DISCUSSION NOTES

MONETARY POLICY DIVISION

N°7

Effect of credit on firms' performance

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PREFACE

The Discussion Notes (DN) seek to examine issues that are relevant for monetary policy in Chile and the world. Their goal is to discuss the status of the literature, highlighting the most important implications for the design of monetary policy. For that purpose, the Notes describe the different approaches set forth by frontier research, highlighting the consensus as well as debates that are still open. The DN are prepared by economists from the Monetary Policy Division and do not necessarily reflect the official position of the Board of the Central Bank of Chile.

This Note addresses the effect of bank credit on business performance. Since firms rely on credit to finance various activities such as investment and working capital, changes in credit availability or cost can have an impact on their performance. Understanding the magnitude of these effects is important for informing monetary and financial policy decisions. This note reviews the existing evidence on the effect of bank credit on firm performance. First, descriptive evidence is presented highlighting the magnitude and purpose of bank credit, and the heterogeneity in its use by firm size and sector. Then, it summarizes recent methodological studies that allow for identification of changes in credit supply and its effects on firms. Finally, the qualitative and quantitative evidence on these effects is summarized.

The results suggest that, in the face of a contraction in the supply of bank credit, firms tend to seek alternative sources of financing and reduce their total indebtedness. The effects on investment and employment of a credit contraction are negative and significant. These effects are heterogeneous according to firm characteristics, being greater for firms with fewer financing alternatives to substitute bank credit. This review is contextualized within a research agenda on firm financing and its macroeconomic implications.

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CONTENTS

1. INTRODUCTION

Firms rely on credit to finance activities such as investment and working capital. The sensitivity of firms' indicators to changes in the availability or cost of borrowing is a relevant empirical question for understanding the consequences of aggregate shocks or policy changes that affect the supply of credit. This note reviews the evidence and mechanisms through which fluctuations in credit supply affect firms' performance, and how these effects vary according to observable firm characteristics.

We begin by presenting descriptive evidence, focused on Chile, of the importance of bank credit for firms. This description helps to understand how firms respond to changes in credit supply, and why some could be more dependent than others on this source of financing.

In Chile, bank credit is the most important source of financing for firms. This is reflected in three descriptive results. First, the magnitude of bank credit. Total corporate bank debt is the equivalent of 45% of GDP. Second, the purpose of credit. Its use to finance investment and working capital stands out at both the extensive and intensive margins. Finally, the heterogeneity across sector and size, which determines the availability and alternatives of financing faced by a company.

Measuring the causal effects of credit on firms' performance requires identifying the credit supply shocks that firms face. This poses an important methodological challenge: separating changes in credit supply from changes in credit demand. This note summarizes the main recent methodological contributions that allow a credible identification of credit supply shocks. They rely on access to matched bank-firm data and exploit idiosyncratic shocks in the supply of bank credit. This methodological approach allows for the identification of firm-level effects (e.g., causal elasticities), although it may not fully capture the aggregate effects of credit supply shocks.

In view of this methodological consideration, we begin by examining the reaction of banks, which tend to contract credit supply in the face of a negative shock. We consider a variety of contexts, ranging from economic crises to changes in monetary and financial policies. Our analysis covers not only the extreme responses in times of crisis, but also the adaptations that occur in periods of stability. Upon facing unexpected shocks, such as an international crises or events, a bank's ability to grant credit is shown to be determined by characteristics such as their level of capitalization, liquidity, or portfolio risk.

We then show that, in the face of a contraction in bank lending, firms end up taking less credit in equilibrium. The studies reviewed show the mechanism by which firms try to compensate for the decline in bank credit with other sources of financing. They single out the characteristics of firms that affect their ability to make this substitution.

Next, we study the effect of contractions in credit supply on firms' investment, employment, and other outcomes. In general, the literature finds a negative and economically significant effect on firms' investment decisions. Regarding employment, results also show a decline after a contraction in credit supply, although some studies find null effects. A one percentage point (pp) contraction in the supply of credit reduces the investment-to-capital ratio between 0 and 3.4pp, with an average of 0.65pp. In

the case of employment, the results show a slowdown in employment growth between 0 and 0.88pp, and an average of 0.27pp. This evidence suggests that investment is more closely linked to access to credit than employment. The more pronounced effects on investment relative to employment, may be related to the greater factor specificity of employment, which can lead firms to engage in labor hoarding.

In addition, we find effects on other variables, such as exports and prices, and the presence of indirect effects through the value chain. The evidence shows that exports drop with a contraction in credit supply. For prices, the evidence is mixed, with some studies finding positive effects and others negative effects. With respect to the value chain, the evidence shows that firms respond both directly to their own credit supply shocks and indirectly through the credit supply shocks affecting their customers and suppliers.

Finally, the evidence finds that the effect of credit supply shocks is larger for firms with observables suggesting important credit constraints (e.g., size, indebtedness).

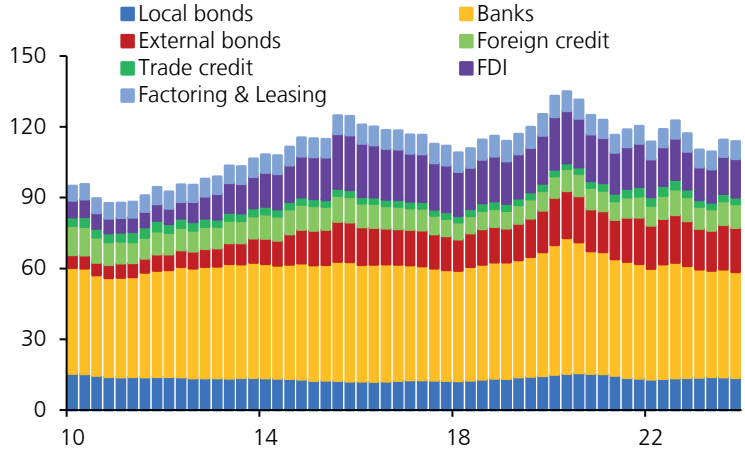
This paper is related to Brunnermeier and Krishnamurthy (2020), a review on the evidence on corporate financing and its macroeconomic implications. Brunnermeier and Krishnamurthy (2020) sheds light on the relationship between corporate indebtedness and macroeconomic consequences, especially in the face of aggregate shocks such as the Covid-19 pandemic. Our closest predecessor is Güler et al. (2021), that analyzes the effects of credit supply shocks on firms' outcomes. Our review incorporates the most recent papers in a very active field of research, and places greater emphasis on the evidence from emerging countries, which has received less attention thus far.

The remainder of this note proceeds as follows. Section 2 presents a descriptive analysis of bank credit. Section 3 reviews the evidence and mechanisms on the effects on firms' performance, with subsections covering the methodology of the studies reviewed, changes in the supply of bank credit, effects on equilibrium credit, and finally the effects on performance indicators. Section 4 presents the conclusions of the note.

