently, these changes have had significant implications for how banks grant loans, how they react to monetary policy shocks, and how they respond to external shocks. We find evidence of significant interactions between the bank lending channel and both monetary and global shocks in Chile. These links have changed significantly after the Global Financial Crisis. In particular, they have been shaped by the counter-cyclical behavior of a state-owned bank.

RESUMEN

Durante la reciente crisis financiera, los bancos sufrieron pérdidas en una magnitud no vista desde la Gran Depresión, en parte debido a dos importantes cambios en la industria bancaria: desregulación e innovación financiera. Posterior a la crisis financiera, la respuesta normativa se concentró en las recomendaciones de Basilea III, que aumenta las necesidades de capital básico para los bancos, afectando así sus modelos de negocio y formas de financiamiento. Estos cambios han tenido implicancias en la forma en que los bancos conceden préstamos, cómo reaccionan a los cambios de la política monetaria y cómo responden a shocks externos. En este artículo presentamos evidencia de la interacción entre la transmisión de la política monetaria y shocks tanto de política monetaria como globales. Esta interacción ha cambiado significativamente después de la crisis financiera, siendo influenciada por el comportamiento contra-cíclico de la oferta de crédito por parte de Banco Estado.

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1 Introduction

During the Global Financial Crisis (GFC) and its aftermath, banks worldwide suffered losses on a scale not witnessed since the Great Depression (Altunbas et al. (2012)). The regulatory response to such a sizable adverse event largely came in the form of increased core capital requirements for banking institutions (concentrated on the Basel III recommendations), therefore affecting the business models and funding patterns of institutions (Gambacorta and Marques-Ibanez (2011) and Roengpitya et al. (2014)). Under this scenario of combined economic downturn and more stringent banking regulation, the GFC showed the importance of understanding the mechanism through which monetary policy is transmitted to the real economy via the actions of banks. Robust macroeconomic policy frameworks and sound financial markets are key elements in shaping this bank lending channel.

In this paper, we focus on the case of Chile, a small developing economy and exporter of commodities, which is open to external financial markets and therefore exposed to international shocks. For decades Chile has had in place a sound macroeconomic policy framework, which includes a structural balance fiscal rule, sovereign wealth funds, and low public debt, among other essential features, allowing the country's economic authorities to conduct counter-cyclical fiscal policy when needed. For example, post-GFC, Chilean authorities put in place one of the largest fiscal stimulus programs in the world (2.8% of GDP) and an equally aggressive counter-cyclical monetary policy, reducing the monetary policy rate by 775 basis points (World Bank (2017)). This policy moved the Chilean economy out of recession after one year, with the publicly owned bank (Banco Estado) playing a decisive role on the implementation of fiscal policy through the origination of commercial loans (Lagos and Tapia (2014)). The monetary policy rate dropped from 8.25 percent in December 2008 to 0.5 percent in July 2009.¹

Specifically, we study the mechanism through which changes in the Chilean banks' specific characteristics affected the supply of commercial credit. We quantify whether these changes in the intermediation industry affected the bank lending channel of monetary policy. We assess how sensitive banks were to changes in global external conditions, i.e., financial uncertainty, liquidity, political uncertainty, and commodity prices. Lastly, we study the differential role Banco Estado played by affecting the supply of commercial loans. Our results suggest that the state-owned bank had a crucial part during the GFC by granting more loans while the remaining banks reduced their willingness to lend (Ffrench-Davis and Heresi (2014); Lagos and Tapia (2014); Mullins and Toro (2018a)).

To this end, we have set up a novel and unique database which combines balance sheet and credit registry data for Chilean banks spanning the period between the first quarter of 2000 and

¹ The monetary policy rate dropped from 8.25 percent in December 2008 to 0.5 percent in July 2009.

the last quarter of 2016. To the best of our knowledge, no other work prior to this has studied these questions with a dataset of this kind.

Our results indicate that Chilean banks' provisions (as a share of total loans), retail loans (as a share of total loans) and lagged share of short-term funding have had a significant role in shaping the commercial credit supply. While provisions have had a negative relationship with the commercial credit growth supply, for retail loans and short-term funding the sign is the opposite. Regarding the bank lending channel, we find that better capitalized banks are more likely to buffer changes in the monetary policy interest rate and hence less likely to affect the credit growth supply. Lastly, we find that the interaction between commodity price shocks and banks' specific characteristics might be explained by the inclusion of Banco Estado, given the evidence for this bank's counter-cyclical behavior during economic crises. Put in a different way, we do not find evidence of a differentiated response among banks to shocks in the global business cycle, except in the case of Banco Estado.

Most of the related literature, after the GFC, on the bank lending channel has focused on advanced economies (e.g. Gambacorta and Marques-Ibanez and Roengpitya et al.), finding that banks' business model and market funding patterns have changed, thus affecting monetary policy transmission (via the bank lending channel). For instance, Gambacorta and Marques-Ibanez focus on Europe and the United States for the period between the first quarter of 1999 and the fourth quarter of 2009. The authors find significant changes in the functioning of the bank lending channel of monetary policy transmission as a result of financial innovation and changes in banks' business model. For the case of Chile, results supporting the existence of the bank lending channel for different time periods and alternative methodologies have been documented by Alfaro et al., Catão and Pagan, and Fernández. More recently, Alegría et al. (2017) study the effects of changes in the Chilean banks' business model after the GFC. The authors assess the existence of spillovers due to the occurrence of the GFC on the cost and structure of cross-border funding of Chilean banks. Alegría et al. find (i) that during the GFC Chilean banks saw a significant deterioration in their access to funds from foreign banks; and (ii) that, in the aftermath of the GFC, Chilean banks modified their sources of funding, turning toward higher levels of bond funding and to new lending counterparties.

During the GFC, the government capitalized Banco Estado, allowing it to operate counter-cyclically. Increasing its granting of loans, while all other banks were either reducing or maintaining the pace at which they provided credit (Lagos and Tapia and Mullins and Toro). Thus Banco Estado's behavior contributed towards reducing the overall credit contraction and ended up increasing Banco Estado's market share while keeping it profitable and with a level of credit risk similar to the one prevalent before the financial crisis. One of our hypotheses is that this fiscal policy shaped the bank lending channel of monetary policy during the aftermath of the GFC in Chile. Mullins and Toro have already confirmed the existence of evidence supporting this hypothesis by using credit registry and detailed firm-level information. Our

approach is different and complements theirs in that we tackle the question from the bank balance sheet angle, combined with information from the same credit registry used by the aforementioned authors.

The rest of this paper consists of four sections. Section 2 presents an overview of the Chilean banking sector, a characterization of the banks' business model and a brief description of Banco Estado and its capitalization. We include a more formal analysis of the relationship between banks' specific characteristics and lending over time, based on banks' specific characteristics, macroeconomic data, and econometric models in Section 3. In Section 4 results are summarized and discussed. Section 5 concludes.

