The capital constraints channel of collateral eligibility: evidence from a credit support exit policy

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Abstract

Central banks can influence credit supply by altering the types of assets eligible as collateral in their refinancing operations. This study examines the impact of such changes through the specific channel of banks' incentives to hold liquid assets versus loans. Leveraging an unexpected policy change in Chile during the post-pandemic normalization period, which mandated banks to replace commercial loans pledged as collateral for an extraordinary credit line with liquid assets, we isolate the effects on credit supply. Our findings highlight the crucial role of bank capital constraints in shaping the effects of collateral policies on credit supply, risk-taking, and funding costs. Specifically, banks with tighter capital constraints reduce their supply of commercial loans more, regardless of their liquidity constraints. Our results also provide evidence in support of a specific mechanism: a contraction in collateral eligibility drives banks to expand their balance sheets to acquire liquid assets. Due to the short-term costs of adjusting bank capital, this expansion leads to increased leverage and tighter capital constraints, resulting in a more pronounced reduction in credit supply among capital-constrained banks.

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1 Introduction

During normal times, central banks accept a restricted array of highly liquid assets as collateral in refinancing operations, which commercial banks hold on their balance sheets to manage liquidity constraints arising from the maturity mismatch between loans and the liabilities that finance them. Since the financial crisis of 2008, expansions in the array of eligible assets, including banks' own loans or new types of loans, have become a widely used tool to facilitate access to cheap funding, relax banks' need to hold liquid assets and, thus support lending during times of distress. In principle, notwithstanding the effects of cheap funding, these type of collateral policies may affect credit supply through two complementary channels: first, by influencing the production of newly eligible loans through an asset-specific channel, and second, by altering the incentives for banks to hold liquid assets on their balance sheets, which depend both on the liquidity and capital constraints they face (Peydró, Polo and Sette (2021)). Although recent empirical studies have made progress in understanding the first of these channels (Van Bekkum, Gabarro and Irani (2017), Mésonnier, O'donnell and Toutain (2022),Cahn, Duquerroy and Mullins (2024)), the latter is less well understood.

In this paper, we study the impact of an unexpected policy change that required Chilean banks to gradually replace commercial loans pledged as collateral for an extraordinary cheap credit line with the Central Bank of Chile (CBC) with liquid assets, in the context of the withdrawal of a large credit support program implemented during Covid-19. Because there was no policy change affecting banks' funding costs when the change in collateral eligibility was announced, we are able to isolate the effects on credit supply through changes in bank incentives to hold liquid assets relative to loans. We investigate how these effects depend not only on banks' demand for liquid assets, but also on the degree of their capital constraints, as the withdrawal of credit support policies was carried out in tandem with additional capital requirements due to the implementation of Basel III, and later, with the unexpected activation of the Countercyclical Capital Buffer (CCyB) for the first time in Chile.

Our main finding is that bank capital constraints are key in determining the effects that collateral policies have on credit supply, risk taking and funding costs. Our results also provide evidence of the underlying mechanism determining these effects: requiring banks to hold more liquid assets induces them to expand their balance sheet, potentially without reducing loans. However, because bank capital is costly to increase in the short run, this expansion leads to higher leverage, which tightens the bank capital constraint. Consequently, more capital-constrained banks decrease the credit supply of all commercial loans more significantly, relative to less constrained banks, independent of the degree of liquidity constraints they face.

Understanding the mechanisms by which changes in collateral eligibility by itself, and thus changes in bank holdings of liquid assets, affect bank behavior is important from a policy perspective. Depending on their design, these interventions can have unintended consequences when activated alongside other lender of last resort measures, which include increasing risk-taking (Drechsler, Savov and Schnabl (2017), Carpinelli and Crosignani (2021)), exacerbating the bank-sovereign nexus (Crosignani, e Castro and Fonseca (2020)), or incentivizing regulatory arbitrage (Acharya and Steffen (2015)). Moreover, understanding these mechanisms is also crucial for the implementation of exit strategies from credit support measures, which should be optimally designed to foster recovery while avoiding heightened systemic risks (Beck, Bruno and Carletti (2021)), and from whose impact we have little empirical evidence. Finally, the mechanisms that determine how banks choose the liquidity and size of their balance sheets are also relevant for the transmission of traditional monetary policy and financial stability (Peydró et al. (2021)).

Despite its relevance, the empirical evidence on how these mechanisms work is scarce for several reasons. First, changes in collateral policy by central banks are usually implemented together with extraordinary credit lines that provide cheap funding to banks, making it hard to quantify their effects separately. Although both policies are complementary and have the objective of fostering bank access to funding, they are aimed at mitigating different risks, namely the scarcity of good collateral in the first case and a dry-up in bank funding in the second. As such, they work through different channels, which are difficult to isolate when both types of policy operate in tandem. Moreover, it is difficult in general to find settings that provide the exogenous variation required to assess the effects of the interaction of changes in collateral eligibility with other policies, such as capital requirements. Finally, assessing how changes in banks' incentives to hold liquid assets affect credit supply through the interaction with capital constraints requires detailed data at the loan-level, balance sheet level information, bank regulatory compliance information, and information on the types of collateral pledged by banks when using extraordinary credit lines with the central bank.

The setting of our paper allows us to overcome these difficulties. We use several data sets, both public and confidential, including the excellent Chilean credit registry that covers the universe of bank loans and has information on both outstanding debt and credit conditions of new loans. Our data also include bank use of credit lines with the central bank and the type of collateral pledged for those operations, and balance sheet information with Basel III compliance for all banks in Chile. We combine banking information with that of firm characteristics, such as sales and employment, by a unique identifier. Moreover, because we analyze a contraction in collateral eligibility, rather than an expansion, we can construct an ex ante measure of liquidity constraints for each bank. This measure is free of cheap funding demand, as the extraordinary credit line associated with changes in collateral could not be used for new loans at the moment of the contraction in collateral eligibility, that is, the complementary funding policy was over at the moment of the policy change. Finally, in order to disentangle the different mechanisms by which changes in collateral eligibility operate, we are able to compare the behavior of banks when they anticipate changes in capital constraints and when they do not.

We proceed in several steps. We start by assessing whether in our setting credit supply is affected through the asset-specific channel, by which banks would reduce the production of commercial loans eligible as collateral before the policy change, relative to always ineligible loans. To do this, we follow the existing literature and exploit the fact that the CBC imposed a maximum credit risk threshold for firms whose loans were eligible as collateral; therefore, we compare loans of just eligible firms to those of just ineligible firms. Because in our case banks could not use the cheap credit line to increase the issuance of new loans, we do not expect this channel to be significative, which is confirmed by our results. Thus, it is unlikely that the results we find at the balance sheet level come from this channel.

In principle, it is not obvious why the effects on credit supply of a policy change that targets the composition of the asset side of banks' balance sheet would depend on bank capital constraints. Thus, our next step is to discuss the link between bank capital surplus, which is defined as the capital in excess of regulatory requirements and has been used in the literature as a measure of bank capital constraints (Couaillier, Lo Duca, Reghezza and Rodriguez D'acri (2024)), and the composition of bank assets. We show that capital requirements, changes in leverage and changes in asset risk have a similar impact on bank capital surplus. Therefore, to the extent that changes in collateral eligibility induce changes in leverage or asset risk, and capital constraints are binding, they interact with them to determine the liquidity and size of the balance sheet, which, in turn, determine the final effect on credit supply. Therefore, changes in collateral eligibility should impact credit supply by affecting banks' balance sheet only to the extent that both bank liquidity and capital constraints are binding.

Next, we provide bank-level evidence of how banks adjusted their capital surpluses along changes in leverage and risk taking around the policy change. The evidence supports the mechanism we hypothesize. Although all Chilean banks were well capitalized before, during and after the pandemic, showing large capital surpluses, around half of the banks in our sample behave as being capital constrained in the sense that they "defend" their levels of capital surplus while the rest of the banks, with larger surpluses, are willing to use them when expected increases in capital requirements become effective. Moreover, less capitalized banks that try to maintain the level of their capital surplus do not increase their leverage in response to policy changes as much as other banks do. Finally, we show that the relative decrease in leverage is due to the fact that these banks try to accumulate capital earnings faster than the growth of their assets. In sum, leverage, assets, and credit grow slower in less capitalized banks after changes in collateral eligibility.

We then turn to the identification of the main results in our paper. To test whether changes in collateral eligibility affect credit supply through capital constraints, we run a diff in diff type of regression of credit growth at the loan-level on capital surplus and our measure of demand for liquid assets. If the reduction in collateral eligibility did not affect credit supply through bank liquidity or capital constraints, we should expect a zero effect of these regressors. On the other hand, if the mechanism we hypothesize is relevant, we should expect a positive effect on the capital surplus coefficient and a negative effect on the liquidity coefficient.

We face several challenges in identifying these coefficients. The first challenge are unobserved demand shocks that affect banks heterogeneously and that can be potentially correlated with bank capital surplus and demand for liquid assets. As is standard in the literature, we deal with them with the method pioneered by Khwaja and Mian (2008), so we run our main regressions in the sample of multi-bank firms. The second challenge and main identification threat is the potential past and current correlation with other policies affecting credit supply through bank capital constraints. Specifically, the capital surplus of banks before the announcement of the policy could capture the effect of the additional capital requirements of the Basel III implementation schedule on credit supply that occurred two months later, even if they were completely anticipated by banks. Using an event-study specification, we show that there are no anticipation effects, therefore, banks did not change their credit supply differentially due to expected increases in capital requirements. Instead, as we show with our bank-level data, they adjusted by increasing their capital levels, mostly with capital injections and accumulation of retained profits. The last identification challenge is not related to the causal interpretation of our estimates as capturing the effects of the policy change on credit supply, but to the interpretation of the estimate of capital surplus as capturing capital constraints separately from liquidity constraints. To that end, we show that the capital surplus is actually independent of other bank-level controls, in particular the measure of demand for liquid assets.

The dynamic effects we estimate show that, after the reduction in collateral eligibility, credit grew faster in banks less capital-constrained at the loan level. One standard deviation in capital surplus is associated with 1.25 percentage points of credit growth six months after the announcement of the policy. If we translate these estimates into an increase in capital requirements, a well-studied policy in the literature, we would get a 1pp effect on credit growth for a 1% increase in capital requirements, an estimate somewhat lower than what other studies have found for other countries. However, our estimates increase significantly after the announcement of the activation of the CCyB. The combined impact of changes in collateral policy and the unexpected increase in capital requirements leads to an increase in credit growth of 3.9% for one standard deviation of the capital surplus measured before changes in collateral eligibility.

Interestingly, we find no effects on credit supply at the aggregate level within our sample, when we run the same specification weighted by loan size. By showing the heterogeneous impact on firms of different size and level of riskiness, we show that more capital constrained banks reacted to both policies changes by shifting lending towards larger and less risky firms, which explains the null effect on aggregate credit supply and is consistent with a diminished risk taking capacity of banks with lower capital relative to other banks. Moreover, in additional regressions that include single-bank firms, we confirm that they suffered a larger impact on credit growth relative to multi-bank firms, beyond substitution between lender effects, which supports our explanation of why we do not observe effects at the aggregate level.

Finally, we assess whether changes in collateral, and later, the activation of the CCyB had an impact on the interest rates, maturity, and size of new loans. Because in our setting, relative changes in credit conditions for new loans, particularly for the interest rate, are likely to reflect relative changes in banks' funding conditions due to the policy changes, these estimates provide additional information on the mechanism that links changes in bank liquidity and capital constraints. We find that better capitalized banks charged lower interest rates and offered larger maturities in new loans, which suggests that these banks faced lower rates in deposit markets after changes in collateral policy. That is, this evidence suggests that more affected banks increased their demand for deposits relatively more, which might have increased their funding costs relative to other banks. Further, this evidence is consistent with the idea of increased leverage in more affected banks due to the requirement to hold more liquid assets.

Our main contribution is to the literature studying the effects of policies that affect collateral requirements for central bank financing operations on credit supply. We complement the existing empirical literature, mainly focused on the supply of newly eligible loans (Van Bekkum et al. (2017), Mésonnier et al. (2022),Cahn et al. (2024)), by showing that these policies can have sizable effects on credit supply measured at the balance sheet level and through a different channel, when bank capital constraints bind. In particular, by isolating the balance sheet channel, we show that changes in collateral eligibility might affect banks' incentives to hold liquid assets relative to loans even when there is no effect in the production of eligible versus ineligible loans. Our study also contributes to this literature by providing empirical evidence on how reductions in collateral eligibility impact bank behavior. Unlike previous studies that focus on expansions of collateral eligibility during times of distress, we analyze the effects of a contraction in eligibility during a period of normalization, highlighting the state-dependent nature of these policies.

Our second contribution is to the literature on how the interaction between bank liquidity and capital constraints affects credit supply. While existing studies analyze how the incentives to hold different types of assets affect bank credit supply (Rodnyansky and Darmouni (2017), Albertazzi, Becker and Boucinha (2021)), and there is extensive literature on how bank capital affects credit supply, there is limited empirical evidence on how constraints on bank asset liquidity interact with bank capital constraints to affect credit supply. Peydró et al. (2021) study monetary policy transmission via banks during crisis and normal times. They show that, during crisis times, less capitalized banks react to higher central bank liquidity by substituting lending with more security holdings to repair their balance sheets. In normal times, however, security holdings do not crowd out lending for less capitalized banks. In line with these results, our findings suggest that constraints on the liquidity of banks' balance sheets can have a sizable impact on credit supply only if capital constraints are binding. Conversely, more restrictive capital constraints can significantly impact credit supply only if minimum holdings of liquid assets are binding. Overall, our findings provide new insights into the balance sheet management of banks.