2. DESCRIPTIVE STATISTICS OF BANK CREDIT

In Chile, bank credit is a crucial source of financing for firms, accounting for 45% of GDP. Figure 1 shows that local bank credit represents the largest share of total debt of non-financial firms, accounting for about 40% of total credit used by firms. This underlines the importance of the banking system in the financial structure of Chilean firms, and its leading role in providing the liquidity and capital necessary for the operation and expansion of businesses. Furthermore, the evolution of bank credit over time reflects the stability and continued relevance of this source of financing compared to other forms of borrowing.

FIGURE 1 DEBT OF NON-FINANCIAL FIRMS IN CHILE
(percent of GDP)

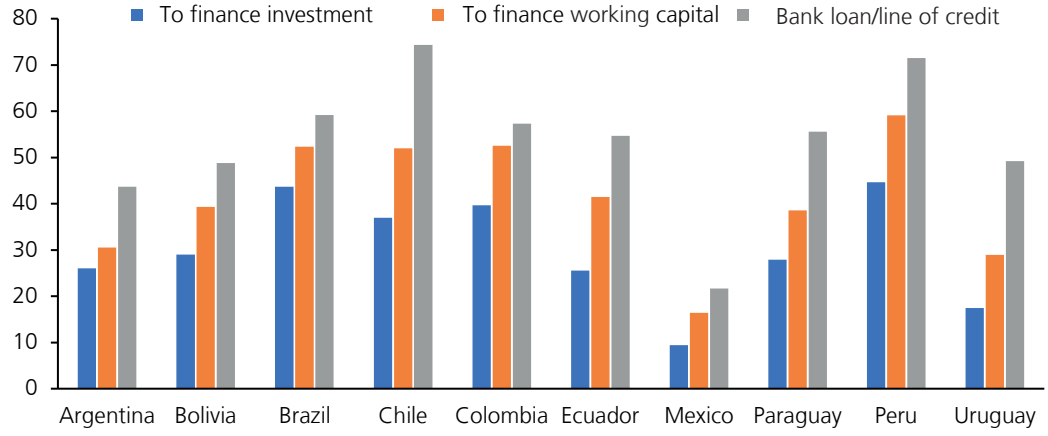


Source: Financial Stability Report, first half 2024, Central Bank of Chile.

The importance of bank credit in Chile also stands out in the international context. On the extensive margin, according to the World Bank's Enterprise Survey, 74% of firms in Chile use bank credit. Figure 2 shows that this proportion significantly exceeds that of other Latin American countries. In addition, firms are asked whether they use bank credit for the specific purpose of financing investment or working capital. A 36% of the firms surveyed use bank credit to finance investments, and 52% use it to finance working capital.

Aside from the extensive margin, the analysis of the intensive margin reveals that Chilean firms finance 34% of their investment and 24% of their working capital with bank credit (Figure 3). These magnitudes suggest that a significant share of their financing is covered through bank loans. The main purposes of these loans explored by the literature include investment and working capital expectations (Verane and Gertler, 1995; Jiménez et al., 2014) or transactional purposes such as mergers and acquisitions (Berg et al., 2024), both of which are nuanced by the duration of projects until they become profitable (Hart and Moore, 1995).

FIGURE 2 EXTENSIVE MARGIN OF BANK CREDIT USE IN CHILE
(share of firms that use it)

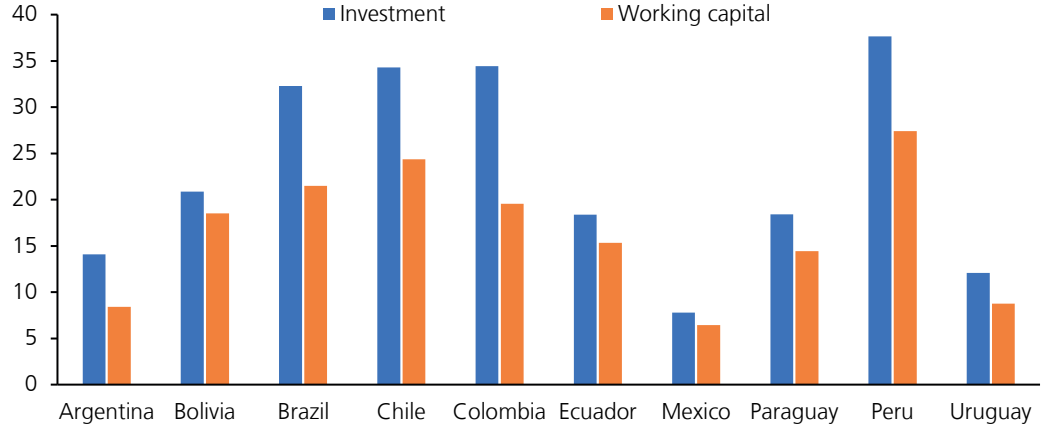


(*) For each country, average data available between 2006 and 2020 are reported.

Source: Authors' calculations based on the World Bank's Enterprise Survey.

The growing importance of bank credit in Chile is reinforced by comparing it with the dynamics of bank lending in other regions. Figure 4 compares Chile with the United States and the Eurozone using data from the Bank for International Settlements (BIS). The left panel shows that Chile has seen pronounced growth in bank credit as a percent of GDP, especially after 2008, in contrast to the stability observed in the United States and the Eurozone. The right panel shows bank credit as a percent of total credit to the private sector, where Chile has shares like those of the Eurozone, which are stable over time, and higher than those of the United States.

FIGURE 3 INTENSIVE MARGIN OF BANK CREDIT USE IN CHILE
(percent of expenditure financed with bank credit)



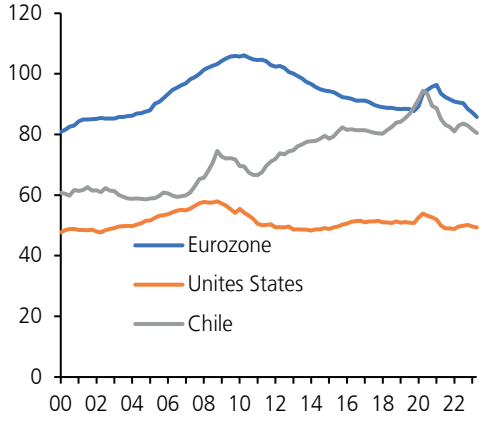
(*) For each country, average of data available between 2006 and 2020 are reported.

Source: Authors' calculations based on the World Bank's Enterprise Survey.

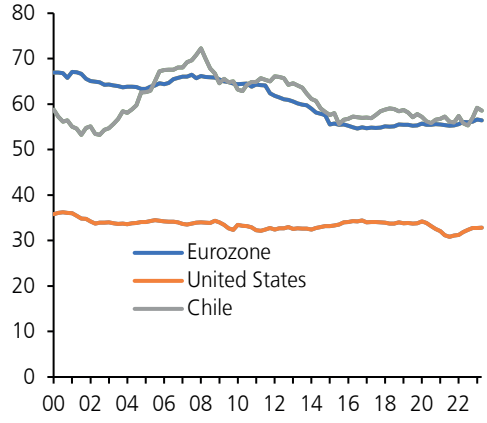
Bank credit is the foremost source of financing across the firm size distribution. Figure 5 shows that local bank credit dominates other sources of funding. However, as size increases, there is a more diversified use of financing sources. Larger companies make greater use of external bonds, foreign direct investment (FDI) and other instruments such as trade credit, indicating a greater capacity to access diverse financing options. At the same time, this heterogeneity persists over time, reflected in the similar proportions of each source of credit in 2015 and 2023.