2 Chilean Banking System

This section includes a brief overview of the Chilean banking sector, classifies the country banks' business model following the methodology proposed by Roengpitya et al. (2014), and discusses the role of Banco Estado.

In a nutshell, the Chilean banking system comprises 21 institutions (Table 1), mostly oriented towards firm and household credit, one of these banks is Banco Estado. According to the classification proposed by Roengpitya et al. (2014), most of these banks fit into the retail-funded category. As of 2017, and without major changes since 2008, over 40 percent of total liabilities were concentrated in deposits of firms and individuals. Beyond this deposit share, Chilean banks have historically maintained a diversified set of funding sources, including local (e.g. other local banks, pension and mutual funds) and external agents (e.g. bonds and loans) (Figure 1). In addition, the Chilean banking sector has historically shown high levels of concentration. Currently three (out of twenty) banks hold half of the system's total assets (Figure 2). Lending is the main source of revenue, with corporate loans comprising more than half of the joint portfolio (Figure 3). In terms of liabilities, the share of long-term funding has been steadily growing in recent years, driven in part by access to lower interest rates abroad. Finally, regarding credit risk, after a sharp increase around the onset of the financial crisis, followed by a protracted decline, default rates have stabilized in low levels for all types of loans (Figure 4).

Chile's banking system is large relative to the corporate debt market and most firms rely on it, to some extent, for funding. Additionally, large firms have access to external bonds and often finance themselves through foreign direct investment coming from their parent company. However, since 2009 more than half of total non-bank firm debt has originated locally. In 2008, total private bank lending was around 80% of GDP while domestic outstanding private debt in the form of corporate bonds or commercial papers was approximately 15% of GDP.

Since the onset of the global financial crisis, banks established in Chile modified their sources of funding. In particular, after 2008, they have relied more heavily on external bond issuance and less on loans from banks abroad (Figure 5). Regarding the former, in 2009, external bonds were a negligible fraction of total cross-border funding; by 2015, this component had risen to more than 50 percent of total external borrowing. During the same time span, due to adverse financial conditions maturities were reduced, which in turn translated into an increasing share of short term liabilities in the banks' balance sheets. As stated by Alegría et al. (2017), during the global financial crisis Chilean banks saw a significant deterioration in the terms at which they accessed funds from foreign banks both for trade and for general funding (this was also the case for most banks in other jurisdictions). Borrowing costs increased significantly, as base rates (such as Libor and Euribor) and spreads charged above these rates to Chilean banks, increased following the collapse of Lehman Brothers in late 2008. Local banks were not the only ones to diversify their sources on income in the last years, European and North American institutions have also followed this strategy (e.g., Stiroh (2004); Stiroh and Rumble (2006); De Jonghe (2010) and Elsas et al. (2010)).

Banco Estado is the only commercial bank in Chile that is state-owned. It was created by government decree in 1953. Banco Estado provides financial services to households and firms, with a focus on national coverage in terms of geography and social sectors and a particular emphasis on unbanked, small, and medium firms, although it serves all types of businesses. It is the country's largest mortgage originator and largest issuer of debit cards. In addition, Banco Estado performs all of the Chilean government's financial activities through a single account managed by the General Treasury of the Republic of Chile. As Mullins and Toro (2018a) states, although Banco Estado it is the only state-owned bank in Chile, it is autonomous from the government and subject to the same regulation as its competitors. Governmental support for

the bank is not explicit, but it is assumed by the market, therefore its debt ratings reflect those of the Chilean government. Furthermore, state participation in the banking sector in Chile is among the lowest in Latin America (Levy Yeyati and Micco (2007)).

Historically Banco Estado has played a central role in the implementation of public policies such as providing loans and collateral to small firms, and in promoting homeownership by granting mortgage loans subsidized by the government. During the financial crisis, as discussed in Lagos and Tapia (2014), Mullins and Toro (2018b), the government capitalized Banco Estado. In December 2008, two policies were announced in order to maintain credit readily available. The first, increased the level of public guarantees on private credit to small firms (FOGAPE) as well as making larger firms temporarily eligible, Mullins and Toro (2018a) study the effects of this. Through the second policy, Banco Estado was instructed to make a special effort to increase credit granting to firms and households. To keep the bank financially sound and its capital-to-loans ratio in line with the supervisor's requirement, Banco Estado was capitalized soon after the announcement (three months after) with USD 500 million (increasing the bank's capital by 50%) in March 2009. As Mullins and Toro (2018a) point out, the capitalization was specifically aimed towards maintaining lending growth; it was not intended to help Banco Estado since it was not in financial distress. This policy decision was largely unexpected, the government had never capitalized Banco Estado before, and so there were no elements of available information at the time to foresee the occurrence of this event.

The capitalization of Banco Estado led it to behave counter-cyclically by granting relatively more loans, while the rest of the banks were either reducing or maintaining the pace at which they provided commercial credit. This credit expansion was mostly directed towards firms that already had a contractual relationship with Banco Estado. In particular, as pointed out in Lagos and Tapia (2014), Banco Estado's response was fast and affected aggregate credit, though its scope was limited by the bank's scale. Banco Estado's credit expanded more rapidly in segments with larger loans, suggesting that a significant share of the new credit ended up in large firms. These policies ultimately contributed towards reducing the overall credit contraction, and ended up increasing Banco Estado's market share while keeping it profitable.

Provided that Banco Estado had such a relevant role during the financial crisis, it seems natural to analyze how sensitive our results are to this counter-cyclical policy. One of our hypotheses is that this fiscal policy shaped the bank lending channel of monetary policy during the aftermath of the financial crisis in Chile. As mentioned before, Mullins and Toro (2018a) have already confirmed the existence of evidence supporting this hypothesis. Our work is complementary to theirs. We tackle the question of how the capitalization of Banco Estado shaped the bank lending channel during the financial crisis by focusing on the banking side, instead of the firms' side as Mullins and Toro (2018a) do. The capitalization of Banco Estado seem to be a suitable case of an exogenous shock that could affect our estimation results. Our strategy is estimating the parameters of interest with and without Banco Estado in the sample. This is an approach that we consider more flexible than adding a set of interactive dummy variables (for loans granted by Banco Estado). We present and discuss the results related to checking the validity of this hypothesis in Section 4. However, in short, our main results are stronger when excluding Banco Estado from the sample. This finding suggests that the lending behavior of the state-owned bank is less cyclical than that of the remaining institutions, which is line with what other authors have reported.