Finally, our results have important policy implications for the design and implementation of credit support exit strategies. First, due to the state-dependent nature of the effects that changes in collateral eligibility have on credit supply, exit strategies from credit support measures should consider a gradual implementation, ideally when bank capital constraints are less binding. Second, bank regulations that impose minimum holdings of liquid assets are likely to affect capital constraints and vice versa. This interaction will impact both loan and deposit markets. Our evidence suggests that the contraction in collateral eligibility prompted banks with more capital constraints to increase their funding on deposits at higher rates, which translated into higher commercial loan rates. Third, although not central to our story, we show that additional capital requirements might not affect credit supply when they are anticipated by banks and gradually implemented over time. In our setting, this was likely the case with the additional capital requirements under Basel III. Finally, our study adds to the limited empirical evidence on the effects of collateral and capital policies in emerging markets. Using detailed loan-level and balance sheet data from Chile, we provide robust evidence on the mechanisms through which these policies affect bank lending behavior.

The rest of the paper is organized as follows. Section 2 presents a short description of our data set. Section 3 describes the institutional framework and the policy changes in detail. Section 4 discusses conceptually how the interaction between bank liquidity and capital constraints might affect credit supply. Section 5 describes our empirical strategy to estimate the causal effects of these policies and discusses our main results. Finally, Section 6 concludes.

2 Data

2.1 Sources and variables definitions

This paper uses several data sets, both public and confidential. Public data are financial statements and capital requirements of the banking sector of the Financial Market Commission (CMF). Confidential data correspond to administrative records of the credit registry and unemployment insurance, and collateral information for the FCIC credit lines. Administrative records cover the universe of bank loans and firms in Chile.[1] We link this information through a unique number, an anonymous version of the *Rol Único Tributario, RUT*, which every firm and individual in Chile is assigned once for tax purposes. The analysis period covers January 2022 to August 2024.[3]

2.1.1 Credit registry

Our main data source is the excellent Chilean credit registry, maintained by the Financial Market Commission. We use the C11 form from the Manual de Sistema de Deudores, which contains the amount of outstanding

[1]Aditionally, an important feature of the Chilean financial market is that most of the firms in Chile depend exclusively on bank credit, therefore, we cover the full amount of debt for most firms in Chile.[2]

[3]Mandatory disclaimer: this study was developed within the scope of the research agenda conducted by the Central Bank of Chile (CBC) in economic and financial affairs of its competence. The CBC has access to anonymized information from various public and private entities, by virtue of collaboration agreements signed with these institutions. Officials of the Central Bank of Chile processed the disaggregated data. All the analysis was implemented by the authors and did not involve nor compromise the Financial Markets Commission.

debt, including all types of loans such as credit lines and loans in installments, at the firm-bank level at the monthly frequency. This form also contains information on the delinquency status and, more important, the risk assessment the bank has on each client. Chilean regulation requires banks to classify firms into individual and group portfolios, depending on whether the firm's credit risk is evaluated individually or not, according to the bank's internal models. Firms in the individual portfolio are classified into 10 risk categories that reflect the probability of repayment. For all firms, including those in the group portfolio, the bank constitutes a credit risk provision, which reflects the expected loss on the client, considering the probability of repayment and other factors, such as guarantees and pledged collateral. We use this information to construct a measure of perceived credit risk at the firm level, at the monthly frequency, which corresponds to the fraction of provisions over total outstanding debt.

We complement this information with the D32 form, which contains detailed information on all new loans from the banking sector at the transaction level, excluding contingent loans such as credit lines. Variables include the borrower, bank, time, type of loan, currency, indexation, use of funds by the borrower, and the conditions of each loan (interest rate, maturity, and amount).

2.1.2 Bank-level information and levels of capital surplus

We use banks' balance sheet records from the MB2 form from the CMF to construct bank-level variables. This form contains the individual balance sheet at the monthly frequency. We construct the level of capital surpluses from public information on capital requirements and compliance available for all banks at the monthly frequency on the CMF's website. Because banks are subject to several regulatory regimes (risk-weighted capital and leverage requirements), in our regressions, we use three different measures of the level of capital surplus (in pesos), defined as follows:

$$HT = PE - RPE - MINREQ - COLCH \tag{1}$$

$$HCB = CET1 - RCET1 - MINREQ - COLCH$$

Our main measure is HT and corresponds to the total capital surplus. PE is common equity tier 1 capital (CET1) plus additional tier 1 capital (AT1) plus tier 2 capital (T2). RPE is the effective capital requirement, $MINREQ$ the minimum systemic and supervisory charge requirements, and $COLCH$ are the conservation buffer and CCyB requirements. The second measure of capital surplus is HCB, which corresponds to the core capital surplus, where $RCET1$ is the minimum requirement of CET1. Based on this last surplus, we construct a third measure of capital surplus, which we call available capital surplus (HD), by subtracting the unmet capital requirements by the tier 1 and tier 2 capital requirements.

2.1.3 Firm characteristics

We identify firms using the Central Bank of Chile's (CBC) directory, which consists of a list of firms at the annual frequency. The directory includes the firm's industry classification for 111 industries and four categories of annual sales.

The unemployment insurance data contains the universe of employer-employee relationships for salaried workers in the private sector at the monthly frequency. We aggregate the data at the firm-month level to construct measures of employment and wage bill. This data set also contains the county in which the employer is located.

We combine CBC and unemployment insurance information to construct industry size-location-time (ILST) fixed effects, which we use to control for firm-level credit demand shocks in firms with a single bank relationship, as in Degryse, De Jonghe, Sanja, Mulier and Schepens (2019). We also employ this type of fixed effects in regressions on loan conditions in multi bank firms, as it is usual for firms to have less than two new loans (of those in the D32 form) in the same month. For the size category, we use deciles of employment, while for the location, we use the county.[4] Finally, for all firms we have publicly available information of annual sales from the Chilean IRS. This variable corresponds to 13 categories of sales.

[4] There are 346 counties in Chile.

2.2 Sample construction

Our sample considers all banks established in Chile, with the exception of two banks that have capital buffers well above the rest during the analysis period, and two small banks that specialize in consumption loans, which makes a total of 10 banks.

As is standard in the literature we focus on non-financial firms and drop those with no formal employment. In the base period (November 2022), the sample contains 174,785 debtors, of which around a third had at least two banking relationships. Table 1 contains the definitions and summary statistics of the variables used in the paper.

3 Institutional background

3.1 Measures to support bank lending during Covid-19

Chile has a highly developed financial system (IMF (2021)) similar to those of developed economies. Although capital markets are highly active, banks dominate the credit provision for non-financial firms, and most of them completely depend on them as a source of external funding. In addition, banks' business model is traditional in the sense that they make and hold loans, relying on deposits as their main source of funding.

Considering the importance of banks, the provision of credit through the banking system was a top priority for the CBC and the government at the time of the pandemic. These institutions coordinated in the implementation of several policies to support bank lending. In March 2020, the government announced an immediate and large expansion of FOGAPE (*Fondo de Garantía para Pequeños Empresarios* for its name in Spanish), the main partial credit guarantees program in Chile, which provided insurance to banks for new loans to SMEs that ranged between 30% and 80% of the amount of the loan, depending on the size of the firm. The expansion of the program was so large (up to USD 33 billion in guarantees, equivalent to 10% of the Chilean GDP), that the program met the whole demand for new credit.[5].

To complement the expansion of FOGAPE, the CBC focused on providing cheap funding to banks and implemented the FCIC program (*Facilidad de Crédito Condicional al Incremento de las Colocaciones* for its name in Spanish). The FCIC was a lending facility for banks at the monetary policy rate (which was in its lower bound at the time, 0.5%) conditional on the increase of commercial lending to SMEs that could be repaid four years later.[6]

In addition to the low rate, this extraordinary credit line had another feature that made it easily available to banks. Normally, the CBC only accepts a few low-risk financial instruments as collateral in its open-market operations with banks. These instruments, which we will refer to as SOMA instruments, include sovereign bonds, time deposits, CBC short-term bonds, bank bonds, corporate bonds, commercial papers, and securitized bonds.[7] However, the FCIC program significantly expanded the scope of eligible collateral and included other types of assets, notably, it included banks' own commercial loans for firms classified in the A1 to A6 categories of credit risk. [8] For firms in most risky categories A5 and A6, the CBC required that the loan was guaranteed by the government, that is, by FOGAPE. At the time the FCIC was implemented, most of these new guarantees corresponded to loans issued during Covid-19, backed up by FOGAPE, however, banks could replace them with new loans later on. Thus, the FCIC was very attractive to banks and was heavily used, reaching USD 30.6 billion, approximately 9. 7% of GDP. Figure 1, shows that the amount used by the median bank was almost 7% of their assets, and for the average bank this number was around 5%.

In addition to the Government and CBC's policies, the CMF postponed additional capital requirements for banks in the context of the implementation of the Basel III accord that could have incentivized them to

[5]See Mullins and Toro (2018) for a detailed description of FOGAPE during normal times and De Elejalde, Sánchez and Toro (2024) for details of changes in the program during Covid-19.

[6]See García (2021) for a complete review of the measures taken in Chile to support the financial system during the pandemic.

[7]Open market operations with banks occur through an electronic system operated and administrated by the CBC. Its name in Spanish is Sistema de Operaciones de Mercado Abierto (SOMA).

[8]In opposition to SOMA instruments, which are traded in secondary markets and therefore have a market price and external risk classification, commercial loans are usually kept in the bank balance sheet, so they do not have a market price and their risk classification is made by the bank, according to its internal models and the regulatory framework.

cut lending during the pandemic. In March 2020, the CMF announced the new implementation schedule of Basel III, which among other measures, considered a gradual increase of the capital conservation buffer (CCoB) and additional capital requirements for systemically important banks. Starting in December 2021, capital requirements would increase for all banks on December of each year by 0.625%, 05%, 0.75% and 0.625% of the bank's risk-weighted assets until reaching 2,5%, the CCoB's long run level. For systemically important banks, 25% of the additional capital requirement had to be met by December 2022, 50% by December 2023, 75% by 2024 and a 100% by December 2025. In December 2022 the CMF, with the agreement of the CBC, considered six banks as systematically important and had set additional capital requirements in the range between 1 and 1.75% of each bank's risk-weighted assets.

3.2 Exit policies: collateral eligibility and the CCyB

Together, these policies succeeded in incentivizing bank lending during the pandemic, particularly to SME's. In turn, after the emergency had passed, the FCIC had to be repaid in the context of increasing capital requirements due to the postponement of the implementation of Basel III.[9] Moreover, the CBC had not yet activated the CCyB, which, in accordance with the Basel III agreement, can encourage capital accumulation by banks that can be used to support lending during systemic stress scenarios.[10]

In November 2022, in preparation for the FCIC repayment date, scheduled for March 2024, the CBC unexpectedly announced the start of a collateral standardization program for the FCIC, which established a gradual replacement of commercial loans pledged as collateral by the usual SOMA instruments.[11] This replacement had to be done at a rate of 1/18 of the stock of commercial loans each month until total replacement. Details of the program were announced in December 2022, and the start of the normalization process was set to January 26 2023. Because an early repayment of the FCIC would have been unprofitable for banks due to its very low cost, this announcement, in practice, meant that banks needed to hold more SOMA instruments relative to commercial loans in their balance sheets.

Finally, six months after the change in collateral eligibility for the FCIC, on 23 May 2022, the CBC unexpectedly announced the activation of the CCyB for the first time at a level of 0.5%, effective one year later, on June 2023. This meant increasing non-systemic bank common equity requirements from 10.5% to 11%.

4 Conceptual framework: collateral eligibility and credit supply

Changes in collateral eligibility can affect credit supply through two different channels. First, by tightening or loosening liquidity constraints at the bank level, that is, by changing banks' optimal holdings of liquid assets in their balance sheet. For a given size of the balance sheet, increasing holdings of liquid and safe assets such as government bonds will negatively affect credit supply, as there will be less room for these assets. Accordingly, the effects on credit supply through this balance sheet channel should be measured across banks. Here, when we think about bank liquidity, we distinguish this channel from that of changes in bank's funding costs, which are usually tied together, as the expansions in collateral eligibility are the complement of policies aimed at providing cheap funding for banks during times of distress.[12]

Second, the effects of changes in collateral eligibility can be asset-specific if they affect the demand of newly eligible or ineligible assets, which, in equilibrium, may affect their price and supply. The effect on credit supply through this channel has been studied in the context of a relaxation in the collateral eligibility criteria of the European Central Bank in 2011 by Cahn et al. (2024) and Mésonnier et al. (2022) for the case of France and by Van Bekkum et al. (2017) for the Netherlands. We refer to this channel as the asset-eligibility channel.

[9] Importantly, all Chilean banks were well capitalized at the moment, as shown by their capital surpluses levels in Table 1, and their profitability experienced an extraordinary surge in 2022, primarily due to a spike in the inflation rate (Financial Stability Report Second Half 2022).

[10] In Chile, the CCyB is an additional capital requirement in the form of common equity within the range of 0 and 2.5% of the bank's risk-weighted assets. As in the case of other "soft" capital requirements, such as the CCoB, its violation triggers restrictions on dividend distribution.

[11] Central Bank reports adjustments in financial operations.

[12] Carpinelli and Crosignani (2021) and Crosignani et al. (2020) study the combined effect of these two types of police during the funding dry up that hit European banks in 2012.

We start this section by briefly assessing whether the change in eligibility that forced Chilean banks to gradually substitute commercial loans by SOMA instruments as collateral for the FCIC had an effect on credit supply through the asset-eligibility channel. Next, we move to the analysis of the balance sheet channel and its interaction with bank capital constraints, the main focus of this paper.

4.1 The asset-eligibility channel

Due to the gradual implementation of changes in collateral eligibility in Chile and the fact that banks could not expand their use of the FCIC with new loans in 2022, we do not expect the asset-eligibility channel to work in our case. In fact, because banks were able to replace pledged loans on a rolling basis, any initial effect on the demand for newly eligible commercial loans should have vanished when the FCIC stopped being a funding source for new loans. We still assess whether this channel is at work in our case because if it is not, we would expect differences in the cross section of banks to come only from the balance sheet channel and its interaction with bank capital constraints.