FIGURE 4 EVOLUTION OF BANK CREDIT IN CHILE, THE US AND THE EUROZONE
(percent of firms that use it)

A. BANK CREDIT TO THE PRIVATE SECTOR
(percent of GDP)



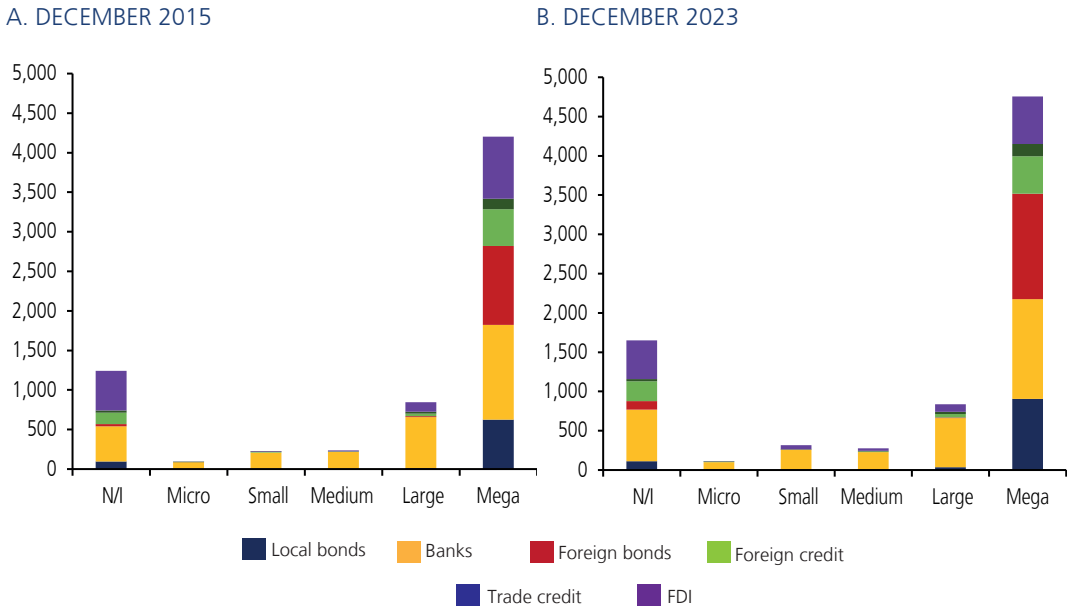
B. BANK CREDIT
(percent of total non-financial private credit)



(*) Credit includes loans and bonds; does not include equity. The non-financial private sector includes both firms and households. Source: Authors' calculations using BIS data.

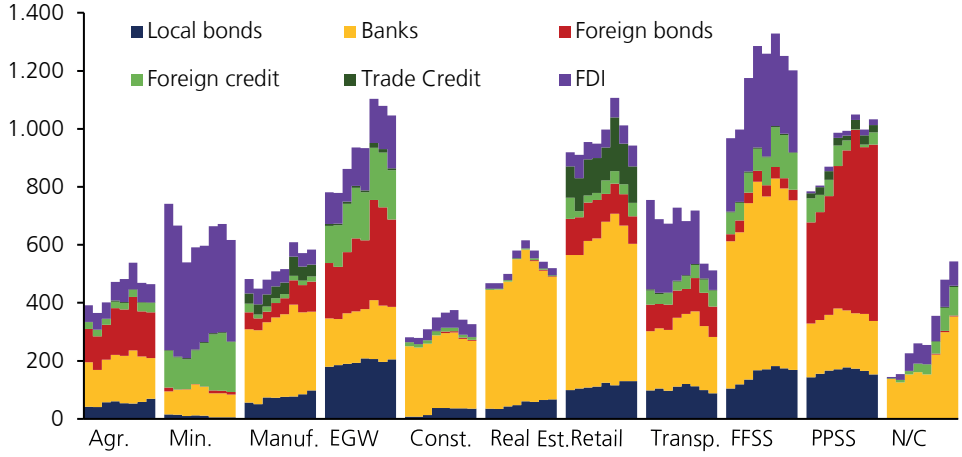
Heterogeneity in the use of diverse sources of funding is also evident across economic sectors. As shown in Figure 6, local bank credit remains a key source of financing in most sectors, especially construction, trade, and financial services. However, sectors such as the mining industry and electricity, gas, and water (EGW), make significantly greater use of alternative sources of financing, such as external bonds and FDI. This reflects not only the characteristics of each sector (such as the size of the representative firm within each), but also their ability to access more diversified capital markets or attract foreign investment. The variation in debt structure across sectors underscores the importance of understanding industry-specific financing needs and strategies, and how these may influence their resilience in the face of contractions in bank credit.

FIGURE 5 TOTAL DEBT OF FIRMS BY SIZE (*)
(millions of UF)



(*) Based on CMF data. The size categories are defined by annual sales: Micro, up to 2,400 UF; Small, 2,400 to 25,000 UF; Medium, 25,000 to 100,000 UF; Large, 100,000 to 1,000,000 UF; and Mega, over 1,000,000 UF. Source: Fernández et al. (2017), Estudio Económico Estadístico No. 121, Central Bank of Chile. Updated by the Financial Analysis Department, Central Bank of Chile.

FIGURE 6 TOTAL DEBT OF FIRMS BY SIZE (*)
(millions of UF)



(*) Based on CMF data. Source: Fernández et al. (2017), Estudio Económico Estadístico No. 121, Central Bank of Chile. Updated by the Financial Analysis Department, Central Bank of Chile. Updated by the Financial Analysis Department, Central Bank of Chile.

3. EFFECTS ON THE FIRMS' PERFORMANCE

3.1 Methodologies to measure the effects of credit supply: a critical review

In this review, we analyze two types of studies. First, studies that use firm-level data and analyze how an event, such as a financial crisis, affects firms with different levels of financial constraints. Examples of this kind of research are Duchin et al. (2010) and Almeida et al. (2011).

Second, we consider studies that use firm-bank level data with information on firms' banking relations (i.e., the firm's level of debt with each bank). These studies typically use syndicated loan data, as in the works of Chodorow-Reich (2014) and Acharya et al. (2018), or credit registry data, as in the studies of Khwaja and Mian (2008), Paravisini et al. (2015), Cingano et al. (2016), and Jiménez et al. (2017). One advantage of having data on bank-firm relations is the possibility of controlling for credit demand shocks, allowing for a more credible identification of credit supply shocks. For this reason, this review will focus on this type of studies.

