

BOX IV.4 THE AGGREGATE EFFECTS OF THE INTERACTION BETWEEN BANKS AND FIRMS AND FEEDBACK MECHANISMS

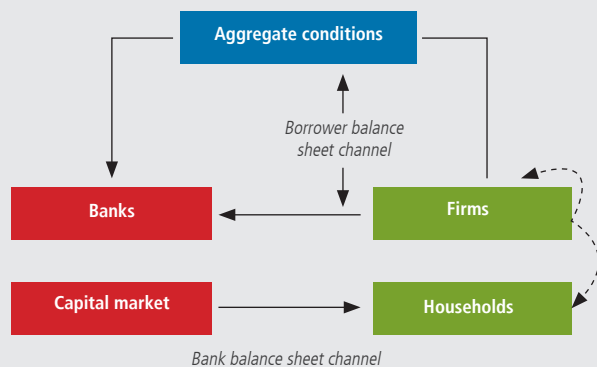
At the aggregate level, the impact of adverse shocks on banks or firms can be amplified through various feedback mechanisms (Kiyotaki and Moore, 1997; Bernanke et al., 1999). For example, a persistent output contraction that generates an increase in firms' default could trigger a contraction in the bank credit supply that intensifies the impact of the initial shock and reinforces the increase in default. This type of second-round effect is not picked up in the stress tests presented in this *Report*, since they are centered on a more detailed analysis at the individual level.

This box illustrates how the feedback mechanisms between banks and firms work, thereby complementing the analysis presented in section 5 of this chapter. To that end, the discussion addresses the most important interactions and mechanisms identified in the literature and illustrates their effects by simulating a surprise increase in corporate risk in a general equilibrium model for Chile developed by Calani et al. (2019), based on Clerc et al. (2015).

Financial frictions and the interaction between banks and firms

The economic literature identifies different mechanisms through which the interaction of the real and financial sectors can trigger episodes of financial instability (diagram IV.3).

DIAGRAM IV.3
Links between the real and financial sectors



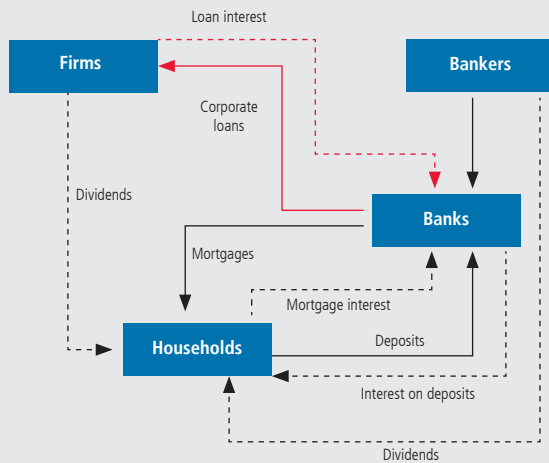
Source: Central Bank of Chile.

Essentially, the existence of financial frictions, which arise due to different types of information asymmetries in the credit markets and which are manifested as a difference between the external and internal funding costs for firms, allow shocks from the real sector to be amplified by the financial sector, and vice versa. The mechanisms through which this amplification of the initial shocks can be generated are inherently general equilibrium phenomena, and they can be classified into two groups: mechanisms that magnify the effect of an adverse shock on the lender's balance sheet; and those that magnify their effect on the borrower's balance sheet. In the former group, the amplification is generated by the effect of default on the behavior of lenders, who, by tightening the credit supply, end up amplifying the default trend that led them to do so in the first place. In the second group, the amplification is generated by the second-round effects deriving from the change in the value of assets on the borrower's balance sheet, which, in turn, affects the borrower's access to credit. The literature identifies these mechanisms through the notion of the financial accelerator^{1/}.

In this line, the dynamic stochastic general equilibrium (DSGE) model used for the simulation, designed and calibrated for Chile, incorporates a financial module in which credit relationships between banks and firms are characterized by information asymmetries. In this sense, the banks must incur a cost for knowing the return on the investment projects that they are helping to finance. This asymmetry generates a financial friction that is manifested in constraints on firms' access to bank credit (diagram IV.4).

^{1/} Recent works on the existence of a financial accelerator include Christiano et al. (2014), Clerc et al. (2015), and Brunnermeier and Sannikov (2014). For detailed review of this literature, see BIS (2011) and Brunnermeier et al. (2013).