In examining the existence of an asset-eligibility channel, we follow Cahn et al. (2024) and Mésonnier et al. (2022) and adopt a similar empirical design. To do so, we exploit the fact that not all commercial loans were eligible as collateral for FCIC: only those of firms with credit risk categories between A1 and A6 could be pledged as collateral.[13] Furthermore, loans of firms in the categories A5 and A6 were eligible only if they were guaranteed by FOGAPE. In practice, at the moment of the policy change in 2022, the Covid-FOGAPE program was over; therefore, approximately only 1% of the collateral for FCIC corresponded to loans from firms in categories A5 and A6.

Identifying asset-specific effects relies on comparing the outstanding loans of just eligible firms to those of just ineligible firms. Because after the policy change in 2022 all loans pledged as collateral for the FCIC had to be replaced by SOMA instruments, we compare the outstanding commercial credit of firms in the A4 category to those in the A5 category before and after the policy change using the following event-study specification:[14]

$$logC_{ibt} = ILST_{it} + \alpha_{bt} + \delta_{ib} + \sum_{s\in\{-6,\ldots,0,\ldots,6\}} \gamma_s Treat^{Nov22}_{i,t-s} + \varepsilon_{ibt} \text{ (within bank)} \quad (2)$$

where our dependent variable is the logarithm of the credit stock of firm i from bank b at month t. $Treat^{Nov22}_{i,t-s}$, the regressors of interest, take the value 1 if the firm i was in the A4 risk category in November 2022 and $s = t$ - November 2022, and 0 otherwise. $ILST_{it}$ is an industry-location-size-month fixed effect, whose good performance in controlling for unobserved demand shocks potentially correlated with the error term we confirm in Section 5.1 for the sample of multi-bank firms. α_{bt} is a bank-month fixed effects that controls for observed and unobserved liquidity and funding shocks, that is, we compare changes in credit supply to firms in very close but different risk categories within the bank's balance sheet. Thus, our estimates are not affected by any endogeneity stemming from non-random firm-bank matching. Finally, we include a firm-bank fixed effect δ_{ib}, which controls for shocks specific to the banking relationship that could be correlated with the error term. We cluster standard errors at the firm level.

Figure 2 shows the plot of the γ_s estimated from Equation 2 and their confidence intervals at 95% confidence. For estimates prior to the policy change and also for those afterward, there is no significant effect. Therefore, the credit supply did not change for firms that were not eligible in practice as collateral for the FCIC (A5) compared to those that in practice were eligible, after the policy change in 2022.[15]

This result confirms our expectations and suggests that changes in credit supply due to the change in collateral eligibility did not occur through an asset-eligibility channel. Thus, any effect we find when comparing changes in credit supply across banks should be explained by the balance sheet channel of collateral eligibility, that is, by differences in liquidity constraints across banks and their interaction with capital constraints. Next, we turn to a conceptual discussion of this channel.

[13] While risk categories and the procedures to classify firms into them are defined by the CMF, each bank defines the category for its clients.

[14] Comparing firms in A6 category to those in the next riskier category, B1, which were never eligible, yields similar results.

[15] In line with these results, we did not find effects on the interest rate of new loans using a similar empirical approach.

4.2 The balance sheet channel and capital constrains

How do changes in collateral eligibility affect credit supply beyond changes in demand for affected assets? Expansions in collateral eligibility during crises times are meant to alleviate bank liquidity constraints (Carpinelli and Crosignani (2021)). Accepting riskier collateral, such as banks' own commercial loans, allows banks to hold less safe assets in their balance sheets, giving them room to expand (or reduce less) their lending activity. This mechanism is related to the effect of securitization on credit supply (Loutskina and Strahan (2009), Loutskina (2011)), therefore, it should be particularly important when newly eligible assets are not easily securitizable, such as commercial loans. Banks that are more liquidity constrained should benefit more from expansions in collateral eligibility and increase their credit supply relatively more.

Because we analyze an exit rather than an enter policy, an advantage of our setting relative to the existing literature is that we have an observable measure of liquidity needs at the bank level at moment of the policy change. In fact, the relative use of this facility before the policy change should reflect differences in banks' valuations of liquidity, net of their opportunity cost. Valuations for liquidity facilities may vary depending on facts such as external shocks in the deposit market, investment opportunities or business models. For example, during the pandemic, some Chilean banks experienced massive deposits inflows as a result of a law that allowed withdrawals of pension funds, which represented approximately 20% of GDP (Cerletti, Cortina, Inzunza, Martínez and Toro (2024)). These factors can also affect the opportunity costs of pledging commercial loans as collateral (Mésonnier et al. (2022)). For example, a bank specialized in lending to small firms that has a larger number of small loans in its portfolio would face higher legal and operational costs of pledging these loans as collateral, relative to a bank that has fewer but very large loans.

Therefore, we expect banks with a larger fraction of their commercial loans pledged as collateral for the FCIC over their total loans to be more negatively affected by the policy change. Consequently, their commercial lending should grow less relative to less affected banks after the policy change. Because we observe each bank's use of the FCIC and the type of collateral pledged, we can measure the exposure of each bank to the policy change at the balance sheet level.

Moreover, we hypothesize that, if bank capital constraints are binding, contractions in collateral eligibility should affect credit supply by reinforcing the liquidity constraints effect. Because reducing commercial loans in favor of more liquid assets is highly unprofitable for banks, they have the incentive to increase their holdings of liquid assets by expanding their balance sheets. Because bank capital is costly to adjust in the short run, banks that face binding capital constraints will not be able to expand their balance sheet and will be forced to substitute a larger fraction of their commercial loans with liquid assets, reducing their credit supply relatively more.

To be more clear about this mechanism, consider a bank's capital surplus, an observable measure of capital constraints.[16] Let η_{bt} be the capital surplus, that is, the amount of capital in excess of the minimum requirements of bank b at time t, normalized by its capital amount C_{bt}:[17]

$$\eta_{bt} = 1 - \frac{\kappa_{bt} \sum_k \bar{w}_k a_{kbt}}{C_{bt}} \tag{3}$$

where κ_{bt} is the minimum capital requirement for bank b at time t, including basic capital, conservation buffer, CCyB, and systemic charges, which can vary in time and at the bank-level. k denotes an asset type classified according to its risk and $\bar{w}_k$ is the specific regulatory risk weight for that asset type, a_{kbt} is the bank's amount of exposure to asset type k.[18] Thus, η_{bt} can be written as function of the minimum capital requirement,

[16] Capital surplus is defined as a bank's amount of capital in excess of its regulatory requirement. Banks usually have capital surpluses, which can be very high, although there is great heterogeneity within and between countries (De Jonghe and Özde Öztekin (2015)). Arguably, a precise measure of capital constraints would be a bank's capital in excess of its internal capital target, which is not usually observed. However, because capital targets depend positively on capital requirements (Berger, DeYoung, Flannery, Lee and Öztekin (2008), Couaillier (2021), Bakkar, De Jonghe and Tarazi (2023)), both measures of capital constraints are likely to be highly correlated. In fact, banks with lower capital surpluses, calculated with respect to minimum regulatory requirements, behave as being capital constrained during times of distress (Couaillier et al. (2024)).

[17] We note that $H_{bt} = \eta_{bt} \frac{\sum_k \bar{w}_k a_{kbt}}{C_{bt}}$ is the usual definition of capital surplus for regulatory purposes. In this paper, we use the measure η_{bt} because we find its decomposition easier to interpret. However, all our results are valid when using H_{bt} instead.

[18] For regulatory purposes, the exposure to an asset is usually defined as the amount of the asset after deducting guarantees.

a measure of the bank's leverage, and the risk weighted assets (RWA) density, a measure of riskiness of its assets:[19]

$$\eta_{bt} = 1 - \underbrace{\kappa_{bt}}_{\text{Capital requirement}} \underbrace{\frac{A_{bt}}{C_{bt}}}_{\text{Leverage}} \underbrace{\sum_k \bar{w}_k \omega_{kbt}}_{\text{Risk}} \tag{4}$$

where $A_{bt} = \sum_i a_{kbt}$ is the total amount of exposure on the asset side, usually called total regulatory assets by regulators, and $\omega_{kbt} = \frac{a_{kbt}}{A_{bt}}$ are the shares of exposures for each risk category. Importantly, in Chile, all terms in Equation 4 are calculated monthly by the CMF and are publicly available on its website. Therefore, for small changes in bank capital requirements, leverage, and risk, changes in η_{bt} can be written as:

$$\Delta\eta_{bt} = \underbrace{(\eta_{bt} - 1)}_{\leq 0}[\Delta^{\%}\kappa_{bt} + \Delta^{\%}Lev_{bt} + \Delta^{\%}Risk_{bt}] \tag{5}$$

Thus, an increase in leverage, caused by an expansion of the balance sheet, tightens the capital constraint, more so for banks facing a tighter constraint, that is, with a lower capital surplus. In contrast, increasing SOMA instruments holdings and reducing commercial lending relaxes the constraint. In our context, we should expect banks with lower η_{bt} before the shock to increase their holdings of SOMA instruments by expanding their commercial lending relatively less (or increasing relatively less their risk exposure) and leveraging relatively less.[20] We test directly this hypothesis in our empirical framework and refer to it as the capital constraints channel of collateral eligibility.

We dub this mechanism the capital constraints channel of collateral eligibility and make some remarks about it. First, the total effect on credit supply might not depend linearly on the degree of liquidity and capital constraints of the bank. Liquidity constraints are required for the existence of the capital constraints channel because in order to have an incentive to lever up banks need not to be able to replace affected collateral with other assets in their balance sheet that have no opportunity cost. Similarly, capital constraints are required for the existence of a liquidity channel, because a bank that can buy new liquid assets at no additional opportunity cost, can completely adjust to the policy change without reducing its credit supply, even if it faces binding liquidity constraints. Moreover, the total effect on credit supply likely depends only on the constraint that is less binding. In this sense, the total effect of the policy change on credit supply can be stated as the minimum between the maximum possible effect of each channel, which corresponds to the effect on credit supply through liquidity (or capital) constraints when increasing leverage (or replacing collateral with liquid in the balance sheet assets) is not possible. As a consequence, the balance sheet channel and the capital constraints channel are relevant by themselves in determining the total effect of contraction in collateral eligibility on credit supply.

Second, the capital constraints channel might also be relevant in expansions in collateral eligibility (the opposite policy). In this case, banks would find it profitable to substitute low-yield safe assets with new risky loans, which would tighten the capital constraint, so the production of these new loans could grow relatively less for constrained banks. This is consistent with the results of Van Bekkum et al. (2017), where the supply of newly collaterizable mortgages increases only in banks that are able to securitize them, thus removing them from the balance sheet and loosening the capital constraint. It is also consistent with the results in Mésonnier et al. (2022), which find that well-capitalized banks reacted more (in terms of lowering the interest rate of collateralizable loans) to a an expansion in collateral eligibility in France.

Third, under the capital constraints channel, the effect of collateral policies can be state dependent. If capital constraints are occasionally binding, a change in collateral eligibility can deliver very different results

[19] In Chile, these risks include credit, market and operational risks, each one evaluated by the CMF.

[20] We note that if a bank increases its holdings of SOMA instruments only by buying sovereign bonds, its η_{bt} does not change, as these instruments have zero regulatory weights, thus, the increase in leverage is completely compensated by a decreased in risk. However, banks can reach for yield more easily by adjusting their liquid rather than their illiquid assets (Myers and Rajan (1998); Acharya and Steffen (2015)) and, under Basel III, they have the incentive to cherry pick on risky but low risk-weighted assets (Acharya, Engle and Pierret (2014)). Thus, Chilean banks had the incentive to substitute commercial loans by other safe assets as collateral for the FCIC, such as deposit (of other banks), which were also exceptionally authorized as eligible collateral. This was indeed the case.

depending on whether the constraints bind, similar to the mechanisms studied for other unconventional policies such as exchange rate interventions (Céspedes, Chang and Velasco (2017)) or capital requirements (Lang and Menno (2023)). This fact has important implications for the optimal timing of collateral policies and rationalizes the expansion in eligibility during downturns and contractions during normal times.

Finally, we emphasize that a contraction in collateral eligibility might have a larger negative impact on banks with lower levels of capital even if they are not capital constrained through a price channel, similar to the liquidity channel. If relatively low levels of capital are the result of higher capital costs in the long run, a contraction in eligibility, such as the one we study, will reduce the return of commercial loans relative to safe assets relatively more for low-capital banks, which will cause their credit supply to grow less afterwards. This is consistent with the mechanism studied in Stulz, Taboada and van Dijk (2022) where the non-complementarity between loans and safe assets induces banks to hold more liquid assets after additional capital requirements. However, in this case, we should expect a moderate effect on credit supply, relative to when capital constraints bind, and banks would not adjust their capital surpluses in reaction to the policy. In the following section, we provide evidence of capital surpluses adjustments in Chilean banks around the policy changes that is consistent with the existence of a capital constraints channel of collateral eligibility.

Regarding the interaction between changes in collateral eligibility and additional capital requirements, according to Equation 4, the effects of an unexpected increase in capital requirements, such as the announcement of the activation of the CCyB in Chile, will directly tighten the capital constraint. The effects of increasing capital requirements on credit supply have been extensively studied. Consistent with the idea of occasionally binding capital constraints, the effects vary with economic conditions and bank characteristics (Fang, Jutrsa, Peria, Presbitero and Ratnovski (2022)). In our context, we expect the announcement of May 2023 to reinforce the effects of changes in collateral eligibility for the FCIC.