Within the second type, there are two main methods applied to firms that have banking relations with more than one bank (known as multibank firms). These methods were proposed by Khwaja and Mian (2008) (hereafter KM) and by Amiti and Weinstein (2018) (hereafter AW). Both approaches, in a first stage, identify shocks in credit supply, and then, in a second stage, estimate their effects on firms' financing conditions and real variables such as investment or employment. The main difference between the two methods lies in how the first stage is estimated.

For the first stage, KM estimate a regression of the change in a firm's debt owed to a bank on firm-time fixed effects, that capture changes in credit demand, and a measure of the bank's exposure to a shock (X_b), that capture changes in credit supply.

The change in the bank's credit supply is calculated as $\Delta\text{Credit supply}_b=\beta X_b$, where β is the estimated coefficient measuring the response of the credit supply to an increase in the bank's exposure to the shock.[1]

On the other hand, AW's approach proposes estimating a regression between the change in the firm's debt to the bank and firm-time fixed effects plus bank-time fixed effects (β_b), where the change in credit supply is measured directly through $\Delta\text{Credit supply}_b=\beta_b$.

Once the changes in the supply of bank credit have been identified, both methods follow a similar procedure in the second stage. First, the change in the supply of credit faced by the firm is estimated as a weighted average of the changes in credit supply from each bank with which the firm has a relationship, using the share of each bank's debt in the firm's total debt in a baseline period. The impact of this change in the supply of credit on firm-specific variables, such as the amount of loans, interest rates, and variables related to firm performance, such as investment and employment, is then estimated.

The two methodologies measure relative credit supply, with different comparison bank. In the case

[1] A more detailed description of the KM and AW methodologies is shown in the Appendix.

of KM, the contrast is done with respect to the bank least exposed to the shock, while AW performs comparisons with respect to a benchmark median bank.[2]

Both approaches require some assumptions to be valid to have credible estimates of credit supply shocks. First, both KM and AW are based on data from firms that owe debt to more than one bank. If the effects vary between firms with a single bank and those with multiple banks, the results cannot be extrapolated directly to the first group. To relax this limitation, Degryse et al. (2019) suggests controlling for fixed effects of sector, size, and geographic location. However, this strategy requires that credit demand shocks occur at these levels and not at the individual firm level, to correctly identify credit supply shocks.

Second, both approaches assume that, when a bank changes its credit supply, the transmission of this change is proportional to all its customers, and that the same is true for changes in credit demand. If this assumption of homogeneous transmission of credit shocks does not hold and trade relationships depend on this heterogeneity, estimates of credit supply may be biased. Gutiérrez et al. (2024) propose a method that allows, under certain assumptions, to accommodate this heterogeneity.

3.2 Why does the supply of bank credit change?

The literature has found that the supply of bank credit reacts to policy changes, both monetary and financial, or to unanticipated shocks such as a financial or debt crisis. While the focus of this note is to understand the effect of bank credit on firms, it is important to note that the nature of the factors that initially cause changes in credit supply may explain some differences in the results.

On the monetary policy side, the literature began referring to the credit channel to study these effects. Bernanke and Blinder (1988) examine how a shock to the demand for money and credit affects aggregate demand. As an intermediate mechanism, the study shows that changes in monetary policy, such as movements in interest rates, can alter the supply of available credit, which in turn impacts the overall economy. Bernanke and Gertler (1995) and Bernanke et al. (1999) elaborate on this channel by focusing on frictions in credit markets. They find that these frictions amplify the effects of monetary policy on the economy.

Subsequently, using a more precise terminology, the bank lending channel, the literature put the focus on the supply of bank loans. Kishan and Opiela (2000) investigate how changes in interest rates set by monetary policy affect the supply of bank loans depending on their level of capitalization. They find that a 100-basis point increase in the federal funds rate induces a fall in loan growth between 3.6% and 4.4% for adequately capitalized banks; a fall between 5% and 7.3% for undercapitalized banks; and a non-significant effect for overcapitalized banks, with the exception of the smallest ones (<USD 50 million).[3]

[2] In the case of KM, the estimation is similar to a regression of credit growth between two periods against a variable that identifies the bank's exposure to an aggregate shock that may affect its credit supply. The coefficient associated with the exposure variable measures the difference in credit growth between a bank with some exposure and banks not exposed to the shock. In the case of AM, the estimation is similar to a regression of credit growth against bank-fixed effects. Here, bank-fixed effects measure the average credit growth at each bank. However, a normalization is necessary to eliminate the effect of aggregate shocks that may be related to both supply and demand factors. Usually, the bank with the highest median credit growth during that period is used as the benchmark bank.

[3] Kishan and Opiela (2000) define an undercapitalized bank as one that has capital/assets of less than 8%, an adequately capitalized bank has capital/assets between 8% and 10%, and an overcapitalized bank has capital/assets greater than 10%.

Ehrmann et al. (2001) focus on the impact of the European Central Bank (ECB)'s monetary policy on the supply of bank credit in the Eurozone. When the ECB raises interest rates, banks tend to reduce their supply of credit due to the resulting increase in the cost of funding. Faced with a 1pp increase in the interest rate, banks reduce their lending by 2.5% on average in Spain and France, and by 0.93% on average in Germany and Italy. More recently, using microdata from Spain, Jiménez et al. (2012) find that, given a 1pp increase in the interest rate, banks in the bottom decile of capitalization and liquidity reduce their lending by 11% more than banks in the top decile.

On the financial policy side, the reviewed studies focus on changes in capital requirements (Gropp et al., 2019; Fraisse et al., 2020), changes in the regulation of banks' risk provisions (Jiménez et al., 2017), or decisions to recapitalize banks in the aftermath of a financial crisis (Giannetti and Simonov, 2013; Toro, 2019). The effects on the supply of bank credit depend on how the cost of banks' capital raising is affected, with mixed results.

Unanticipated shocks, whether aggregate or idiosyncratic, affect the lending capacity of banks. Unlike policy changes, a financial shock, a debt crisis, or other local events are disruptions that potentially affect bank's health. The works of Peek and Rosengren (1997, 2000), Klein et al. (2002), Khwaja and Mian (2008), Paravisini (2008), Amiti and Weinstein (2011), Jiménez et al. (2014), Santos (2011) and Chodorow-Reich (2014) provide evidence at the bank level or bank-firm match, showing that deteriorating "bank health" leads banks to contract their lending activity.

The literature finds that the effects on credit supply are connected to the characteristics of each bank when facing the same shock; or even to the fact that some banks face it and others do not. Banks with higher levels of capitalization or liquidity, or lower portfolio risk, respond to shocks with a comparatively higher credit supply than other banks.

Peek and Rosengren (2000) provide evidence of how the Japanese banking crisis affected the operation of Japanese banks in the United States. The more capitalized Japanese banks were able to maintain their credit supply in foreign markets, while those less well capitalized had to significantly cut back on their lending operations. Gambacorta and Marques-Ibañez (2011), in their analysis of the financial crisis between 2007 and 2010 examined banks from Europe and the United States and found that banks with higher capitalization responded to the shock with a smaller contraction in credit supply. In contrast, banks with lower capitalization show a substantial reduction in their credit supply.