As mentioned before, considering the legal and economic environment in Chile, our hypothesis—regarding the role of Banco Estado along the business cycle and shaping the bank lending channel of monetary policy—is one where Banco Estado might have played a stabilizing role in terms of credit supply during and after the global financial crisis. As mentioned by Mullins and Toro (2018a), Banco Estado has behaved counter-cyclically more than once in the past, however during the financial crisis the addition of capital gave the bank more room to operate in this fashion. Our work is closest to that of Bertay et al. (2015). These authors using a sample of 1,633 banks from 111 countries (including Banco Estado in Chile) find that lending by state banks is less pro-cyclical than the lending by private banks, especially if the bank is located in a country with good governance. They also report that in general their results suggest that state banks can play a useful role in stabilizing credit over the business cycle as well as during periods of financial instability. However, the track record of state banks in credit allocation remains quite poor, questioning the wisdom of using state banks as a short term counter-cyclical tool. We can hypothesize that the latter claim is not necessarily true for the case of Chile, where besides its

capitalization; Banco Estado received a mandate to maintain levels of risk in its portfolio. An objective that seems to have been fulfilled, according to available data.

3 Empirical Strategy

In this section, we discuss both the data and specifications used to study whether the Chilean banks' characteristics have shaped the credit supply, and how this relationship has been affected by the occurrence of shocks, both global and local. We are also interested in assessing the relevance of these changes over the interaction with changes in the monetary policy interest rate, and evaluate whether the impact of global factors/external conditions change the way banks' specific characteristics affect the supply of credit. To do so, we use data on banks' characteristics and macroeconomic variables for the period spanning between 2000 and 2016. We build on the econometric models used in Gambacorta and Marques-Ibanez (2011) and Jiménez et al. (2012).

3.1 Data and Variables

We use both balance sheet and commercial credit registry data in quarterly frequency for the period spanned between 2000: Q1 and 2016: Q4. Table 2 presents descriptive statistics and definitions of the variables we included in the estimated models. For our dependent variable, we use credit registry data at the commercial loan level for each bank-firm pair and time, sourced by the Financial Market Commission (CMF) of Chile. Both administrative and banks' balance sheet data, also sourced by the CMF, are used for completing our set of regressors.

The variables presented in Table 2 include the supply of commercial credit growth as the dependent variable, and banks' characteristics, available for Chile, classified on the following five categories:

- (i) Bank lending channel, standard indicators (i.e., total assets in logarithms representing the banks' size, bank capital ratio, and bank liquidity ratio);
- (ii) Risk profile (loan-loss provisions as a share of total loans, reflecting the credit quality and the pressure banks might face in terms of a potential write-down of existing loans);
- (iii) Revenue mix (i.e., the share of net fees and commission income, the share of trading income, and retail loans as a share of total loans, describing the Chilean banks' business sources of revenue);
- (iv) Funding (i.e., the share of short-term funding and share of funding in foreign currency, meaning the sources of funding that Chilean banks have);

(v) Profitability (measured by the return on assets, indicating how efficient Chilean banks are generating earnings).

3.2 Baseline Model

Our empirical strategy for analyzing the evolution of the banks' business model and its interaction with the commercial credit supply, borrows from Gambacorta and Marques-Ibanez (2011) and Jiménez et al. (2012). With a baseline model that can be written as:

$$\Delta \log L_{fbt} = \beta X_{b,t-1} + bank_b + firm_f * t + \varepsilon_{fbt} \quad (1)$$

Where L_{fbt} denotes the amount lent by bank b to firm f at time t , $X_{b,t-1}$ is a vector of bank b characteristics at time $t-1$, $bank_b$ is a vector of time-invariant bank b fixed-effects, $firm_f * t$ is a vector of firm-time fixed effects², and ε_{fbt} is an error term. Banks' characteristics are lagged because we assume that monetary and economic conditions determine the capital and liquidity ratios that banks optimally choose (Jiménez et al., 2012). In the baseline model, we are mostly interested in the estimated β coefficients, which tell about the interaction between the banks' characteristics and their loan granting process.

3.3 Bank Lending Channel

To respond to the question on how monetary policy changes have affected the supply of commercial credit, and to determine the role that banks' specific features have had in strengthening or weakening the bank lending channel, we extend the baseline model as follows:

$$\Delta \log L_{fbt} = \beta X_{b,t-1} + \delta(\Delta i_{t-1} * X_{b,t-1}) + bank_b + firm_f * t + \varepsilon_{fbt} \quad (2)$$

In this specification, Δi_{t-1} represents the quarterly change in the monetary policy interest rate at time $t-1$, sourced by the Central Bank of Chile (BCCh). In this case, we are mainly interested

² All specifications use interactive bank*time clustered errors.

in the sign and size of the δ estimated coefficients, which correspond to the interaction between the monetary policy interest rate and the banks' characteristics, in subsection 3.1.

3.4 Impact of Global Factors

To assess the impact that external conditions (global factors) could have had on the way banks' characteristics interact with banks' commercial credit supply, we estimate the specification represented by equation (3), which once again builds on the baseline model:

$$\Delta \log L_{fbt} = \beta X_{b,t-1} + \gamma (C_t * X_{b,t-1}) + bank_b + firm_f * t + \varepsilon_{fbt} \quad (3)$$

Where C_t corresponds to a global characteristic. For the purpose of this exercise we have considered five alternative sources of global shocks and their corresponding alternative definitions for C_t :

- (i) Global financial uncertainty proxied with the Chicago Board Options Exchange Market Volatility Index, VIX;
- (ii) Global liquidity measured by the Wu-Xia shadow rate for the US monetary policy, as in Wu and Xia (2016);
- (iii) Economic political uncertainty approximated with the Baker, Bloom and Davis index, as in Baker et al. (2016);
- (iv) Global commodity prices measured by the IMF primary commodities index for all commodities; and
- (v) The financial crisis, represented by a dummy variable that takes the value of 1 during the 2008: Q3-2009: Q4 period, and zero otherwise.

Figure 6 depicts these global factors. In this case, we are mostly interested in the significance, sign, and magnitude of the estimated γ coefficients as they capture the relationship between the global factors and the banks' specific characteristics.

4. Results

In our estimates, we use both balance sheet and commercial credit registry data with quarterly frequency for the period spanned between 2000: Q1 and 2016: Q4. We focus our study on commercial lending because it represents about sixty percent of total credit in Chile, meaning that our results are sufficiently general. Also, set a database for household loans would imply an enormous effort regarding computational resources. Table 2 presents descriptive statistics for the variables describing the banks' specific characteristics included in the estimated models, represented by equations (1), (2), and (3). For our dependent variable, we use commercial credit registry data at the loan level, for each bank-firm pair and period. Both administrative and banks' balance sheet data are used for completing our set of regressors.

4.1 Baseline Model

To answer the question about the interaction between changes in banks' characteristics and commercial credit supply, first, we estimated the baseline model in equation (1). Table 3, column (6) reports the baseline model main results.