DIAGRAM IV.4
Financial module of the DSGE model (*)



(*) Arrows represent the flow of funds and payments between lenders and borrowers. Red lines represent interactions between banks and firms that are characterized by the existence of financial frictions.

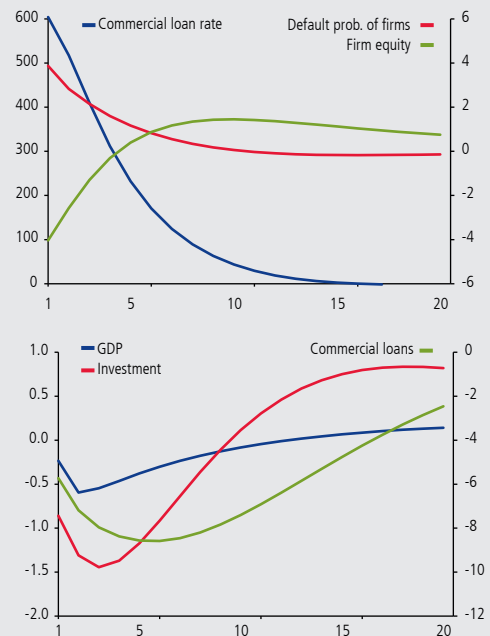
Source: Based on Calani et al. (2019).

The magnitude of the constraints on credit access facing a given firm depends on the value of its equity, which acts as collateral on its debt. To the extent that a firm has less equity, it must either reduce its investment or accept higher interest rates on financing, which makes it more sensitive to a contraction in sales. Similarly, in the model, the existence of the same type of financial frictions makes the banks vulnerable to default episodes, since they must support the losses of firms that record negative returns on their investment projects.

In this context, the exercise analyses the aggregate impact of an unexpected increase in the uncertainty of the companies' returns^{2/}. With this increase, a larger share of firms earns negative returns, and an equally large share receives positive returns, such that, in the absence of financial frictions, the increase in corporate risk would not have a direct impact on the economy's performance. Thus, all the effects of the simulated shock derive from the existence of financial frictions between banks and firms.

^{2/} The shock used increases the variance of returns on corporate projects financed with bank debt, without affecting the average return. The magnitude of the shock is calibrated to replicate the increase in loan spreads observed in October 2008.

FIGURE IV.22
Effects of a corporate risk shock at a horizon of 20 quarters, DSGE model (*)
(basis points and percent)



(*) Impulse responses of the probability of default (%) and commercial loan rate (bp) expressed in deviation from the steady state. GDP, investment, commercial loans, and firm equity expressed in percent deviation from the steady state.

Source: Calani et al. (2019).

In line with the results in the literature, the exercise shows that an increase in corporate risk generates a higher default probability in the sector. This increase in default generates losses for the banking sector and puts upward pressure on commercial loan rates for all firms. At the same time, a lower demand for capital reduces the value of the firms' equity, which, on increasing their leverage, face higher interest rates to finance the same projects. Both effects generate a tightening of the constraints on the firms' access to credit and, therefore, a contraction of output, which reinforces the increase in default. Thus, both feedback mechanisms contribute to amplifying the adverse impact of the initial shock (figure IV.22).



At the aggregate level, the increase in uncertainty has persistent effects. Investment and output fall immediately, and they only begin to recover to the extent that credit conditions in the economy improve. An increase in the value of the firms' equity and a reduction in their leverage level allows the interest rate on commercial loans to return to the equilibrium level (figure IV.22).

Conclusions

This box shows that in the face of large real or financial shocks, the interaction mechanisms, through changes in prices and aggregate conditions in the economy, can explain a large share of the fluctuations in variables that are critical for financial stability, such as default rates and the volume of credit. Usually, these mechanisms cannot be captured by an individual-level analysis, which highlights the importance of complementary tools, such as general equilibrium models, for the analysis of financial stability.

The box also emphasizes the importance of constraints on firms' access to credit in the propagation and amplification of adverse shocks. To the extent that a larger number of firms face constraints on their access to financing, the aggregate impact of these shocks is magnified. This is directly related to the evidence presented in box IV.3, which analyzes the role of bank financing on access to credit by firms that use local financing. This box presents empirical evidence for Chile on the financial constraints faced by some firms and their implications during periods of financial stress.