Khwaja and Mian (2008) show that, in the face of a negative shock, banks with high liquidity maintained their credit supply, while those with low liquidity responded with a contraction of it. They analyze the supply of credit in Pakistan during the 1998 crisis, a period marked by political and economic unrest in the country. The Pakistani government froze foreign currency deposits in commercial banks to avoid capital flight during the crisis. This caused an immediate liquidity shortage in the banking system, as banks lost access to a sizable portion of their liquid reserves which were mostly denominated in dollars. Banks with lower liquidity reserves, those that were more dependent on foreign currency deposits, responded to the shock by significantly reducing their credit supply. Conversely, banks with higher liquidity reserves were better able to sustain their lending activity.

Bottero et al. (2020) show that banks with riskier portfolios responded with a larger credit contraction to the sovereign debt crisis in Europe. Using loan-level data for Italy, the authors find that banks with larger holdings of sovereign bonds, especially from countries such as Greece, tended to significantly reduce their credit supply. Banks with lower sovereign risk were able to maintain a more stable credit supply.

3.3 Access to credit by firms

In the face of a contraction in the supply of bank credit, the reaction of firms' demand for credit determines the new equilibrium in the credit market. Several studies in the reviewed literature show that firms seek to substitute financing sources, which can be understood as a shift in the demand curve for bank credit or as a more elastic demand. In that case, the total credit taken by a firm (bank and non-bank) may not be affected as much. However, they also find that much of the effect on firms' performance occurs because of difficulties in making such substitutions. Examples of these mechanisms are presented below.

Firms resort to the corporate bond market during periods of bank credit contraction. Kashyap et al. (1993) show that this is the case in a context of tight monetary policy. Becker and Ivashina (2014) find a similar result during the global financial crisis (GFC). In this case, the crisis involves a shock of an aggregate nature, where the finding suggests some degree of robustness of the mechanism, given that substitution exists even when alternative funding sources are also affected by the shock. Finally, Leary (2009) and Levine et al. (2016) find that U.S. and Chinese firms resort to issuing equity as an alternative source of financing, despite the potential implications for corporate ownership and control structure.

Another alternative found in the literature when faced with limited access to bank credit is greater use of inter-firm credit. De Blasio (2005) shows this for small and medium enterprises in Italy during an economic recession. Fukuda et al. (2006) show a similar result for Japan. For the United States, Garcia-Appendini and Montoriol-Garriga (2013) study the GFC, finding that sectors with higher dependence on bank credit tended to compensate for the shortage by seeking more favorable terms with their suppliers. Love et al. (2007) arrive at a similar result for emerging markets.

Although firms can resort to alternatives such as issuing bonds, trade credit or stock issues to compensate for the reduced supply of bank credit, certain structural characteristics limit the effectiveness of these strategies. Small firms, especially those with no access to capital markets, face great difficulties in obtaining alternative financing (Iwaki, 2019; Leary, 2009). Highly leveraged firms, who took on bank debt but face restrictions in accessing additional credit, find few options to replace lost financing when banks restrict their supply (Becker and Ivashina, 2014). Although strong relations with banks (i.e., credit is a high percentage of the firm's liabilities, has a high volume of credit or repeated interactions) may offer some protection, these same relations may limit substitution (Becker and Ivashina, 2014); (Leary, 2009; Iyer et al., 2014; Acosta-Henao et al., 2023).

The literature finds mixed effects of a contraction in bank credit on the interest rates faced by firms. Some studies find that interest rates rise when firms face a tighter credit supply. Chodorow-Reich (2014) and Santos (2010) document this increase for U.S. firms during the GFC. These studies highlight that the increase was greater for firms that borrowed from banks that incurred higher losses. In contrast, during the same crisis, Bentolila et al. (2018) and Cingano et al. (2016) find null interest rate effects for Spain and Italy, respectively. Stiglitz and Weiss (1981) argue that, in contexts of asymmetric information, quantity effects are more likely to be found than price effects, since the borrower's risk profile can change with the interest rate and monitoring is costly.

3.4 Effects on firms' performance

This section summarizes the effects of credit supply on firm performance indicators such as investment and employment, among others. Moreover, we highlight the heterogeneity of the effects found for firms with different credit constraints.

3.4.1 Investment

Duchin et al. (2010) and Almeida et al. (2011) study the impact of the 2007 crisis on firms with different degrees of financing constraints, using data from firms in Compustat. Duchin et al. (2010) compare the effect of the crisis for firms with low and high cash-to-assets ratios, finding that a zero-cash firm reduces investment by 0.18 pp but firms with one standard deviation higher cash-to-assets ratio (0.213 points) mitigates the decline in investment by 0.10pp. Almeida et al. (2011) compare firms with more than 20% of their long-term debt maturing in the year after the crisis with those that do not meet this condition and find that the former reduced their investment by 2.2pp more than the latter (28% of the mean).

These studies suggest that firms with tighter financing constraints reduced their investment to a greater extent during the 2007 financial crisis. However, as previously mentioned, it is difficult to distinguish between changes in credit supply and demand using only firm-level data. We therefore concentrate now on studies using bank-firm data, the results of which are summarized in Figure 7.

Figure 7 shows the effects on investment of a 1pp credit supply shock for studies using bank-firm data. Before interpreting the figure, a few aspects must be considered. First, the figure includes only those studies in which the effects of a 1pp change in credit supply can be expressed or inferred based on the available information. For example, if the change in credit supply is measured in standard deviations but the standard deviation is not reported in the study, it is not included. Second, investment is measured as the ratio of investment to capital in the initial period or as the growth in capital or fixed assets; in both cases the effect is measured in percentage points. Finally, in those cases where the effect found is not significant at 10%, it is plotted as a null effect.

Often, the reviewed papers conclude that a contraction in the supply of bank credit reduces investment. However, there are exceptions such as Amiti and Weinstein (2018) and Bottero et al. (2020). The former do not find a generalized impact in Japan, but they do observe a decrease in investment by the most indebted firms. Similarly, Bottero et al. (2020) find no generalized effects in Italy, although they do identify a reduction in investment by small firms. These aspects of heterogeneity are discussed in detail in section 3.4.3.