Table 3, column (6), find that provisions (loan-loss provisions as a share of total loans), retail loans (retail loans as a share of total loans), and short-term funding (share of short-term funding to total liabilities), would explain commercial loans changes. Our estimates indicate a negative relationship between provisions to total loans and commercial credit, and in particular, a 100 basis points increase of provisions to total loans, implying a decrease of about 1.6% in commercial credit. This finding, documented in the literature (e.g., Bouvatier and Lepetit (2012)), relates to the process carried out by banks in order to comply with banking authorities' loan-loss provision requirements. In other terms, whenever a loan is granted, provisions are constituted, and therefore less funding available for credit supply. Alternatively, a negative sign of this term is a signal of portfolio adjustments, made by the banks, to maintain credit risk under control.

In addition, we find a positive relationship between retail loans to total loans and commercial credit, indicating that a 100 basis points increase in the ratio between retail loans and total loans, relates to an increase of 0.2% in commercial credit. This finding is consistent with the idea that

retail banking would provide a more stable base of funding base, which in turn would allow fostering lending (Blundell-Wignall and Roulet (2013)).

Finally, concerning the banks' funding strategy, we find evidence of a positive relationship between the short-term funding to total liabilities and the commercial credit, where a 100 basis points increase in the ratio of short-term funding relates to an increase of 0.3% in commercial credit. In line with Perotti and Suarez (2009), this finding is related to the fact that short-term funding permits reducing monitoring, enabling to lax credit, and therefore increasing credit growth. Additionally, since the 2000s, there has been a global trend of increasing short-term leverage in banks' balance sheets, mostly due to abundant liquidity. This trend constituted a change as, before this, banks used to rely more on long-termed sources of funding, such as bonds and long-term deposits.

4.2 Bank Lending Channel and Monetary Policy

Regarding the bank lending channel and the transmission of monetary policy, our results from estimating equation (2) are summarized in Table 4. Incorporating the monetary policy stance in our baseline model does not translate into significant changes with respect to the results in Table 3. Consequently, we still find a significant inter-temporal effect between the provisions and commercial credit growth. We also find a significant positive effect between commercial credit expansion and retail loans to total loans and the short-term funding ratio. These results reinforce the findings reported in the baseline model.

Regarding the interactions with the monetary policy interest rate term. A monetary policy tightening (an increase in Δi_{t-1}) only affects banks' capital ratio, without significant spillover effects over commercial credit supply. Consequently, after a 100 basis point increase in the monetary policy interest rate, the bank with the average capital ratio, would increase its commercial loans by about 0.3%. The way this mechanism works is that during periods of tight monetary policy, only those banks with relatively higher capital ratios would have room for expanding their lending base and still be able to comply with capital requirements. Jiménez et al. (2012) finds similar results for the Spanish economy.

4.3 Impact of Global Factors

As already mentioned, Chile is a small developing economy, exporter of commodities, open to external financial markets, which, despite having a sound macroeconomic policy framework, is very exposed to international shocks. Therefore it is natural to study the effects of global economic conditions on the Chilean economy, and in particular on the banks' characteristics that later affect the credit supply.

Thus, this subsection evaluates whether the impact of global economic conditions could affect banks' characteristics, and then the commercial credit supply. Hence, building upon our baseline model, we investigate the influence over lending of five alternative global economic conditions (namely, financial uncertainty, liquidity, economic political uncertainty, commodity prices, and the global financial crisis). Among these global economic conditions, the most relevant factor for Chile corresponds to commodity prices.

Then we estimated the specification in equation (3) for all five global factors, but focusing on the commodity price index. Meanwhile, Table 5 contains the results due to changes in commodity prices. The results from the interactions between the banks' characteristics and the global financial uncertainty, global liquidity, economic political uncertainty, and global financial crisis, are reported in Table 7. Among the global factors, the most interesting are those focusing on the interaction with the commodity price index. This finding is not surprising as Chile is a net exporter of several commodities, notably copper.

Besides the fact that, once again, our results for the baseline model are robust to the inclusion of the global factor variable C_t . Three additional results arise from our estimations of the relationship between changes in commodity prices and banks' characteristics in Table 5.

First, the retail loans' ratio has a slightly negative relationship with commodity prices. It suggests that every time there is an increase in commodity prices, those banks with high shares of retail loans will slightly cut back commercial lending to the other banks with lower shares. Among the banks in our sample, Banco Estado has about a 15 percent more share of retail loans than the average of the remaining banks (all private). Second, the interaction between commodity price

shocks and the share of funding in foreign currency is positive in Table 5, meaning that banks less funded in foreign currency are less affected by adverse commodity price shocks. Notably, Banco Estado holds about 7 percent less of funding in foreign currency than the average of the remaining banks in our sample. Third, in our results, we also encounter evidence indicating that those banks with more substantial returns over assets are more willing to increase lending when facing higher commodity prices. Precisely Banco Estado has about 0.23 percent less of return over assets than the remaining average of the banks in our sample. These results highlight a different behavior of Banco Estado to the rest of the banks. In sum, banks with relatively lower deposits, less funded in foreign currency, and with poor asset quality transmit commodity price changes to lending more aggressively.

4.4 Banco Estado

Considering the results in subsection 4.3 and the well documented economic dependence that Chile has on commodity prices (copper in particular), we investigate the hypothesis suggesting that Banco Estado has a counter-cyclical role in periods of economic downturn and credit contraction. In order to assess the relevance that Banco Estado has in the local financial market, and how it might have shaped the bank lending, monetary and global factors channels, we excluded Banco Estado from our sample, and compare our estimates to the ones previously obtained in our baseline model (equation (2)) using the full sample (which includes Banco Estado). The results obtained when excluding Banco Estado are summarized in Table 6. In short, our main results in Table 3 become stronger when Banco Estado is excluded from the sample, Table 6.

The comparison between the results in Table 3 and Table 6 yield several interesting results. First, all variables found to be statistically significant under the full sample baseline estimation are still significant (at 99 percent) with the ex-Banco Estado sub-sample. This points towards the robustness of our results, reassuring that Banco Estado and its counter-cyclical behavior do not drive our findings.

Second, all coefficients estimated when excluding Banco Estado are more substantial (in absolute value) than those obtained with the full sample. Meanwhile in our baseline model, including all

banks (Table 3), we find that a 100 basis points increase of provisions to total loans, retail loans to total loans, and the share of short-term funding, relate to changes of -1.65, 0.20, and 0.30%, in commercial loans respectively. Our estimates, excluding Banco Estado from the sample (Table 6), yield changes of -1.87, 0.24, and 0.32%, respectively. All of them of larger magnitude relative to the ones obtained with the full sample of banks. This result does not come as a surprise considering that when we exclude Banco Estado from the sample, all remaining institutions in the pool are more alike.