4.3 Evidence of capital constraints and bank adjustments of capital surpluses

We start by showing that bank adjustments of capital surpluses and their components according to Equation 4 are consistent with the capital constraint channel of changes in collateral eligibility of the FCIC. For this purpose, we use the public information available on the CMF website.

First, the bank-level evidence suggests that some banks in our sample were close to their minimum target capital levels before the policy change, while others were well above this level, indicating that at least some of these banks were, in this particular sense, capital constrained. Figure 3 shows the values of η for each bank in our sample at the monthly frequency from January 2022 to June 2024. The banks are increasingly sorted according to the value of η in August 2022. All banks in the sample show positive capital surpluses that range between 25% and 55% of their capital throughout the period. However, banks can be divided into two groups, according to the initial value and the evolution of η. The first five banks are those with lower initial capital surpluses ranging between 30% and 40%. These banks roughly maintain their level of η throughout the period, even after the additional capital requirements of the Basel III implementation schedule, which correspond to the sudden drops in η in December 2022 and 2023. To do so, most of these banks received capital injections of similar amounts of the corresponding capital requirement just before it became effective, which confirms that Chilean banks anticipated and prepared for these regulatory changes well in advance. The second group instead has larger initial capital surpluses, in the range of 45% and 50%, which decrease after the additional capital requirements and do not appear to receive capital injections, suggesting that these banks, in contrast to those in the first group, had enough capital surplus so that they could use it as an adjustment margin after changes in collateral eligibility and additional capital requirements.

Second, the group of banks with lower capital surplus before the policy change maintained their levels of η through anticipated capital injections but also by significantly decreasing their leverage. Figure 4 shows the cumulative impact of each component of Equation 5 in the change of η with respect to December 2021, the starting point of our sample. Because in Equation 5 changes in variables are multiplied by a negative number, a positive value of leverage, risk, or capital requirements means that these variables are decreasing. In general, the figure suggests that banks do not manage their capital surplus by changing the average risk of their assets, but rather, by changing their leverage, a measure of the size of their balance sheet. In fact, after the policy change, the first group of five banks actively decreases their leverage, while the rest of the banks show variations around zero, which is consistent with the idea that banks that are more capital constrained face larger frictions in expanding their balance sheet. Regarding the change in collateral eligibility for the FCIC, this means that these banks had to substitute relatively more commercial loans to meet the requirement of SOMA instruments, thus negatively affecting their credit supply relatively more. Moreover, the difference in the leverage component between the two groups of banks is less noticeable before changes in collateral eligibility, even if banks anticipated the additional capital requirement of December 2022, which supports the idea that the unexpected announcement of changes in collateral eligibility for the FCIC tightened the capital constraint of some banks.

Finally, the group of low capital surplus banks decrease their leverage after the policy change by increasing capital from retained earnings faster than their asset accumulation, which further supports the idea that more capital constrained banks faced larger restrictions in expanding their balance sheet. Figure 5 shows the cumulative change in the contribution of leverage to changes in η, log assets, and log capital, with respect to December 2021. In general, in the group of less capital constrained banks, assets and capital grow at the same rate, which maintains their leverage levels. In more constrained banks, instead, capital grows faster than leverage, which, in principle, is also consistent with commercial loans growing relatively slower, compared to less capital constrained banks.

In sum, the balance sheet level evidence suggests that banks with lower capital surplus could not expand their balance sheet in response to the changes in collateral eligibility and additional capital requirements as much as banks with higher capital surplus, which is consistent with the idea that changes in collateral eligibility may affect credit supply not only through the liquidity channel, but also through interactions with banks capital constraints. Next, we provide causal evidence of the effect of changes in collateral eligibility and the activation of the CCyB on credit supply through banks' capital constraints.

5 The capital constraints channel: empirical evidence

5.1 Identification

The fact that capital constraints can directly affect credit supply when collateral eligibility is reduced motives an empirical setting were we assess this effect by running an OLS regression of credit supply growth on a measure of capital constraints. In this setting, we face three challenges for the identification of the mechanism we have described. The first challenge are unobserved demand shocks that affect banks heterogeneously and that can be potentially correlated with banks' capital surplus, our measure of capital constraints and main regressor of interest. As is standard in the literature, to deal with unobserved demand shocks stemming from non-random firm-bank matching, we follow the method pioneered by Khwaja and Mian (2008) and generalized by Amiti and Weinstein (2018), and include a firm fixed effect in loan-level regression of first differences in the sample of firms with more than one banking relationship. For firm-level regressions, where it is not possible to include firm fixed effects, our preferred specification includes industry-location-size-time fixed effect, as proposed by Degryse et al. (2019).

The second and main identification challenge is the potential past and current correlation with other policies affecting credit supply via banks' capital constraints. Specifically, the capital surplus of banks before the announcement of the policy could be capturing the effect of the additional capital requirements of the Basel III implementation schedule on credit supply that occurred two months later, even if they were completely anticipated by banks. Moreover, the identification of these effects requires that our base period measures of capital surplus are not a function of past adjustments in credit supply in anticipation of the additional capital requirements. As we show next, our evidence suggests that banks adjusted to the anticipated capital requirements of Basel III by increasing their capital levels, some times with capital injections as shown in the previous section, without affecting credit supply, which supports our empirical design in the sense that we are correctly capturing the effect of changes in collateral eligibility and not those of other policies.

Although changes in collateral eligibility and the activation of the CCyB were unexpected and therefore it is unlikely that banks could anticipate them, banks could have adjusted their credit supply in anticipation of the implementation of the Basel III. For example, banks could increase their capital surplus by decreasing the supply of credit in the period right before the announcement of the changes in the FCIC program, which would imply that capital surpluses in August 2022, our regressor of interest, could be correlated with past credit growth, as if changes in collateral eligibility were anticipated. More generally, capital surpluses could be a function of past credit growth. In order to assess anticipation effects, we run the following monthly frequency event study specification for the subsample of firms with more than one banking relationship (multi-bank):

$$logC_{ibt} = \alpha_{it} + \delta_{ib} + \sum_{s\in\{-6,\ldots,0,\ldots,18\}} \gamma_s \eta^{Aug22}_{b,t-s} + \varepsilon_{ibt} \text{ (outstanding debt, multi-bank)} \quad (6)$$

where $\eta^{aug22}_{b,t-l}$ is the value of bank b's capital surplus in August 2022 if $s = t$ - August 2022, and 0 otherwise. Although our base period is November 2022, we measure capital surplus in August 2022 because some banks received capital injections between September and November 2022 in anticipation of the Basel III calendar, as shown in Figure 3. However, our results remain unchanged if we instead measure capital surplus in the base period. This is the result of the persistence of η_{bt}, even after capitalization and capital requirements, which, in turn, is consistent with the fact that banks have heterogeneous internal capital targets that depend on common factors, such as regulation, and on idiosyncratic factors, such as business models (Couaillier (2021)).

Our main dependent variable is $logC_{ibt}$, the logarithm of the credit of firm i with bank b in month t. Equation 6 includes a firm-month fixed effect α_{it} and a firm-bank fixed effect δ_{ib}, which control for unobserved time-varying heterogeneity at the firm level, possibly stemming from unobservable credit demand shocks, and for unobserved heterogeneity at the firm-bank level, possibly stemming from the existence of lending relationships. We compute standard errors by clustering at the borrower level.

Figure 6 shows the plot of estimated γ_s from Equation 6 and their confidence intervals at 95%. Estimates are not statistically different from 0 in the months prior to the base period in regressions at the loan level, which rules out anticipation effects in the supply of credit for this sample of firms. This result is consistent with the evolution of capital surpluses around the policy change, shown in Figure 3: banks adjusted to the additional capital requirements of the Basel III calendar by increasing their capital before December 2022, in fact, some banks received capital injections between September and November 2022 of a similar magnitude of the additional capital requirement. Importantly, these injections are usually decided by the bank board well in advance. Moreover, the lack of an anticipation effect on credit supply is also consistent with the fact that during the post-pandemic period Chilean banks exhibited extraordinary profits, mainly due to a spike in the inflation rate (Financial Stability Report Second Half 2022).

Furthermore, the absence of evident additional effects due to additional capital requirements in the context of the Basel III implementation schedule, support our identification strategy. First, in 6 there is no evident additional effect in December 2023, when an additional capital requirement of 0.75% of RWA was due. Second, the fact that the estimated effects on credit supply stabilize in the medium run, before the end of the implementation of Basel III, which considered a final additional capital requirements in December 2024, provides reassuring evidence that banks had already internalized these capital requirements, therefore, they should not affect our estimates. In general, we are confident that this evidence supports a causal interpretation of our estimates in the sense that they correctly capture the effects of unanticipated changes in collateral eligibility and the CCyB.

At this point, it is worth highlighting that, because changes in collateral eligibility of the FCIC had an effect on credit supply, we cannot separately identify the effect of the announcement of activation of the CCyB in May 2023 on credit supply. Thus, we argue that our estimates correctly capture the causal effects of collateral eligibility in the 6 months after the announcement of the policy, and, after that period, our estimates capture the joint effect of both policy changes. Because we expect the credit supply of banks with higher capital surplus to be less affected by both policy changes, our estimates after the activation of the CCyB represent an upper bound of the effect that each policy would have had individually. Figure 6 supports the interpretation that both policies have similar effects in the supply of commercial loans, as the positive effect of capital surplus becomes stronger in the second semester of 2023, right after the announcement of the activation of the CCyB, effective on May 2024.

Also, going back to the first identification challenge, we use Equation 6 to perform a heuristic test of the performance of the ILST fixed effect in controlling for unobserved demand shocks potentially correlated with our capital surplus measures. To do this, we replace the α_{it} fixed effect by the ILST fixed effect and compare the estimated γ_s. Figure 7 shows the estimates using the ILST fixed effect. In general, the are very similar to those of Equation 6, and in fact, yield the same results of no anticipation effects and positive effects in the post period. Thus, the ISLT fixed effect seems to control much of the unobserved heterogeneity in firms' demand for credit for the multi-bank sample, and so, in principle, we expect it to perform well in the single-bank sample.

Finally, the third identification challenge is not related to the causal interpretation of our estimates but to the interpretation of the estimate of capital surplus as a separate channel from the liquidity channel of collateral eligibility. In order to do so, we need the capital surplus to be independent from other bank-level controls, in particular to the regressor that captures the effects through the liquidity channel (each bank's fraction of commercial loans pledge as collateral for the FCIC over total loans). In the following section, we show that the estimates on capital surplus are in practice invariant to including bank-level controls in our specifications.

5.2 Loan-level effects (balance sheet channel)

Having shown the absence of anticipation effects, we now turn to the assessment of the effect of changes in collateral eligibility and the activation of the CCyB on credit supply. To this end, we run cross-section regressions, which corresponds to the first differentiated counterpart of the panel specification in Equation 6. We differentiate the outcome variable with respect to the base period and run several regressions to assess the effect of the policies over time, one for each month after changes in collateral eligibility. In this way, we assess the dynamic impact of changes in collateral eligibility in regressions up to month 6 after the announcement of the policy, and the effect of changes in collateral eligibility and the activation of the CCyB from months 7 to 18. Moreover, the specification in cross sections allows for different samples over time to account for attrition effects and to accommodate intensive and extensive margin effects in a simpler manner.

Under the assumption that credit demand is homogeneous across banks, and that bank shocks are propagated equally to all connected firms, the methodology proposed by Khwaja and Mian (2008) identifies the causal effects on the credit supply using the following cross-sectional regression at the firm-bank level in the sample of companies that have debt with at least two banks in a given period:[21]

$$GC_{ib}^{h} = \alpha_i^h + \beta^h \ \eta_b^{Aug22} + X_b^{Aug22} \ \Lambda^h + \varepsilon_{ib}^h \tag{7}$$

where i denotes a company, b a bank, and h are the months since the base period, $t =$ November 2022. The dependent variable is the credit growth between the base period and h months later. This variable is measured in different ways, depending on whether or not we want to consider effects on the extensive margin, which in this case corresponds to the disappearance of debtor-bank relationships.[22] α_i^h is a firm fixed effect, which captures all demand shocks, observed or not, that occur between November 2022 and h months later. η_b^{Aug22} corresponds to the capital surplus level of bank b in August 2022 and X_b^{Aug22} is a set of controls at the bank level as of August 2022, that is, prior to the announcement of the changes in collateral requirements for the FCIC. This set of controls includes the logarithm of loans, the fraction of commercial loans with respect to their total, the credit growth rate at the bank level a year before and the percentage of loans pledged for the FCIC over the total loans. ε_{ib}^h is an error with mean 0. Finally, all standard errors are clustered at the debtor level.

The parameter of interest is β^h, which is interpreted as the effect that an additional capital surplus of 1% has on GC_{ib}^h, that is, the cumulative effect of the capital surplus on credit growth over a period of h months. When the regression in Equation 7 does not consider weights, then β^h corresponds to the effect at the credit level. If, on the other hand, we weight the observations by the amount of credit in the previous period, β^h

[21] Villacorta, Villacorta and Gutierrez (2023) propose a bank-group within this framework that relaxes this assumption.

[22] In particular, we measure credit growth with a second-order approximation around 0, which is bounded between -2 and 2:

$$GC_{ibt+h} = 2(C_{ibt+h} - \ C_{ibt})/(C_{ibt+h} + \ C_{ibt})$$

To estimate effects in the intensive margin we exclude observations with values 2 or -2, while the extensive margin considers exits, that is, values of the variable equal to -2. In a robustness exercise, available upon request, we approximate the credit growth rate with differences in logarithms and the same + 1 for the case of outflows. This transformation of the dependent variable yields similar results but larger estimates.

corresponds to the effect at the aggregate level.[23]

Table 2 shows the estimates of our baseline specification that do not consider extensive margin effects. We show cumulative effects over time, where $h = 6$ months corresponds to May 2023, the last month in which we can measure the pure effect of changes in collateral eligibility. For each period, we present the estimates of two different specifications. The first specification does not include controls, while the second includes baseline bank-level controls. Finally, the first row presents the estimates of the capital surplus, which captures effects on credit through the capital constraints channel, and the following row presents the estimates of the fractions of commercial loans pledged as collateral for the FCIC over total loans, which captures effects through the liquidity channel.