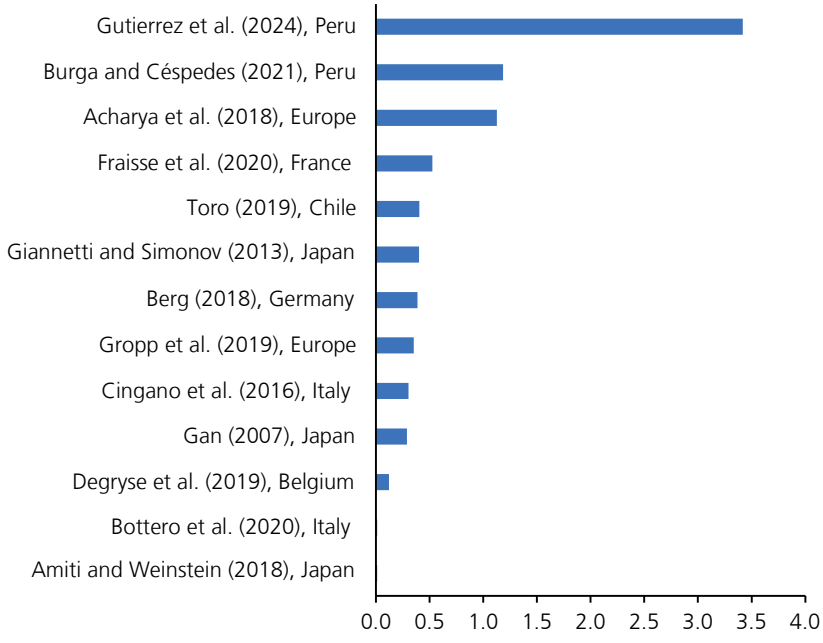
To provide an approximate magnitude of the effect, a simple average of the effects found can be calculated. On average, the studies find that the ratio of investment to capital decreases by 0.66pp with a credit supply contraction of 1pp. Moreover, there is considerable heterogeneity in the effects, which one would expect, given that the studies are based on different sources of credit supply shocks, different samples of firms, and varied geographical contexts.

Regarding the different sources of changes in credit supply, studies analyze economic or financial crises, such as the fall in real estate prices in Japan (Gan, 2007), the fall in sovereign bond prices in Europe (Bottero et al., 2020; Acharya et al., 2018), and the 2008 financial crisis (Cingano et al., 2016). Others focus on monetary or financial policies, such as bank recapitalization (Giannetti and Simonov, 2013; Toro, 2019), and changes in capital requirements (Gropp et al., 2019; Fraisse et al., 2020). There are also studies that analyze changes in market structure, such as mergers (Burga and Céspedes, 2021), a bank's internal policies for evaluating loans (Berg, 2018), and heterogeneity in the changes in the banks' credit supply (Amiti and Weinstein, 2018; Degryse et al., 2019; Gutiérrez et al., 2024).

About the different samples of firms, several studies use data from publicly listed firms (Gan, 2007; Giannetti and Simonov, 2013; Amiti and Weinstein, 2018), or from syndicated loans (Acharya et al., 2018; Gropp et al., 2019), while others also include smaller sized firms (Cingano et al., 2016; Degryse et al., 2019; Toro, 2019; Bottero et al., 2020; Fraisse et al., 2020; Burga and Céspedes, 2021).

Finally, regarding geographic contexts, there is abundant evidence for developed economies such as the United States, Japan, and several European countries. However, the evidence is scarcer for emerging economies, where studies are available for Peru and Chile (i.e., the two countries with the most intensive use of commercial credit according to the evidence presented for Latin America in section 2). In this scenario, the effects for emerging economies are at the upper end of the effects found, which is consistent with tighter credit constraints in these economies.

FIGURE 7 EFFECT ON INVESTMENT OF A CREDIT SUPPLY SHOCK (ONE PERCENTAGE POINT)(*)
(percentage points)



(*) The figure shows the effects of a 1pp credit supply shock on the investment-to-capital-stock ratio (in pp) found in different studies. The vertical axis shows the authors, year of publication, and country or region of focus. The horizontal axis indicates the magnitude of the effect. For cases where the effect is not significant at 10%, the effect is plotted as zero. Source: Authors' calculations based on the cited studies.

3.4.2. Employment

Several studies examine the effects of credit supply on employment in the United States during the Great Recession. The main motivation of these studies is that the economic recovery after the recession was characterized by slow employment growth in the United States.

For example, Duygan-Bump et al. (2015) compare the probability of moving from being employed to unemployed among workers in industries with high and low dependence on external financing. The results show that, in industries with high dependence, the probability of being unemployed is 1.2pp higher than in those with low dependence. Siemer (2019), adopting a similar strategy, focuses on employment growth and differentiated effects for small and young firms. The study concludes that there is no significant employment effect for large firms in sectors highly dependent on external financing compared to less dependent sectors. However, young and small firms do experience an impact. Employment growth is 7.2pp lower for young firms and 1.8pp lower for small firms, compared to similar firms in sectors less dependent on external financing.

Chodorow-Reich (2014) uses detailed syndicated loan data and finds that employment growth declines by 2.38pp when the supply of credit faced by a firm decreases by one standard deviation. This work is significant because, by having specific data on financing and firms with multi-bank relations, it allows controlling for the firms' demand for credit. Moreover, the results show that credit constraints do matter, even for large companies in a developed financial market such as the United States.

Figure 8 shows the results of studies that use bank-firm data to calculate the effect of a 1pp increase in credit supply on employment growth, measured in percentage points. On average, employment growth is found to be reduced by 0.28pp after a 1pp contraction in credit. However, as illustrated, several studies find null or non-significant effects.

Greenstone et al. (2020), study the effects of credit supply on employment in the United States over the period 2007-2009. Unlike Chodorow-Reich (2014), Greenstone and coauthors employ an experimental design that exploits the importance of the bank in the county and changes in small business credit at the bank aggregate level. Although they find effects on access to business credit, they do not find a significant impact on employment. This finding contrasts with the results of Chodorow-Reich (2014), but differences in methodology and firm sample might explain the different results.

A related study by Gutiérrez et al. (2023) applies a similar methodology to Greenstone et al. (2020) in the context of Mexico. These authors find that a contraction of one standard deviation in credit supply reduces employment by 1.42 pp. They suggest that this effect in Mexico, which is not observed in the United States, may be due to tighter credit constraints in emerging economies.

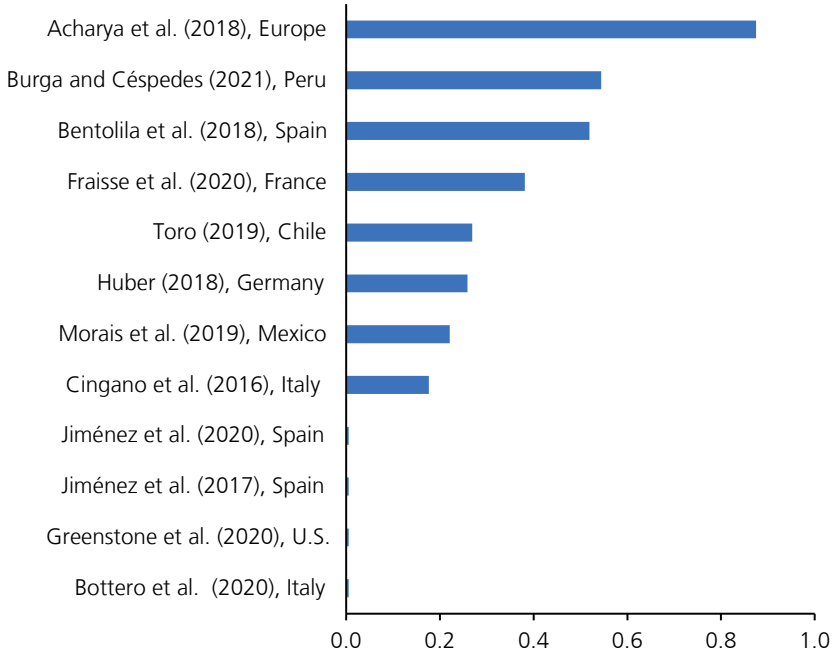
The studies by Jiménez et al. (2017, 2020) focus on the impact of credit supply on employment in Spain, using different sources of variation. Jiménez et al. (2017) explore the introduction of dynamic provisions in 2000, while Jiménez et al. (2020) investigate the increase in real estate prices and banks' exposure to mortgage lending. Both papers focus on expansionary business cycles and do not find significant effects of credit supply on employment, suggesting that such effects may be dependent on the business cycle.