Third, the term corresponding to the past share of net fees and commission income becomes significant with a negative estimated coefficient. This finding points towards the substantial evidence indicating that during bust periods, banks must adapt and resort to alternative sources of income. As pointed out in European Central Bank (2016), one way for banks to compensate for compressed net interest margins is to adapt their business models, moving towards more fee and commission-generating activities. As banks are forced to substitute their usual sources of income for alternatives such as fees and commissions, it is sensible to find a negative sign on this coefficient. It is also sensible that this effect arises only after removing Banco Estado from the sample, provided that it was capitalized during the financial crisis and therefore it did not need to resort to alternative sources of income unlike the private banks in the system.

Overall, our findings suggest that the lending behavior of Banco Estado is less cyclical than that of the remaining banks in Chile. Our paper contributes to the existing literature on the effects of government involvement in banks.

5 Final Remarks

During the Global Financial Crisis, banks suffered losses on a scale not witnessed since the Great Depression, partly due to two major structural developments in the banking industry; deregulation combined with financial innovation. In the aftermath of the financial crisis, the regulatory response concentrated on the Basel III recommendations, raising core capital requirements for banking institutions, and affecting their business models and funding patterns. Consequently, these changes have had significant implications for how banks grant loans, how they react to monetary policy shocks, and how they respond to the occurrence of external

shocks. We find evidence of significant interactions between the bank lending channel and both monetary and global shocks in Chile, these links have had important changes after the Global Financial Crisis

By exploring the evolution of the bank lending channel we find that there is a negative relationship between the level of loan-loss provisions and credit growth. We also see a positive relationship between both retail loans and short-term funding and credit growth. All of these results are consistent with the related literature and consistent across different specifications. Regarding the interaction with monetary policy, more capitalized banks are less sensitive to changes in the monetary policy interest rate, and therefore less likely to affect the loans supply.

Regarding the role that Banco Estado has played along both the business and credit cycle, our results confirm our main hypothesis. All of our results are robust to the exclusion of the government-owned bank. However, when removing Banco Estado from the sample, all the interactions between private banks' characteristics and bank lending are increased and reinforced, since all the banks in the pool are more alike. The comparison of results coming out of the model representing the interaction between commodity prices and banks' specific characteristics shows that, by excluding Banco Estado from the sample, there is evidence for counter-cyclical behavior during commodity prices crunches. The governance of this bank and the institutional arrangements prevalent in Chile have been key elements behind the outcome of the capitalization policy implemented amidst the Global Financial Crisis. BE effectively operated counter-cyclically, supporting credit growth while other banks either maintained or reduced their pace of lending, reshaping the bank lending channel of monetary policy during that period.

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Table 1. Chilean Banking Sector

Banks Established in Chile

Banco de Chile
Banco Internacional
Scotiabank, Chile
Banco de Crédito e Inversiones
Banco BICE
HSBC Bank
Banco Santander, Chile
Itaú Corpbanca
Banco Security
Banco Falabella
Banco Ripley
Banco Consorcio
Banco Bilbao Vizcaya Argentaria, Chile
Banco BTG Pactual, Chile

Foreign Banks Branches

Banco do Brasil S.A.
JP Morgan Chase Bank
Banco de la Nación Argentina
MUFG Ltd.
China Construction Bank, Chile
Bank of China, Chile

State Bank

Banco del Estado de Chile (Banco Estado)

Source: Own elaboration based on CMF data.

Table 2. Descriptive Statistics and Variables Definitions

Variables	Units	Observations	Min	Median	Average	Max	Definition
Dependent Variable							
Δ Log credit	log (CLP)	7,794,210	-4,5336	-0,0180	-0,0097	4,7116	difference of log loans
Independent Variables							
Bank lending channel standard indicators							
Log (total assets)	log (CLP)	1,453	17.0530	17.8465	18.1782	21.0371	log of total assets
Bank capital ratio	Ratio	1,453	0.0501	0.0983	0.1067	0.1444	total capital/total assets
Bank liquidity ratio	Ratio	1,453	0.0625	0.2227	0.2408	0.4010	liquid assets/total liabilities
Risk profile							
Loan-loss provisions as a share of total loans	Ratio	1,453	0.0111	0.0193	0.0213	0.0421	provisions/total loans
Revenue mix							
Share of net fees and comision income	Ratio	1,453	0.0375	0.0794	0.0889	0.2086	net fees and comision income to total income
Share of trading income	Ratio	1,453	0.0000	0.0750	0.1306	0.4146	net fees of trading income to total income
Retail loans as a share of total loans	Ratio	1,453	0.0214	0.1805	0.2109	0.5411	retail loans to total loans
Funding							
Share of short-term funding	Ratio	1,453	0.7426	0.9701	0.9451	1.0000	non bonds funding to total liabilities
Share of funding in foreign currency	Ratio	1,453	0.0359	0.1754	0.1725	0.2704	liabilities in foreign currency to total liabilities
Profitability							
Return on assets	Ratio	1,453	-0.0019	0.0027	0.0025	0.0069	net income to total assets

Source: Own elaboration based on CMF data.

Note: total loans correspond to retail and commercial loans.

Table 3. Baseline Model

Δ Log credit	(1)	(2)	(3)	(4)	(5)	(6)
ln (Total assets) (t-1)	-0.032 (0.077)*	-	-	-	-	-0.014 (0.433)
Bank capital ratio (t-1)	0.140 (0.407)	-	-	-	-	-
Bank liquidity ratio (t-1)	0.005 (0.959)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1)	-	-1.300 (0.022)*	-	-	-	-1.648 (0.002)***
Share of net fees and comission income (t-1)	-	-	-0.197 (0.291)	-	-	-
Share of trading income (t-1)	-	-	0.036 (0.357)	-	-	-
Retail loans as a share of total loans (t-1)	-	-	0.188 (0.007)***	-	-	0.201 (0.002)***
Share of short-term funding (t-1)	-	-	-	0.266 (0.004)***	-	0.300 (0.001)***
Share of funding in foriegn currency (t-1)	-	-	-	-0.160 (0.086)*	-	-0.079 (0.442)
Return on assets (t-1)	-	-	-	-	3.888 (0.075)*	2.869 (0.194)
Number of debtors	104 109	104 109	104 109	104 109	104 109	104 109
Number of banks	36	36	36	36	36	36
Observations	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902
R-squared	0.414	0.414	0.414	0.414	0.414	0.414
Adjusted R-squared	0.062	0.062	0.062	0.062	0.062	0.062

Source: Own elaboration based on CMF data.

Note: (1) Main indicators, (2) Risk profile, (3) Revenue mix, (4) Funding, (5) Profitability, (6) All. *, **, *** indicate significance at the 10, 5 and 1%, respectively.