According to Table 2, in our baseline specification, an additional 1% capital surplus in August 2022 caused credit to grow 0.16% faster six months after the announcement of the policy change (or 4 months after the policy became effective). In our sample, this effect is equivalent to 1.25% of additional credit growth for 1 additional standard deviation of capital surplus. Although not directly comparable, the magnitude of this effect is moderate relative to what other studies find for increasing capital requirements, a different policy, but that can be compared using Equation 5. In our sample, an additional requirement of 1% capital over RWA translates into an increase of approximately 10% in κ_{bt} of Equation 5 before the policy change, on average. According to Table 1, for the average bank, this means an increase of approximately 6pp in η, thus, an increase of 1% credit growth over six months, which is less than the effects found by Fang et al. (2022) in Peru of 4 to 6pp per quarter for a 1pp increase in capital requirements, or Fraisse, Lé and Thesmar (2020) in France of 2.3% to 4.5%, for a decrease in requirements of the same magnitude. However, our baseline estimates increase considerably and effects on credit supply become persistent after the announcement of the CCyB. A year later, we find that an additional 1pp of η is associated with 0.5% more credit, or equivalently 3. 4% more credit growth for each 1pp of lower capital requirement. That is, the estimates of the two policies combined are in the range of what other studies have found for a 1pp change in capital requirements. Notably, in the medium run, after February 2024, these effects stabilize around 0.6%, as shown in Figure 6.

Importantly, Table 2 also shows that the estimates in our main specification do not change significantly when we do not include predetermined bank-level controls, suggesting that the level of capital surplus is independent of other bank characteristics that could capture the effects of changes in collateral eligibility on credit supply through other channels, such as the liquidity channel. Thus, we are confident that we estimate the capital constraint channel separately from other channels.

Table 3 shows the results of the alternative specifications of Equation 7. Column "Baseline + Exits", reports estimates when considering extensive margin effects through terminations of firm-bank relationships. Compared to our baseline estimates, these effects are significantly greater for all periods; therefore, terminations of firm-bank pairs were less likely in more capitalized banks relative to other banks after the policy change. Because exits are more likely to happen in smaller loans, this result suggests that the contraction in collateral eligibility and, later, the activation of the CCyB, had a larger negative effect on the supply of credit for smaller firms.

Considering that the loan and size distributions are extremely skewed in Chile, as shown in Table 1, if the policy changes had significant effects only on small firms, they could not have had effects at the aggregate level. To investigate this possibility, we run Equation 7 weighting each observation by the amount of the outstanding loan in the base period. We refer to these estimates as aggregate effects of the policies because by weighting the observations in this way the mean of the dependent variable is equal to the growth of total credit in the sample, even if they only capture differential effects between banks (Amiti and Weinstein (2018)). Furthermore, we also try a specification splitting the sample in banks with below and above the median level of η in August 2022, and compare the credit supply shock we obtain from a regression using bank-time fixed effects instead of η, as in (Amiti and Weinstein (2018)). We do this for the loan level (unweighted regression) and aggregate level effects (weighted regression).

Columns "Baseline (Weighted)" and "Baseline + Exits (Weighted)" in Table 3 show the aggregate effect of the policies for our baseline specification and when including the extensive margin effect, respectively. In both cases, there are no statistically significant effects. In line with the previous results, this indicates that the policies do not appear to have had effects on larger credit sizes, and are therefore unlikely to have stimulated

[23]Specifically, with these weights, estimator are obtained whose prediction of credit growth corresponds to credit growth at the economy level, that is, the value of the growth of the variable that is obtained after adding all the credits in the sample at t and t-1.

a contraction of credit supply at the aggregate level. Figure 12 provides graphical evidence of these results. Dynamic credit supply shocks from banks with a capital surplus below versus above the median in August 2022 do not differ when we weight the regression by loan amount in the base period. At the loan level instead, credit supply shocks are significantly larger over time for banks above median capital surplus when compared to those below. A possible explanation to the difference between credit and aggregate level effects is a shift in the composition of lending towards larger firms from more capital constrained banks. We dig further into this result in the following section.

Finally, we highlight that these results are robust to the different measures of capital surplus, as shown in Figures 8 and 9

5.2.1 Heterogenity: size and risk taking

We start this section assessing whether a shift in lending towards larger firms, within the sample of multi-bank firms, by more capital constrained banks can explain the null effect of the policies in lending at the aggregate level. To do so, we run the following set of cross-sectional regressions:

$$GC^h_{ib} = \alpha^h_i + \delta^h \ \eta^{Aug22}_b + \beta^h \ \eta^{Aug22}_b \ \times Y^{Aug22}_i \ + \ X^{Aug22}_b \ \Lambda^h + \ \varepsilon^h_{ib} \tag{8}$$

where Y^{Aug22}_i corresponds to the borrower's size category before the policy changes. In particular, in this case Y^{Aug22}_i is a dummy variable equal to 0 if the firm is an SME and the value 1 if it is a large firm.[24]

Table 4 shows the estimates of Equation 8 when the variable Y^{Aug22}_i corresponds to the borrower's size category. For all periods in which changes in collateral eligibility and the activation of the CCyB have an effect on credit supply through banks' capital constraints, there is a significant and strong negative effect associated with large firms. Thus, as a reaction to the policy changes, more capital constrained banks shifted their lending towards larger firms, which is consistent with the finding of no effect on the aggregate supply of credit. Furthermore, this finding implies that the results reported in Table 3 are driven by SMEs who receive relatively less credit from banks with less capital before the policy change.

Because larger firms tend to be less risky, a potential explanation for this effect of composition in lending is a diminished risk bearing capacity of more constrained banks, similar to the effect documented for additional capital requirements (Imbierowicz, Kragh and Rangvid (2018), Cappelletti, Ponte Marques and Varraso (2024)). In contrast, because a contraction in collateral eligibility negatively affects banks' profitability, more affected banks, either because they were more capital constrained or had a larger fraction of their assets pledged as collateral, may try to maintain sufficiently high returns and therefore shift lending towards riskier firms.

To assess whether changes in collateral eligibility first, and then the activation of the CCyB, induced risk taking in more capital constrained banks, we estimate Equation 8 using a firm-level measure of credit risk as variable Y^{Aug22}_i. We measure credit risk with banks' provisions, which reflect the expected loss on firm i, considering total exposure to the firm, the probability of default and fraction of loss given default, after deducing all types of guarantees. In particular, Y^{Aug22}_{ib} now varies at the firm-bank level and corresponds to a dummy variable that takes the value 1 if the firm is above the median of the distribution for bank b of the provision for firm i over outstanding debt to firm i. Therefore, we measure the risk taking behavior of banks using their own risk exposure to credit to each firm and relative to their own portfolio.[25]

Table 5 shows the results. Six months after the announcement of changes in collateral eligibility, there is a statistically significant negative effect on more risky firms. That is, even if more capital constrained banks lent relatively less after the policy change, as shown in Table 3, they lent relatively more to more risky firms, which is consistent with the idea that these banks may have increased risk taking to maintain profitability levels. However, the coefficient is small relative to that of the base category, indicating limited heterogeneity among banks in terms of risk taking and is consistent with the fact that less capitalized banks adjusted leverage levels rather than riskiness of their assets to cope with additional capital requirements in the context of the Basel III implementation schedule, as shown in Section 4.3. Interestingly, the coefficient becomes positive after the

[24]We use the tax authority's firm size classification. A firm is considered large if its annual sales are larger than 100.000 *Unidades de Fomento*, approximately 3.7 million USD in August 2022.

[25]We also estimate Equation 8 using a firm-level risk measure, namely, the weighted average of the same variable and obtained similar results.

announcement of the activation of the CCyB, which is consistent with the fact that capital constraints negatively affect risk taking capacity. Overall, these results highlight how the two policy changes can have different effects on bank's risk taking, even of both of them operate through a tightening in bank capital constraints.

Thus, in the long run, after the activation of the CCyB, our results suggests that more affected banks reacted to the policy change by shifting their lending toward larger, less risky firms, consistent with a diminished risk taking capacity. In the short run, the evidence is not as clear, as lending to larger firms appears to be inconsistent with more risk taking by more affected banks. A possible explanation could be related to the fact that cutting lending to smaller firms is easier due to the existence of commitments in credit lines with larger firms (Chodorow-Reich, Darmouni, Luck and Plosser (2022)).

5.3 Credit conditions in new loan origination

In this section, we assess whether the policy changes that affected credit supply had an impact on the interest rates, maturity, and size of new loans. Because in our setting, relative changes in credit conditions for new loans, particularly for the interest rate, are likely to reflect relative changes in banks' funding conditions due to the policy changes, the evidence in this section should be informative about the mechanisms involving the interaction between banks' liquidity and capital constraints, described in Section 4.2.

On the one hand, increasing leverage through deposits could increase funding costs if the bank faces an upward sloping supply in the deposits market, which would translate into higher interest rates in commercial loans for more capital constrained banks. Moreover, if longer-term funding is more scarce in the deposit market, banks could shorten the maturity of their loans to match the term structure of assets and liabilities (Carpinelli and Crosignani (2021). On the other hand, if capital constraints act only as a constraint on the size of the bank's balance sheet, and therefore as a quantity restriction in the short run, funding conditions might not be affected, and the effects on credit supply we found in the previous section would be explained by caps in loan sizes, rather than relatively lower interest rates.

To assess the effect in credit conditions, we employ the same sample of multi-bank firms of the previous section and run a difference in difference specification, similar to that of Equation 7 but, considering that this data set is at the loan-firm-bank-month level, instead of estimating the model in differences, we do it in levels for expositional clarity. We run the following regression in the data set of new loan origination, which covers all non-contingent loans in Chile, that is, it excludes credit lines and other types of revolving credit:

$$\begin{aligned} logR^h_{libt} =& ILST^h_{it} + \delta_l + \beta^h_1 \eta^{Aug22}_b + X^{Aug22}_b \Lambda^h_1 + Z^{Aug22}_i \Delta^h_1 + P^{Aug22}_{ib} \Omega^h_1 ... \\ &+ \beta^h (\eta^{Aug22}_b \times Post_t) + (X^{Aug22}_b \times Post_t)\Lambda^h + (Z^{Aug22}_i \times Post_t)\Delta^h + (P^{Aug22}_{ib} \times Post_t)\ \Omega^h + \varepsilon^h_{libt} \end{aligned} \tag{9}$$

where h denotes the post period in each regression. Here, we do not run a different regression for each month as we did before. Instead, we define two post periods, first, from month 1 to 6 after changes in collateral eligibility, and second, from months 7 to 18. As before, the first period captures the pure effect of changes in collateral eligibility, and the second, the combined effect with the announcement of the activation of the CCyB. Thus, our estimates capture average effects over each post period, which is the effect of interest in these regressions.

The dependent variable in Equation 9 is the log of the interest rate, maturity, or amount of new loans. We use logs of the dependent variable to interpret our estimates as semi-elasticities, which allows us to pool all credit types in one regression, regardless of their denomination or whether the interest rate is fixed or variable. For a similar reason, we include a denomination-interest rate type fixed effect (l), so we compare changes in the outcome variable relative to the same type of loan before the policy change. Because many multi-bank firms do not get a new loan with different banks each month, we cannot include a firm-month fixed effect as we did in Equation 7. Instead, we include an industry-location-size-month fixed ($ILST$), which performed well when controlling for observed and unobserved demand shocks correlated with the error term in Equation 6 for the same sample firms. X_b are the same set of bank-level controls included in Equation 7, Z_i is an additional set of firm-level controls, which include a broad category of annual sales (13 categories in total) and the fraction of delinquent loans of the firm with the financial system, which is observed by banks. Finally, P_{ib} is a set of firm-bank controls that includes the fraction of provisions on total outstanding credit, the fraction of delinquent loans over total outstanding credit with the lending bank, and an indicator of whether the bank assesses the credit risk of the firm individually or as a group. All controls are measured before the policy change. As in previous regressions, standard errors are clustered at the firm-level.

Table 6 shows the estimated parameters of interest, β^h, from Equation 9. Before the announcement of the activation of the CCyB, that is, up to 6 months after changes in collateral policy, we observe a negative and significant effect on interest rates, a positive and significant effect on maturity and insignificant effects on loan size. According to the point estimate, a 1pp increase in η is associated with a 0.26% in the annual interest rate of new loans and 0.48% increase in the maturity of these loans measured in months, on average. Thus, in our sample, 1 standard deviation increase in η causes the annual interest rates of non-contingent loans to fall by approximately 2 percentage points and the maturity to increase by 3.72 percentage points in the six months after changes in collateral eligibility, on average.

As we discussed in Section 4.1, we did not find evidence of an asset-eligibility channel due to the changes in collateral eligibility in our case. Thus, these interest rate effects are coming from relative changes at the balance sheet level of banks only. Together with the relative shortened maturity in new loans of less capitalized banks before the policy change, this results suggest that more capital constrained banks faced increasing funding rates in the deposits markets, more so for longer term deposits. In our view, along with the bank-level evidence presented in Section 4.3, this results support the existence of a capital constraints channel of collateral eligibility.