The other studies presented in Figure 8 show negative effects of a contraction in credit supply on employment in different countries, and/or using different sources of variation in credit supply. For example, some papers analyze economic or financial crises (Cingano et al., 2016; Bentolila et al., 2018; Acharya et al., 2018; Huber, 2018; Popov and Rocholl, 2018), while others study changes in financial policies (Fraisse et al., 2020; Toro, 2019), bank mergers (Burga and Céspedes, 2021), or changes in monetary policy (Morais et al., 2019).

An interesting case is the study by Morais et al. (2019), who examine how changes in monetary policy in the United States or the European Union can affect credit supply in Mexico through the presence of foreign bank subsidiaries. The authors find that tighter monetary policies in developed economies have a negative effect on employment in Mexico.

Overall, the effects of changes in credit supply seems to be weaker for employment than for investment. One explanation for the lower employment effects in the face of investment is the practice of labor hoarding. According to this theory, firms prefer not to adjust employment immediately to negative shocks because of the costs of hiring, training, and loss of specific skills (Burnside et al., 1993). In contrast, capital, being less specific, is easier to adjust. Papers such as Dörr et al. (2018) and Liao (2021) show that, in the face of a credit supply contraction, investment decreases more if there are labor frictions that generate adjustment costs (Dörr et al., 2018; Liao, 2021).

FIGURE 8 EFFECT ON EMPLOYMENT OF A CREDIT SUPPLY SHOCK (ONE PERCENTAGE POINT)(*)
(percentage points)



(*) The figure shows the effects of a 1pp credit supply shock on employment (in pp) found in different studies. The vertical axis shows the authors, year of publication and country or region of focus. The horizontal axis indicates the magnitude of the effect. For cases where the effect is not significant at 10%, the effect is plotted as zero. Source: Authors' calculations based on the cited studies.

3.4.3. Other indicators

There is evidence of the effect of credit supply on other business variables such as sales, exports, and prices. There is also evidence of indirect effects through the value chain.

With respect to exports, in the case of Peru, Paravasini et al. (2015) find that, during the financial crisis of 2007-2009, a reduction in credit supply negatively affected the intensive margin of exports. Similarly, for Pakistan, Zia (2008) finds that the elimination of a credit subsidy between 1998 and 2003 led to a decline in exports by smaller firms, although larger and better-connected firms did not suffer the same impact (consistent with evidence that more financially constrained firms are more adversely affected).

On the prices side, some recent studies find mixed results on the effects of credit supply shocks on product prices. For example, Meinen and Soares (2022) for Germany and Renkin and Zullig (2024) for Denmark find price increases, while Kim (2021) for the United States and Lenzu et al. (2023) for Belgium find price reductions.

As for indirect effects through the value chain, the literature highlights the importance of trade credit as a key channel for the transmission of financial shocks. For the United States, Costello (2020) points out that firms that experience a negative credit supply shock reduce the trade credit they grant to their customers, which increases credit risk and affects the employment of those customers, propagating the shock along the chain (downstream propagation). For Spain, Alfaro et al. (2021) find evidence of this propagation in terms of employment, production, and investment, although they do not obtain conclusive results on the reverse (upstream) propagation. In turn, Huremovic et al. (2023) finds that the negative effects on bilateral sales are more pronounced when shocks affect customers rather than sellers, which could be explained by a higher elasticity of substitution among suppliers.