Table 4. Commercial Credit Supply and Monetary Policy

Δ Log credit	(1)	(2)	(3)	(4)	(5)	(6)
Bank-specific characteristics						
ln (Total assets) (t-1)	-0.032 (0.085)*	-	-	-	-	-0.014 (0.465)
Bank capital ratio (t-1)	0.153 (0.370)	-	-	-	-	0.079 (0.637)
Bank liquidity ratio (t-1)	0.013 (0.895)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1)	-	-1.281 (0.023)**	-	-	-	-1.660 (0.001)***
Share of net fees and comission income (t-1)	-	-	-0.216 (0.229)	-	-	-
Share of trading income (t-1)	-	-	0.032 (0.368)	-	-	-
Retail loans as a share of total loans (t-1)	-	-	0.187 (0.007)***	-	-	0.211 (0.000)***
Share of short-term funding (t-1)	-	-	-	0.253 (0.007)***	-	0.302 (0.002)***
Share of funding in foriegn currency (t-1)	-	-	-	-0.154 (0.101)	-	-
Return on assets (t-1)	-	-	-	-	3.896 (0.075)*	2.563 (0.231)
Interaction between monetary policy interest rate and bank-specific characteristics						
ln (Total assets) (t-1) * Δ i(t-1)	-0.001 (0.706)	-	-	-	-	0.005 (0.402)
Bank capital ratio (t-1) * Δ i(t-1)	0.153 (0.015)**	-	-	-	-	0.296 (0.002)***
Bank liquidity ratio (t-1) * Δ i(t-1)	-0.037 (0.511)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1) * Δ i(t-1)	-	0.118 (0.736)	-	-	-	0.432 (0.220)
Share of net fees and comission income (t-1) * Δ i(t-1)	-	-	-0.076 (0.361)	-	-	-
Share of trading income (t-1) * Δ i(t-1)	-	-	-0.041 (0.318)	-	-	-
Retail loans as a share of total loans (t-1) * Δ i(t-1)	-	-	-0.025 (0.353)	-	-	-0.046 (0.250)
Share of short-term funding (t-1) * Δ i(t-1)	-	-	-	0.101 (0.267)	-	0.044 (0.620)
Share of funding in foriegn currency (t-1) * Δ i(t-1)	-	-	-	0.055 (0.440)	-	-
Return on assets (t-1) * Δ i(t-1)	-	-	-	-	0.335 (0.874)	-0.176 (0.908)
Number of debtors	104 109	104 109	104 109	104 109	104 109	104 109
Number of banks	36	36	36	36	36	36
Observations	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902
R-squared	0.414	0.414	0.414	0.414	0.414	0.414
Adjusted R-squared	0.062	0.062	0.062	0.062	0.062	0.062

Source: Own elaboration based on CMF data. Monetary policy interest rate by the BCCh.

Note: (1) Main indicators, (2) Risk profile, (3) Revenue mix, (4) Funding, (5) Profitability, (6) All. *, **, *** indicate significance at the 10, 5 and 1%, respectively.

Table 5. Commercial Credit Supply and Commodity Prices

Δ Log credit	(1)	(2)	(3)	(4)	(5)	(6)
Bank-specific characteristics						
ln (Total assets) (t-1)	-0.031 (0.111)	-	-	-	-	-
Bank capital ratio (t-1)	0.089 (0.604)	-	-	-	-	-
Bank liquidity ratio (t-1)	0.008 (0.929)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1)	-	-1.301 (0.021)**	-	-	-	-1.632 (0.001)***
Share of net fees and comission income (t-1)	-	-	-0.231 (0.207)	-	-	-
Share of trading income (t-1)	-	-	0.030 (0.412)	-	-	-
Retail loans as a share of total loans (t-1)	-	-	0.208 (0.002)***	-	-	0.236 (0.000)***
Share of short-term funding (t-1)	-	-	-	0.272 (0.001)***	-	0.339 (0.000)***
Share of funding in foriegn currency (t-1)	-	-	-	-0.184 (0.032)**	-	-0.088 (0.342)
Return on assets (t-1)	-	-	-	-	2.722 (0.205)	1.695 (0.401)
Interaction between commodity prices and the bank-specific characteristics						
ln (Total assets) (t-1) *C	0.000 (0.620)	-	-	-	-	-
Bank capital ratio (t-1) *C	0.009 (0.108)	-	-	-	-	-
Bank liquidity ratio (t-1) *C	-0.001 (0.651)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1) *C	-	-0.005 (0.735)	-	-	-	0.018 (0.182)
Share of net fees and comission income (t-1) *C	-	-	0.003 (0.435)	-	-	-
Share of trading income (t-1) *C	-	-	-0.001 (0.634)	-	-	-
Retail loans as a share of total loans (t-1) *C	-	-	-0.002 (0.072)*	-	-	-0.002 (0.015)**
Share of short-term funding (t-1) *C	-	-	-	0.002 (0.365)	-	0.001 (0.779)
Share of funding in foriegn currency (t-1) *C	-	-	-	0.005 (0.081)*	-	0.003 (0.069)*
Return on assets (t-1) *C	-	-	-	-	0.112 (0.036)**	0.106 (0.011)**
Number of debtors	104 109	104 109	104 109	104 109	104 109	104 109
Number of banks	36	36	36	36	36	36
Observations	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902	4 629 902
R-squared	0,414	0,414	0,414	0,414	0,414	0,415
Adjusted R-squared	0,062	0,062	0,062	0,062	0,062	0,062

Source: Own elaboration based on CMF data. Commodity Prices Index from the IMF.

Note: (1) Main indicators, (2) Risk profile, (3) Revenue mix, (4) Funding, (5) Profitability, (6) All. *, **, *** indicate significance at the 10, 5 and 1%, respectively.

Table 6. Commercial Credit Supply and Banco Estado

Δ Log credit	(1)	(2)	(3)	(4)	(5)	(6)
Bank-specific characteristics						
ln (Total assets) (t-1)	-0.031 (0.100)	-	-	-	-	-
Bank capital ratio (t-1)	0.141 (0.427)	-	-	-	-	-
Bank liquidity ratio (t-1)	0.009 (0.927)	-	-	-	-	-
Loan-loss provisions as a share of total loans (t-1)	-	-1.405 (0.027)**	-	-	-	-1.870 (0.000)***
Share of net fees and comission income (t-1)	-	-	-0.302 (0.075)*	-	-	-0.289 (0.067)*
Share of trading income (t-1)	-	-	0.020 (0.631)	-	-	-
Retail loans as a share of total loans (t-1)	-	-	0.208 (0.001)***	-	-	0.242 (0.000)***
Share of short-term funding (t-1)	-	-	-	0.256 (0.006)***	-	0.316 (0.000)***
Share of funding in foriegn currency (t-1)	-	-	-	-0.172 (0.075)*	-	-0.094 (0.334)
Return on assets (t-1)	-	-	-	-	3.095 (0.165)	-
Number of debtors	104 109	104 109	104 109	104 109	104 109	104 109
Number of banks	35	35	35	35	35	35
Observations	4 342 815	4 342 815	4 342 815	4 342 815	4 342 815	4 342 815
R-squared	0.438	0.438	0.438	0.438	0.438	0.438
Adjusted R-squared	0.062	0.062	0.062	0.062	0.062	0.062

Source: Own elaboration based on CMF data.