Regarding effects on loan conditions after the announcement of the activation of the CCyB, Table 6 shows that between and 18 months after changes in collateral eligibility, the negative effect on interest rates is larger, while the effect on maturity becomes insignificant. During that period, a 1pp increase in η is associated with a decrease of 0.3pp in the interest rate, on average. Therefore, a one standard deviation increase in capital surplus in our sample is associated with a 2.3 pp decrease in the annual interest rate of new loans. These results suggests that the CCyB reinforced the effects on the interest rates. However, if this was the case, we would expect a different underlying mechanism through which funding cost may be affected, namely, that after the activation of the CCyB, interest rate do not only reflect higher interest rates in the deposit market for more capital constrained banks, but also, the opportunity cost of additional units of capital for these banks (Lang and Menno (2023)). This explanation would also be consistent with the reduced and insignificant effect on the maturity of new loans during this period.

Overall, the results in this section provide reassuring evidence of the existence of a capital constraints channel of collateral eligibility.

5.4 Firm-level effects

We now turn to firm-level effects, that is, taking into account the fact that multi-bank firms are capable of substituting funding sources between banks that changed their credit supply heterogeneously after the policy changes. Firm-level regressions also alow us to expand our sample and include in the analysis those firms with a single bank relationship. Although the identification of firm-level effects requires stronger assumptions than those at the loan-level, they are paramount for the evaluation of the policy changes we analyze. On the one hand, if multi-bank firms, which represent around 70% of total commercial credit in Chile, are able to switch borrowing across banks, we should not expect significant amplification effects of the policies through real-financial linkages at the aggregate level. On the other hand, even in the absence of significant aggregate effects, the policy changes could still have a negative impact on a large number firms, as single-bank firms, which cannot easily substitute borrowing between banks, represent approximately 87% of total firms in Chile.

At the firm level, it is not possible to include a fixed effect that captures observed and unobserved demand shocks, as in Equation 7. Thus, we follow Degryse et al. (2019) to estimate firm level effects while attempting to control for unobservable heterogeneity in the demand for credit and run the following regression separately for multi and single bank firms:

$$GC_i^h = ILS_i^h + \theta^h \bar{\eta}_i^{Aug22} + \bar{X}_i^{Aug22}\, \Lambda^h + Z_i^{Aug22}\, \Delta^h + \varepsilon_i^h \tag{10}$$

where credit growth is measured at the firm level and $\bar{\eta}_i^{Aug22} = \sum_{b \in I} w_b \eta_b^{Aug22}$ is the weighted average of the capital surplus of the banks with which firm i had a banking relationship in the base period. The weight corresponds to the credit from each bank b over total credit to firm i in the base period. Also, each variable $\bar{x}_i^{Aug22} = \sum_{b \in I} w_b x_b^{Aug22}$ in vector $\bar{X}_i$ corresponds to a weighted average, according to outstanding credit, of the same bank-level controls X_b in Equation 7. Z_i and ILS_i are the same firm-level controls and fixed effects used in Equation 9.

The parameter of interest is θ^h, which is interpreted as the effect that an additional 1% average capital surplus in August 2022 has on firm-level credit growth between November 2022 and h months later. Thus, θ^h considers the potential substitution in borrowing from more to less affected banks. We expect these estimates to be lower than the those of Equation 7, in fact, if firms could not substitute sources of financing, both estimators should be equal, while in the opposite case, we should expect a zero effect.

Table 7 shows the estimates from Equation 10 for multi and single bank firms separately on the left and right columns of each time period respectively. On the one hand, these results confirm that changes in collateral eligibility did not have an effect on total borrowing by multi-banks firms, as these firms were able to substitute funding sources across banks. Moreover, the estimates after the announcement of the activation of the CCyB (9 months and afterwards), show that the two policies combined did not have have an effect on credit supply to these firms 18 months later either.

On the other hand, these results show that policy changes did have a negative effect on total borrowing for single-bank firms. A 1pp increase in the weighted average capital surplus ($\bar{\eta}$) is associated with 0.45 pp increase in commercial credit growth six months after changes in collateral eligibility. This estimate is considerably larger than the loan-level baseline estimate of the lending channel for multi-bank firms in Table 3 (0.16 pp). Because to some extent single-bank firms might be able to switch between banks, this estimate represents a lower bound of that of the lending channel. Thus, the effect of changes in collateral eligibility on lending was heterogeneous among firms.

The estimated effect eighteen months after the policy change, which consider the announcement if the activation of the CCyB, show similar results, although the effect on single-bank firms is smaller. In fact, in the medium run, there is no effect on multi-bank firms, while for single-bank firms A 1pp increase in the weighted average capital surplus ($\bar{\eta}$) is associated with 0.34 pp increase in commercial credit growth. Moreover, this estimate is also lower to that of the lending channel for multi-bank firms in the same period of time (0.58554 pp) reported in Table 3. This results could be explained by single-banks firms' increased ability to switch between banks over time.

6 Conclusion

This study provides empirical evidence on the critical role of bank capital constraints in shaping the effects of collateral policy changes on credit supply. By analyzing an unexpected policy change in Chile that reduced collateral eligibility during the post-pandemic normalization period, we demonstrate that banks with tighter capital constraints are more adversely affected by such changes.

Our findings suggest that while banks initially expand their balance sheets to acquire safe assets without reducing credit supply, the high short-term cost of adjusting bank capital leads to increased leverage and tighter capital constraints. Consequently, more capital-constrained banks experience a greater reduction in credit supply.

These results underscore the importance of considering bank capital constraints in the design and implementation of collateral policies and credit support exit strategies.

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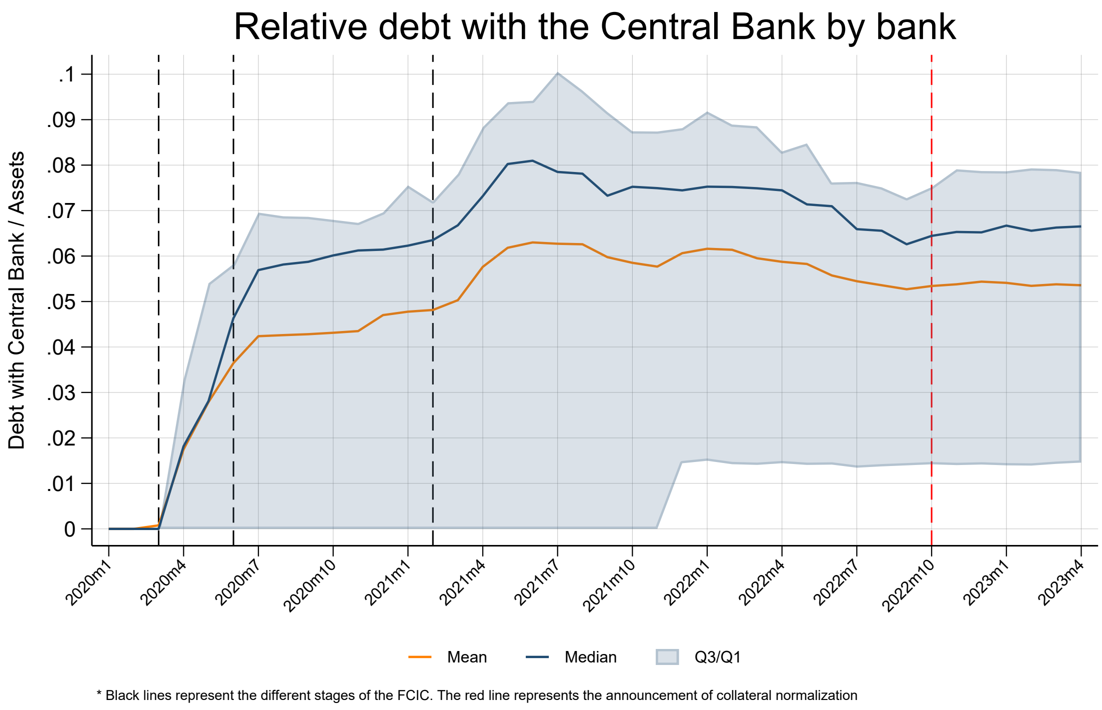
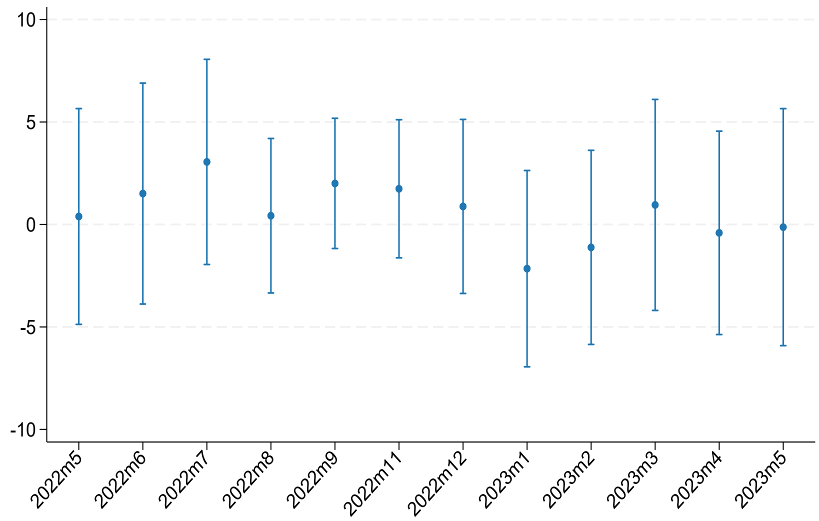
7 Appendix

Figure 1: Use of the FCIC



(*) Note. This figure shows the evolution of FCIC use by Chilean banks during and after the pandemic. In average, FCIC use represented 8% of total assets in the at its peak and remained close to 7% until May 2024.

Figure 2: The asset-eligibility channel

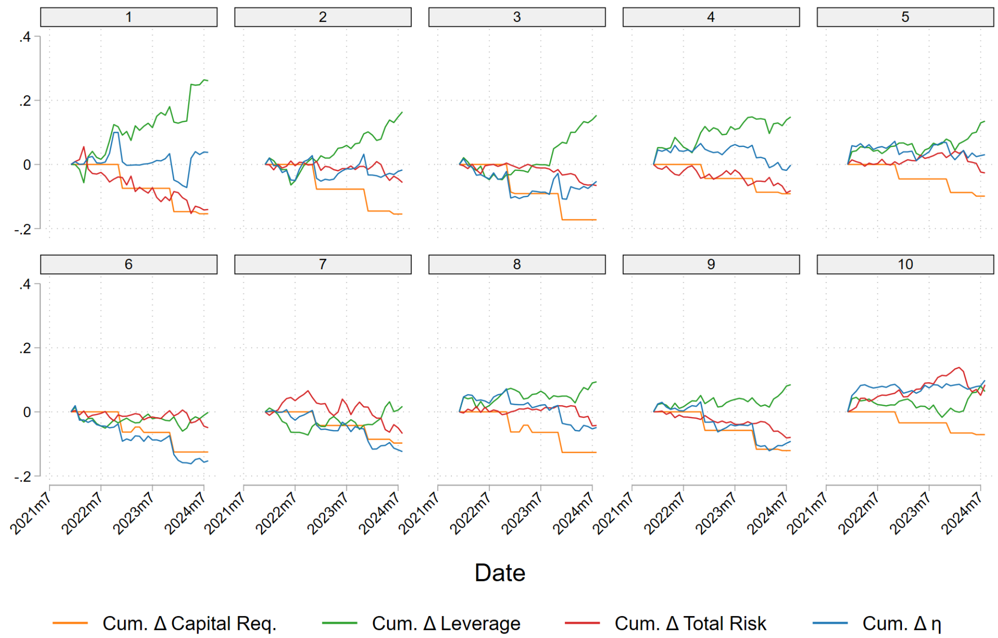


(*) Note. This figure shows the point estimates and confidence intervals of Equation 2, which measures the effect on credit supply of just eligible versus just ineligible loan types before and after the announcement of changes in collateral eligibility. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. As expected in our setting, we find no significant effects.

Figure 3: Capital surplus (η) by bank

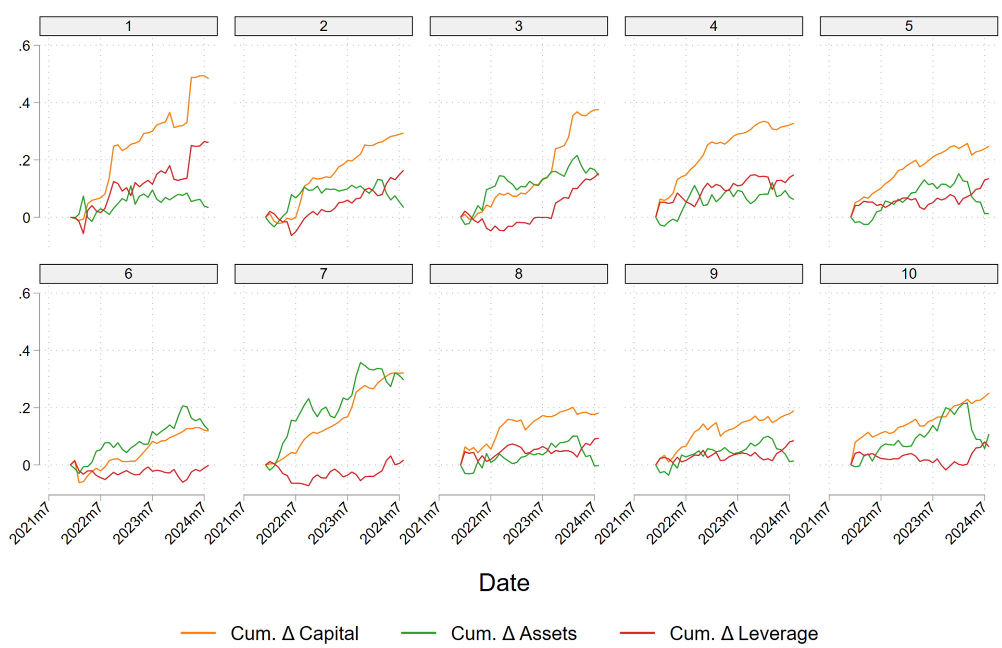
(*) Note. This figure shows the evolution of capital surplus (η) as defined in Equation 3 for our sample of banks from April 2022. Banks are sorted from low to high capital surplus in August 2022. Two groups of banks can be distinguished: those with relatively less capital surplus, which maintain their levels after additional capital requirements in the context of Basel III implementation, and those with higher levels, which are willing to use their surpluses to face the additional requirements.