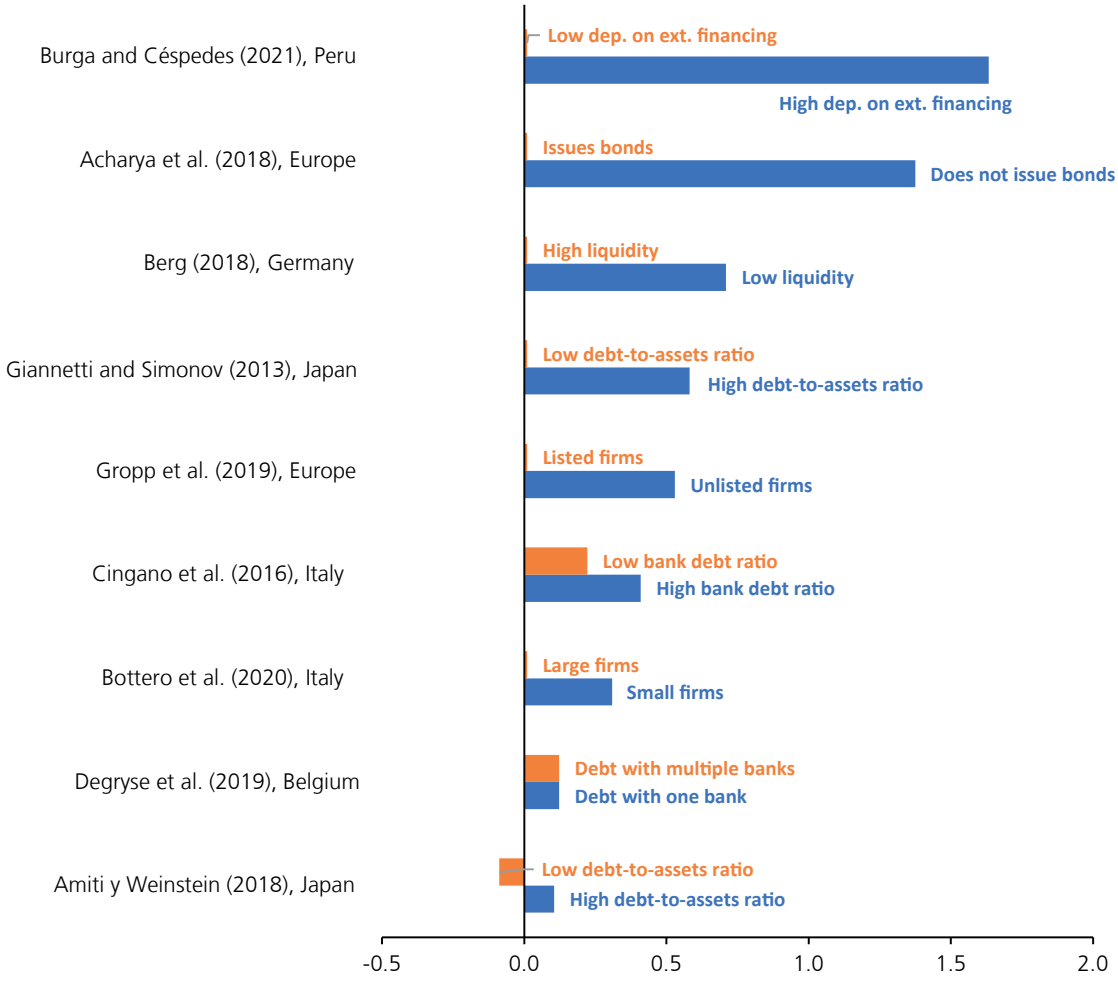
3.4.4. Heterogeneity

The reviewed results, especially on investment and employment, show some dispersion. This heterogeneity could be explained by differences in the credit constraints faced by firms, that vary according to the country, the business cycle, and firm-specific characteristics, such as size, financing alternatives and capital needs.

To quantify the importance of these factors, Figure 9 summarizes the heterogeneity observed in the studies reviewed. This figure suggests that the firms' characteristics are crucial to understanding the effects of credit supply. In general, firms more dependent on bank credit are more vulnerable to a credit supply shock. For example, the effects are larger for firms in industries with higher dependence on external financing (Burga and Céspedes, 2021), firms that do not issue bonds (Acharya et al., 2018), firms with lower liquidity (Berg, 2018), more indebted firms (Giannetti and Simonov, 2013; Amiti and Weinstein, 2018), unlisted firms (Gropp et al., 2019), firms with high bank indebtedness (Cingano et al., 2016), and small firms (Bottero et al., 2020).[4]

[4] On the other hand, there do not seem to be significant differences as a function of the number of banking relations (Degryse et al., 2019), although it should be noted that most studies cannot analyze this margin, as they use samples of firms with multiple banking relations.

FIGURE 9 EFFECT ON INVESTMENT OF A CREDIT SUPPLY SHOCK (ONE PERCENTAGE POINT). HETEROGENEITY IN FIRMS' CHARACTERISTICS (*)
(percentage points)



(*) This figure shows the effects for different groups of firms of a credit supply shock of 1 pp on the ratio of investment to capital stock (in pp) found in different research papers. The vertical axis identifies the authors, year of publication and country or region of focus. The horizontal axis indicates the magnitude of the effect. For each research paper, the orange bar indicates the effect for firms with more financing alternatives and/or fewer credit restrictions and the blue bar indicates the effect for firms with fewer financing alternatives and/or more credit restrictions. For cases where the effect is not significant at 10%, the effect is plotted as zero. Likewise, when the difference in the effect between the two groups is not significant at 10%, the same effect is plotted for both groups. Source: Authors' estimations based on the cited studies.

4. CONCLUSION

The analysis presented in this note highlights that bank credit is an important source of financing for firms in Chile, representing a significant part of their debt structure. The cited literature demonstrates that fluctuations in credit supply, influenced by aggregate or individual economic shocks, as well as monetary and financial policies, can have a tangible impact on the performance of firms, particularly on their ability to invest and hire. In turn, it is evident that the firms most vulnerable to these changes are those with greater credit constraints, such as small firms or those with limited access to alternative sources of financing.

In particular, the evidence shows that the ability of banks to continue lending during periods of contraction depends on their characteristics. Banks with higher capitalization, better liquidity and lower-risk portfolios tend to maintain a more stable credit supply, even during a crisis. The studies cited in this note achieve a credible identification of the effect of bank credit supply by using bank-firm level data and exploiting heterogeneity in bank exposures to generate idiosyncratic supply shocks.

The contraction in the supply of bank credit has a negative effect on firms' investment decisions, this variable being the most sensitive to credit constraints. Although adverse effects on employment are also observed, the results are not as strong, with some studies finding no significant relationship between credit constraints and the level of employment. In addition, a contraction in credit supply affects other important variables, such as exports, which tend to decline, and prices, where the evidence is mixed. Indirect impacts along the value chain are also important, as shocks to the lending capacity of customers or suppliers affect the firm indirectly.

Finally, it is important to highlight evidence of heterogeneity in the responses of both banks and firms. The observable characteristics that shape this heterogeneity can serve to inform the expected impacts of policies, whether aimed at strengthening the banking system or at reducing barriers credit access.

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APPENDIX

There are two main methodologies to exploit bank-firm data that measure the effect of changes in credit supply on firm-level variables: Khwaja and Mian (2008) -KM- and Amiti and Weinstein (2018) -AW-. The main idea is to use firms that have banking relations with more than one bank (multi-bank firm) to control for credit demand using firm-fixed effects.

Both methods identify, in a first stage, the supply shocks of bank credit and then, in a second stage, estimate the effects of supply shocks on firms' financing conditions and real variables such as investment and employment, among others. The differences between the two methods are in the first stage.

KM propose estimating: $\Delta Debt_{f,b}=\alpha_f+\beta X_b+\varepsilon_{f,b}$,

where $\Delta Debt_{f,b}$ is the percentage change in the firm f's debt with bank b, α_f is a firm-fixed effect that captures changes in the demand for credit, X_b is a measure of the exposure of bank b to a shock or policy change that may affect its credit supply (for example, the shock may be the sovereign bond crisis in Europe and the exposure to the importance of sovereign bonds in the bank's balance sheet), and $\varepsilon_{f,b}$ is an error term.

In KM (2008), the change in credit supply of bank b is: $\Delta Credit\ Supply_b=\beta X_b$.

In turn, AW propose estimating: $\Delta Debt_{f,b}=\alpha_f+\beta_b+\varepsilon_{f,b}$,

where β_b , is a bank-fixed effect that measures the change in bank b's credit supply, i.e., $\Delta Credit\ Supply_b=\beta_b$

Once the changes in bank credit supply have been identified, the second stage is the same for both methods. They first estimate the change in credit supply faced by firm f as

$\Delta Credit\ Supply_f = \sum_b \omega_{f,b} \Delta Credit\ Supply_b$,

where $\omega_{f,b}$ is the share of the debt that firm f has with bank b in the total bank debt that firm f has in a baseline period.

Next, they estimate the effect of the change in credit supply on the firm's variables, thus:

$Y_f=\alpha+\theta\ \Delta Credit\ Supply_f + \varepsilon_{f,b}$,

wher Y_f is a variable of the firm related to the funds as an amount loaned, the interest rate on the loans, and other financing conditions, or related with the firm's performance, like investment, employment, or sales.[5]

[5] Actually, Khwaja and Mian (2008) propose estimating in the second stage the equation $Y_f=\alpha+\rho\ \hat{X}_f+\varepsilon_{f,b}$, where $\hat{X}_f=\sum_b \omega_{f,b} X_{f,b}$ is the average exposure of firm *f*. This model is equivalent to the previous one if we make $\theta=\rho/\beta$.