Note: (1) Main indicators, (2) Risk profile, (3) Revenue mix, (4) Funding, (5) Profitability, (6) All. *, **, *** indicate significance at the 10, 5 and 1%, respectively.

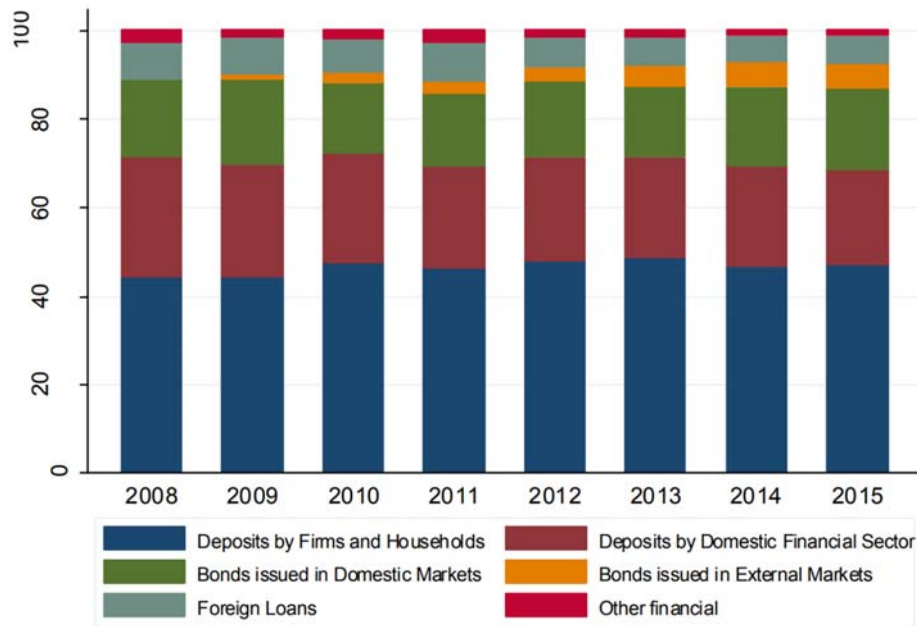
Table 7. Commercial Credit Supply and Global Factors

$\Delta \text{ Log credit}$	(1)	(2)	(3)	(4)
Bank-specific characteristics (BSC)				
ln (Total assets) (t-1)	-0.027 (0.268)	-0.023 (0.271)	- -	-0.026 (0.298)
Bank capital ratio (t-1)	- -	0.109 (0.458)	0.455 (0.123)	- -
Bank liquidity ratio (t-1)	- -	- -	0.165 (0.194)	- -
Loan-loss provisions as a share of total loans (t-1)	0.407 (0.709)	-1.839 (0.001)***	- -	-1.638 (0.001)***
Share of net fees and comission income (t-1)	-0.767 (0.053)*	- -	-0.476 (0.057)*	-0.273 (0.145)
Share of trading income (t-1)	- -	- -	-0.133 (0.200)	- -
Retail loans as a share of total loans (t-1)	0.183 (0.007)***	0.191 (0.027)**	0.193 (0.022)**	0.185 (0.009)***
Share of short-term funding (t-1)	- -	0.301 (0.002)***	- -	0.280 (0.004)***
Share of funding in foriegn currency (t-1)	- -	-0.102 (0.353)	0.204 (0.356)	-0.056 (0.609)
Return on assets (t-1)	- -	3.009 (0.256)	- -	- -
Interaction between the global factor and BSC				
ln (Total assets) (t-1) *C	-0.000 (0.610)	0.000 (0.872)	- -	0.004 (0.670)
Bank capital ratio (t-1) *C	- -	0.027 (0.667)	-0.003 (0.235)	- -
Bank liquidity ratio (t-1) *C	- -	- -	-0.001 (0.097)*	- -
Loan-loss provisions as a share of total loans (t-1) *C	-0.088 (0.015)**	0.230 (0.095)*	- -	-0.953 (0.378)
Share of net fees and comission income (t-1) *C	0.025 (0.193)	- -	0.003 (0.027)**	0.218 (0.106)
Share of trading income (t-1) *C	- -	- -	0.002 (0.077)*	- -
Retail loans as a share of total loans (t-1) *C	-0.000 (0.931)	-0.007 (0.645)	-0.000 (0.426)	-0.006 (0.907)
Share of short-term funding (t-1)*C	- -	-0.002 (0.937)	- -	-0.175 (0.377)
Share of funding in foriegn currency (t-1) *C	- -	0.029 (0.090)*	-0.003 (0.096)*	-0.136 (0.337)
Return on assets (t-1) *C	- -	-0.375 (0.602)	- -	- -
Number of debtors	104 109	104 109	104 109	104 109
Number of banks	36	36	36	36
Observations	4 629 902	4 629 902	4 629 902	4 629 902
R-squared	0.414	0.414	0.414	0.414
Adjusted R-squared	0.062	0.062	0.062	0.062

Source: Own elaboration based on CMF data. Global Financial Uncertainty index by the CBOE, Global Liquidity index by Wu and Xia (2016), and Economic Political Uncertainty from Baker et al. (2016).

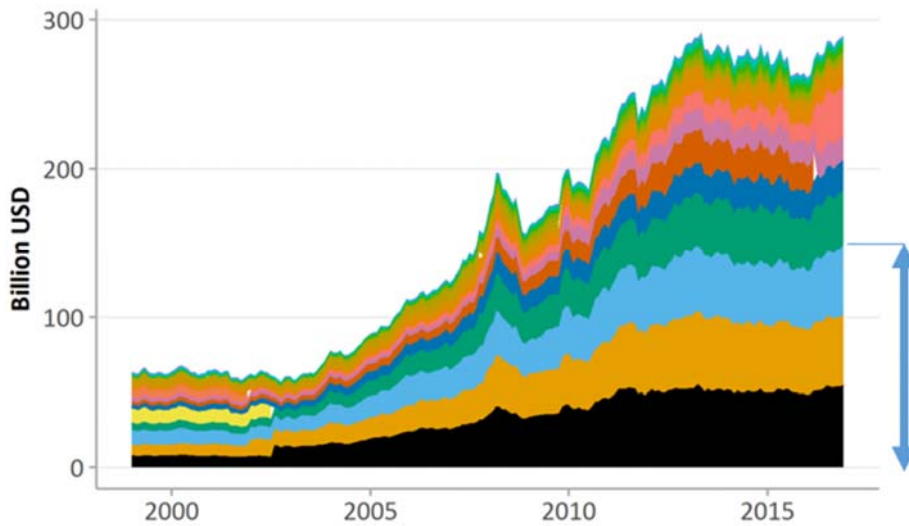
Note: (1) Global Financial Uncertainty, (2) Global Liquidity, (3) Economic Political Uncertainty, (4) Financial Crisis. *, **, *** indicate significance at the 10, 5 and 1%, respectively.