Figure 4: Decomposition of the cumulative change in η



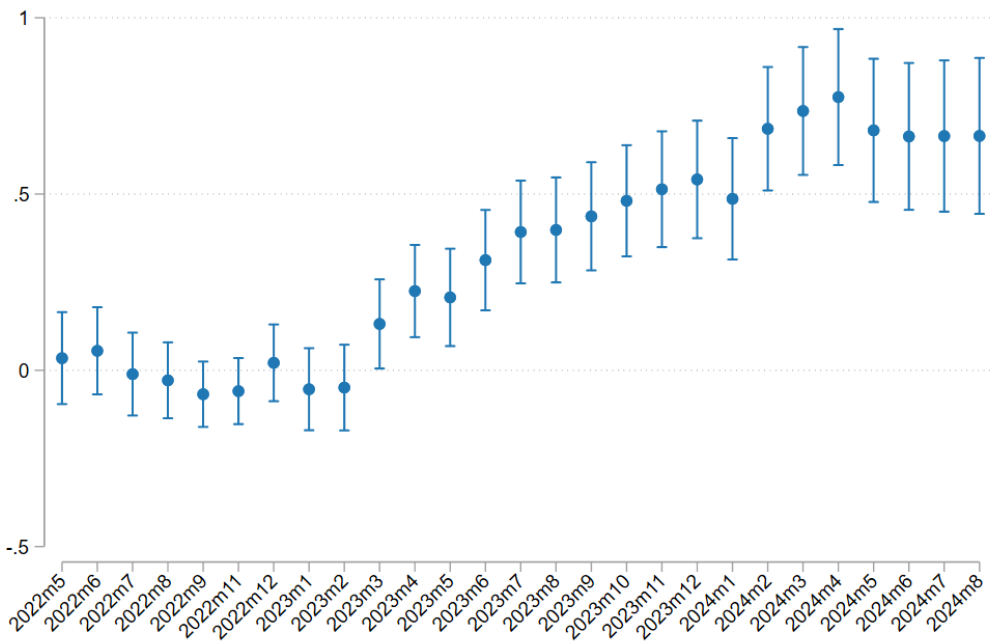
(*) Note. This figure shows the decomposition of cumulative changes in capital surplus from April 2022 according to Equation 5. Banks are sorted from low to high capital surplus in August 2022. Banks with relatively low levels of capital surplus maintained their levels after anticipated additional capital requirements by decreasing leverage.

Figure 5: Cumulative changes in assets and capital by bank



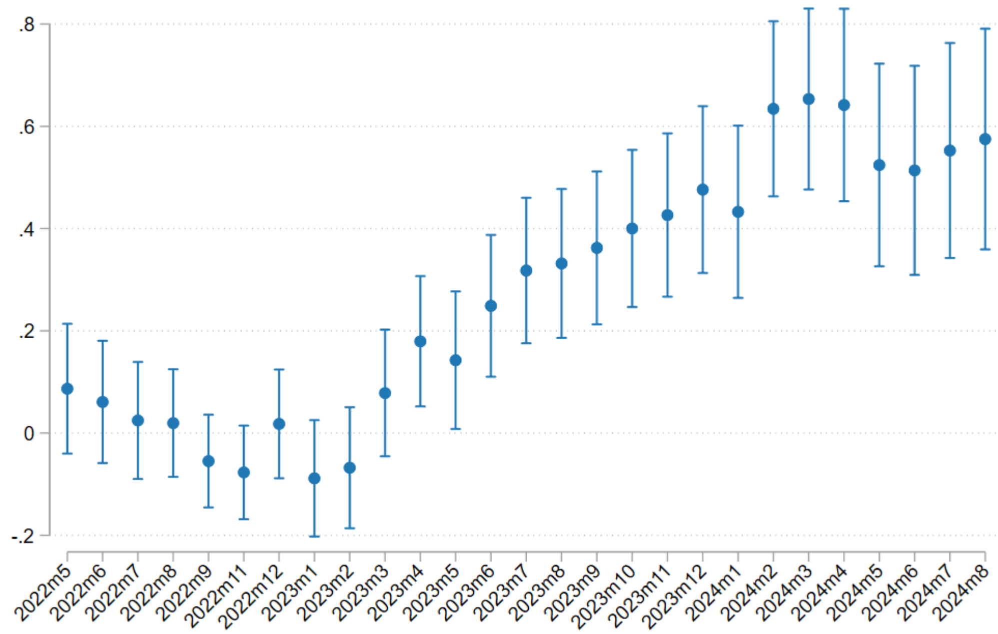
(*) Note. This figure shows the decomposition of cumulative changes in bank leverage from April 2022. Banks are sorted from low to high capital surplus in August 2022. Banks with relatively low levels of capital surplus decreased their leverage by cumulating capital faster than increasing assets.

Figure 6: No anticipation effects



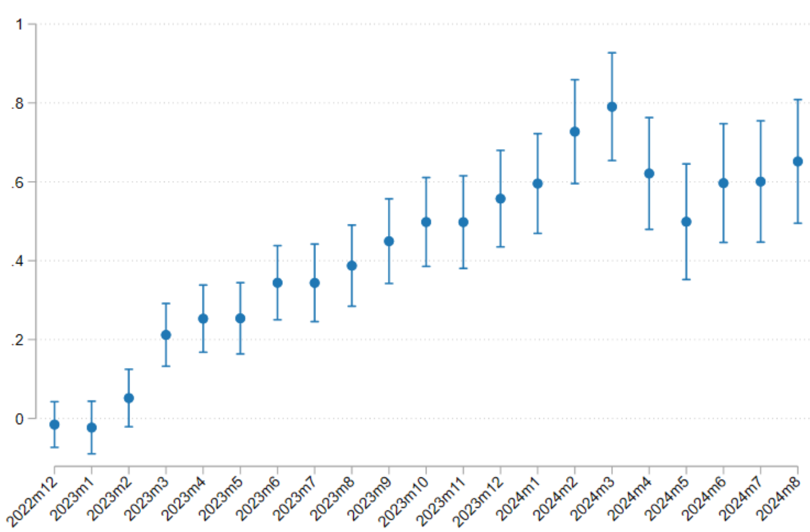
(*) Note: The figure shows point estimates and 95% confidence intervals of γ_s in Equation 6, which correspond to the effect of bank capital surplus (η_b) in August 2022 on credit supply. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The dependent variable is the logarithm of credit and the sample considers multi-bank firms only.

Figure 7: ILST fixed effect performance



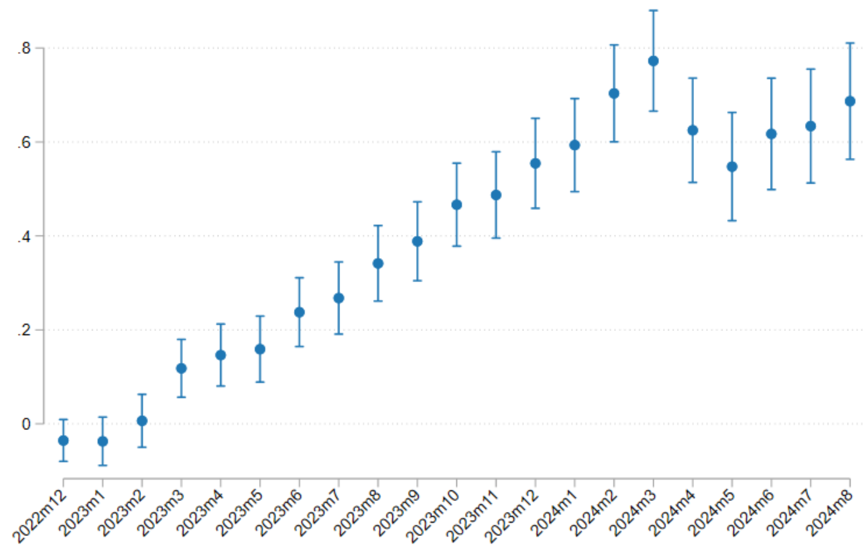
(*) Note: The figure shows point estimates and 95% confidence intervals of γ_s after replacing the firm-month fixed effect α_{it} with the ILST fixed effect in Equation 6 to control for unobserved credit demand shocks, which correspond to the effect of bank capital surplus (η_b) in August 2022 on credit supply. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. T= 0 corresponds to November 2022. The dependent variable is the logarithm of credit and the sample considers multi-bank firms only.

Figure 8: Robustness: core capital surplus



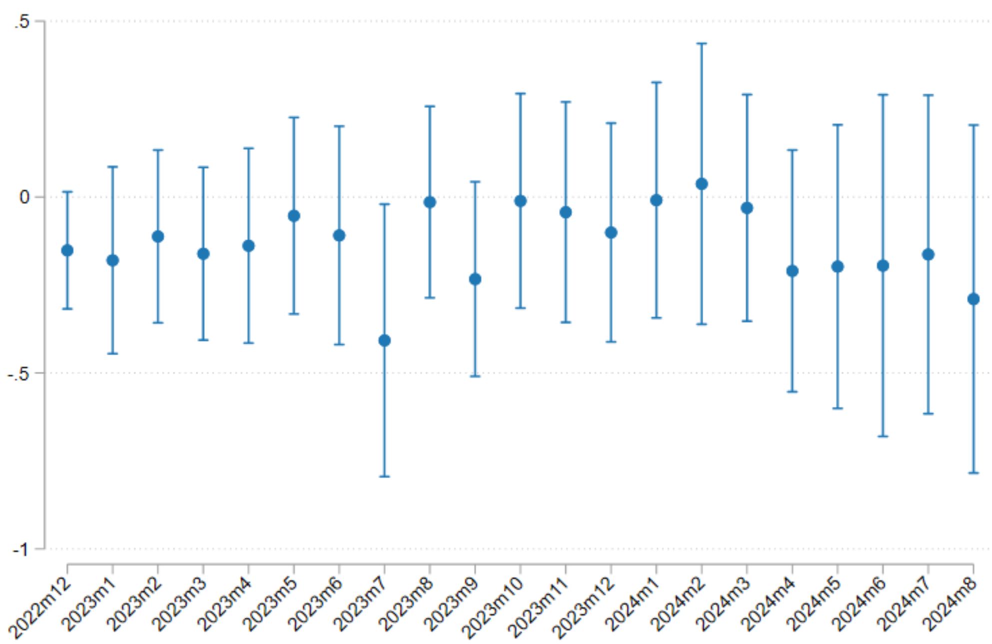
(*) Note. The figure shows point estimates and 95% confidence intervals from Equation (7) when η is calculated considering core capital only, as described in Section 2.1.2. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The sample considers firms with multiple banking relationships.

Figure 9: Robustness: available core capital surplus



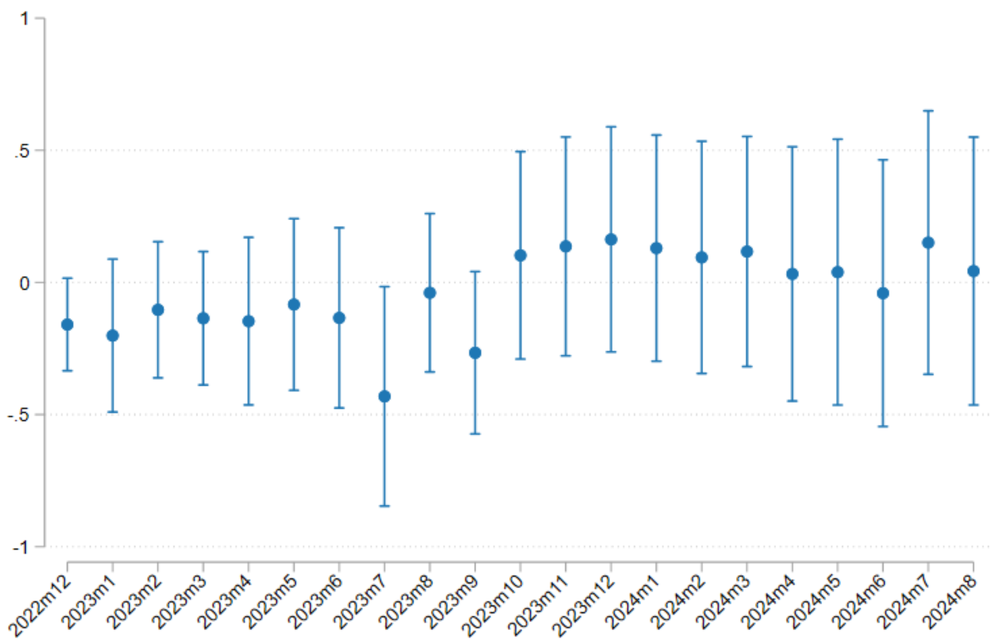
(*) Note. The figure shows point estimates and 95% confidence intervals from Equation (7) when η is calculated considering available capital, as described in Section 2.1.2. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The sample considers firms with multiple banking relationships.