Figure 1. Composition of liabilities in the Chilean banking system, percentage



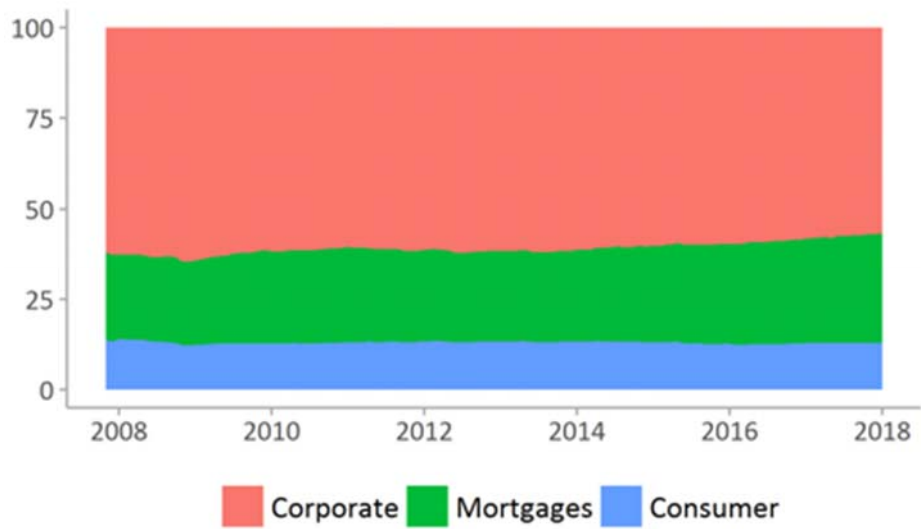
Source: Alegría et al. (2017).

Figure 2. Assets by institution, billions of USD



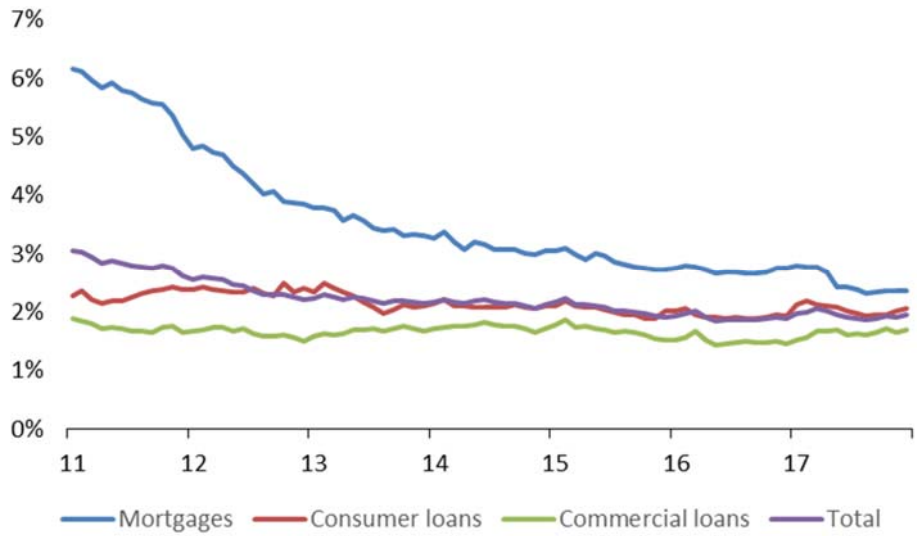
Source: Own elaboration based on CMF data.

Figure 3. Debt stock composition, percentage



Source: Own elaboration based on CMF data.

Figure 4. Default rate by type of loan, percentage



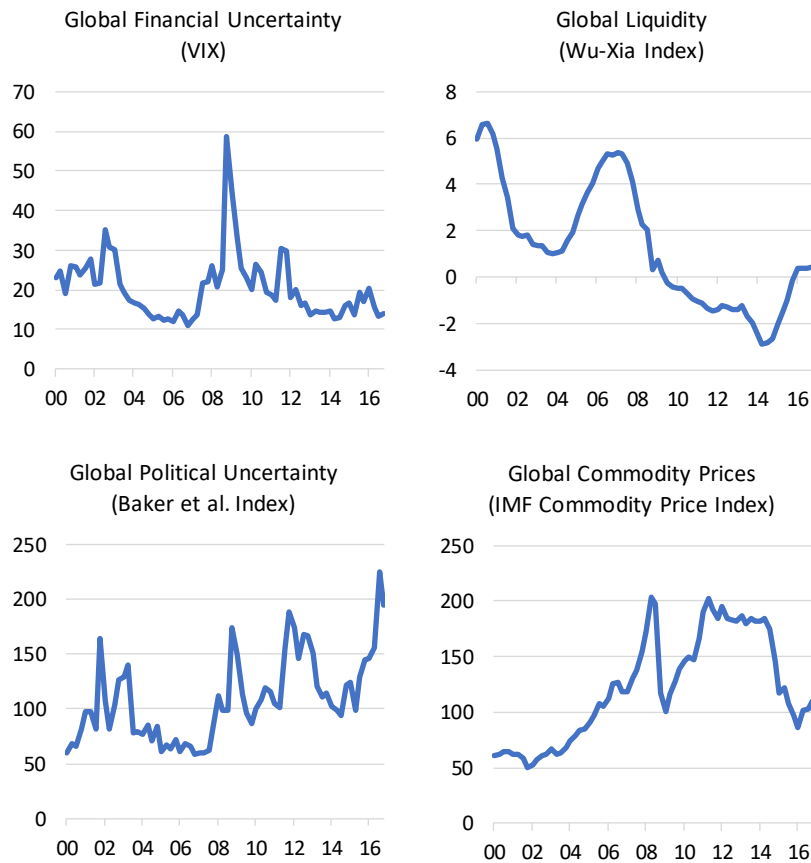
Source: Own elaboration based on CMF data.

Figure 5. Composition of bonds by currency, percentage



Source: Own elaboration based on CMF data.

Figure 6. Global Factors



Source: CBOE, Wu and Xia (2016), Baker et al. (2016), and IMF.