Figure 10: Effect of surplus on the size-weighted credit growth rate (baseline)



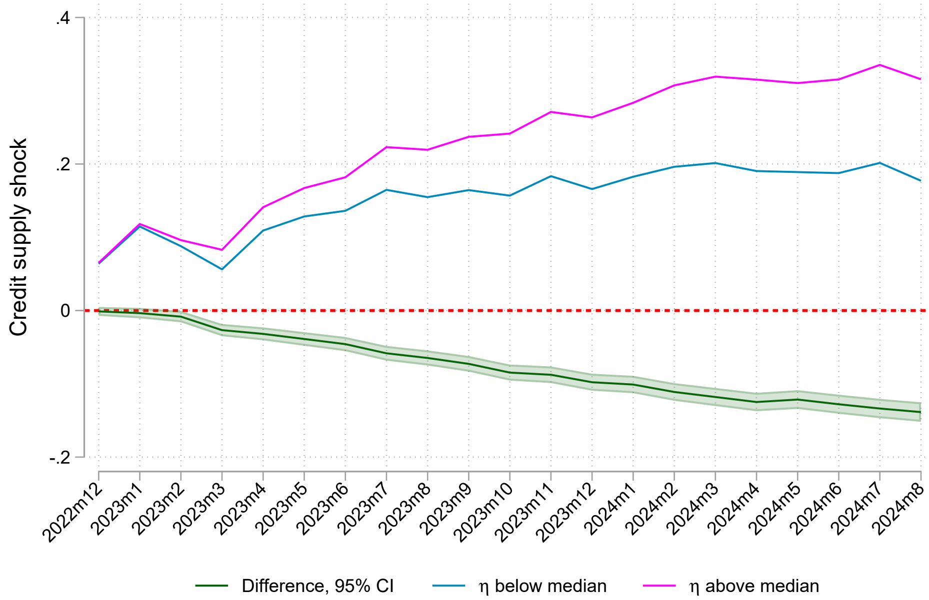
(*) Note: The figure shows shows point estimates and 95% confidence intervals from Equation (7) when observations are weighted by loan amount in October 2022. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The sample considers firms with multiple banking relationships in both pre and post periods.

Figure 11: Effect of surplus on the size-weighted credit growth rate (baseline + exits)

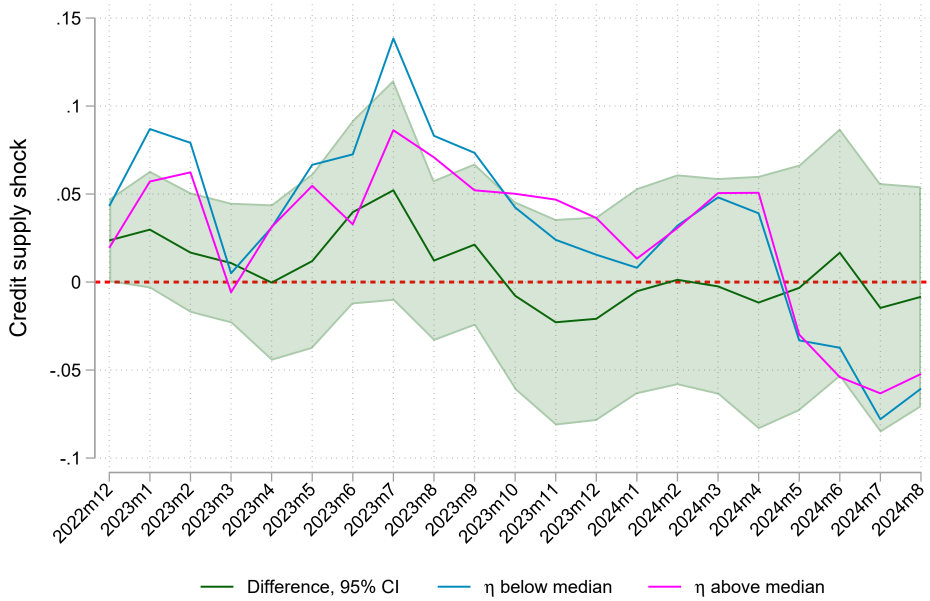


(*) Note: The figure shows shows point estimates and 95% confidence intervals from Equation (7) when observations are weighted by loan amount in October 2022. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The sample considers firms with multiple banking relationships in both pre and post periods plus exits at the firm-bank level.

Figure 12: Dynamic credit supply effects at the loan and aggregate levels



((a)) Loan level



((b)) Aggregate level

(*) Note: The figure shows the coefficient of bank-time fixed effects for banks with capital surplus (η) above versus below the median in August 2022 in cross sectional regressions of credit on firm-time and bank-time fixed effects for each month. Panel (A) shows the coefficients of unweighted regressions, which capture the relative credit supply shocks of each group of banks at the loan level. Panel (B) shows the coefficients of regressions weighted by base period loan size, which capture the relative credit supply shocks of each group of banks at the aggregate level. The green area corresponds to the 95% confidence interval of the difference between estimates for each group. Changes in collateral policy for the FCIC where announced in November 2022 and became effective end of January 2023. The activation of the CCyB at 0.5% of risk-weighted assets was announced in May 2023, effective in June 2024. The sample considers firms with multiple banking relationships. The figure shows persistent effects at the credit level, however, effects are not significantly different between bank groups at the aggregate level.

Table 1: Summary Statistics

Variable	Description	Mean	SD	Min	Max	Obs
Panel A. Banks						
η	Capital surplus normalized by bank capital, according to Equation 4.	41.50	7.75	31.44	53.02	10
HT	Total capital surplus defined as regulatory capital minus the regulatory capital requirement, idiosyncratic requirements and capital buffers. See definition 1	6.70	1.92	4.01	9.87	10
FCIC Control	Interaction of two FCIC related measures at the bank-level: i) fraction of loans pledged over the total guarantees and ii) the fraction that the FCIC represents out of total outstanding loans.	9.41	3.66	3.93	15.98	10
Log Outstanding Loans	Logarithm of total outstanding loans.	16.46	1.00	14.60	17.42	10
Comercial loans/Total loans	Fraction that comercial loans represent out of the total.	0.65	0.16	0.49	0.96	10
Panel B. Firms						
Multibank	Indicates whether a firm has more than one banking relationship.	0.33	0.47	0.00	1.00	174,785
Outstanding Debt (Millions of CLP)	Firms total stock of debt within the reference month.	357.76	5088.34	0.01	617872.12	174,785
N. workers	Number of employees	19.65	186.50	1.00	26394.00	174,785
Firm Size	Categorical variable that ranges from 1 to 4 according to firm sales.	1.82	0.80	1.00	4.00	173,059
Groupal Risk	Indicator variable that activates if firm is assigned Group Risk category by the bank.	0.90	0.29	0.00	1.00	144,163
Provision Fraction	Fraction of provision out of total outstanding debt	0.06	0.15	0.00	1.00	162,109
Loan Amount (Millions of CLP)	Notional amount of new loans within the reference month.	494.41	4049.46	0.02	275000.00	13,449
Loan Interest Rate	Annual interest rate of new loans within the reference month.	13.4580	4.3092	0.0001	19.9993	13,449
Loan Maturity	Maturity in months new loans within the reference month.	28.55	47.02	0.03	390.07	13,449

(*) Note: This table defines and reports the summary statistics for the main variables. Panel A focuses on the banking-side variables for the 10 banks in our sample whereas Panel B describes the variables on the firm-side for the 174785 firms that meet our sample conditions (see Section 2.2).

Table 2: Dynamic effects of the two policy changes under alternative specifications

	Collateral eligibility				Collateral eligibility + CCyB announcement					
	+3		+6		+9		+12		+18	
η (aug-22)	0.019	0.018	0.162***	0.161***	0.283***	0.363***	0.332***	0.523***	0.370***	0.585***
	(0.020)	(0.024)	(0.025)	(0.030)	(0.029)	(0.035)	(0.033)	(0.040)	(0.041)	(0.050)
FCIC (exposure X total/col)		-0.064		-0.359***		-0.322***		-0.316***		-0.333**
		(0.073)		(0.091)		(0.104)		(0.115)		(0.139)
Obs.	133,819	133,819	128,695	128,695	124,056	124,056	120,237	120,237	107,423	107,423
Bank Level Controls	No	Yes*	No	Yes*	No	Yes*	No	Yes*	No	Yes*

(*) Note: This table shows the estimation of Equation (7) as described in Section 5.2. The dependent variable is defined as the credit growth between the base period and h periods later, which spans from $h = 3$ (February 2013) up to $h = 18$ (May 2024). For each period, we show the estimation without and with controls. Bank level controls include *Log outstanding loans* and *Commercial loans over total loans*. Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3: Dynamic effect of the two policy changes considering the extensive margin and loan-weighted regressions

	Specification			
	Baseline	Baseline + Exits	Baseline (Weighted)	Baseline + Exits(Weighted)
3 months after	0.0184	0.0326	-0.1119	-0.1034
	(0.0240)	(0.0289)	(0.1253)	(0.1314)
	133,819	144,467	130,774	139,383
6 months after	0.1612***	0.2546***	-0.0531	-0.0834
	(0.0301)	(0.0344)	(0.1425)	(0.1657)
	128,695	144,464	125,767	139,379
9 months after	0.3633***	0.4446***	-0.0143	-0.0390
	(0.0346)	(0.0379)	(0.1388)	(0.1529)
	124,056	144,464	121,211	139,380
12 months after	0.5227***	0.6061***	-0.0430	0.1366
	(0.0396)	(0.0415)	(0.1598)	(0.2112)
	120,237	144,463	117,398	139,380
18 months after	0.5854***	0.8573***	-0.1976	0.0392
	(0.0499)	(0.0472)	(0.2056)	(0.2566)
	107,423	144,456	104,753	139,372

(*) Note: This table shows the estimation of Equation (7) as described in Section 5.2. The dependent variable is defined as the credit growth between the base period and h periods later, which spans from $h = 3$ (february 2013) up to $h = 18$ (may 2024). Each row displays the coefficient of the adjusted capital surplus (η) for varying specifications. Our baseline specification excludes entries and exits (intensive margin). Weighted estimates are obtained by WLS where the weight is the stock of credit in the previous period. Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4: Heterogeneity: dynamic effects by firm size based on annual sales

	Collateral eligibility		Collateral eligibility + CCyB announcement		
	+3	+6	+9	+12	+18
η (aug-22)	0.0392	0.2923***	0.4998***	0.6475***	0.9176***
	(0.0311)	(0.0369)	(0.0410)	(0.0448)	(0.0510)
η (aug-22) $\times$ Large_i	-0.0509	-0.2293***	-0.3378***	-0.2521***	-0.3713***
	(0.0692)	(0.0809)	(0.0878)	(0.0952)	(0.1083)
Obs.	144,421	144,418	144,418	144,417	144,410
Bank Level Controls	Yes	Yes	Yes	Yes	Yes

(*) Note: This table shows the estimation of Equation (8) as described in Section 5.2.1. The dependent variable is defined as the credit growth between the base period and h periods later, which spans from $h = 3$ (february 2013) up to $h = 18$ (may 2024). Our baseline specification excludes entries and exits (intensive margin). Large_i is a dummy variable equal to 0 if the firm i is an SME and 1 if it is a large firm. Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 5: Heterogeneity: dynamic effects by firm credit risk

	Collateral eligibility		Collateral eligibility + CCyB announcement		
	+3	+6	+9	+12	+18
η (aug-22)	0.0596**	0.2489***	0.4449***	0.6293***	0.8704***
	(0.0300)	(0.0365)	(0.0407)	(0.0451)	(0.0521)
η (aug-22) $\times$ Provision Above Median$_{ib}$	-0.0713***	-0.0396***	0.0180	0.0657***	0.1305***
	(0.0115)	(0.0139)	(0.0155)	(0.0169)	(0.0194)
Obs.	123,456	123,452	123,453	123,453	123,445
Bank Level Controls	Yes	Yes	Yes	Yes	Yes

(*) Note: This table shows the estimation of Equation (8) as described in Section 5.2.1. The dependent variable is defined as the credit growth between the base period and h periods later, which spans from $h = 3$ (february 2013) and $h = 18$ (may 2024). Provision Above Median$_{ib}$ is a dummy variable that takes the value 1 if the firm is above the median of the distribution for bank b of the provision for firm i over outstanding debt to firm i. Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6: Credit conditions in new loan origination

	Collateral eligibility (+6)	Collateral eligibility + CCyB announcement (+18)
Δ Log Interest Rate	-0.256**	-0.302**
	(0.126)	(0.142)
Obs.	327,226	566,608
Δ Log Maturity	0.480**	0.224
	(0.224)	(0.292)
Obs.	327,226	566,608
Δ Log Amount	-0.417	0.481
	(0.540)	(0.593)
Obs.	327,226	566,608
Bank Controls	Yes	Yes
Firm Controls	Yes	Yes
Bank-Firm Controls	Yes	Yes

(*) Note: This table shows the estimation of Equation (9) as described in Section 5.3. The dependent variable is the log of the interest rate, maturity, or amount of new loans for two after periods. The first column pools all months up to may 2023 (pure effects of collateral eligibility), whereas the second column pools all the months from june 2023 to may 2024 (collateral eligibility plus CCyB announcement). Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 7: Dynamic effects at the firm-level

	Months after event									
	+3		+6		+9		+12		+18	
Weighted Avg. Eta	-0.065*	0.180***	-0.029	0.458***	0.066	0.577***	0.119*	0.663***	0.087	0.634***
	(0.037)	(0.038)	(0.050)	(0.044)	(0.059)	(0.049)	(0.067)	(0.053)	(0.082)	(0.060)
Weighted Avg. FCIC Exposure	-0.598***	-0.932***	-0.778***	-1.106***	-0.832***	-1.130***	-0.721***	-1.174***	-0.702***	-1.209***
	(0.129)	(0.192)	(0.168)	(0.218)	(0.197)	(0.238)	(0.223)	(0.253)	(0.270)	(0.282)
Obs.	44,857	102,876	44,857	102,876	44,857	102,872	44,857	102,870	44,857	102,867
Multibank	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

(*) Note: This table shows the estimation of Equation (10) as described in Section 5.4. The dependent variable is defined as the credit growth between the base period and h periods later, which spans from $h = 3$ (february 2013) and $h = 18$ (may 2024). Clustered standard errors at the firm level are reported in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.