CHANGES IN BANK CAPITAL AND LENDING: A MICROECONOMIC APPROACH

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Introduction

During the period 1996-2007, in an environment characterised by relative macroeconomic stability, significant accumulation of savings at the global level and exceptionally loose financial conditions, bank lending to the non-financial private sector grew significantly in a large number of advanced economies, with the highest rates recorded in those experiencing property booms. The outbreak of the financial crisis and, in some cases, the house price correction triggered a deterioration in private-sector balance sheets and cut off flows of bank financing to households and firms. Against this background, there has been an intense debate about the relative contribution to changes in bank lending of supply-side factors (deriving from the weakness of banks' solvency position, linked to the rise in default rates) and demand-side factors (associated with the sharp fall in activity and, in some cases, the need to reduce the level of private-sector debt).

As regards the supply of credit, various studies have attempted to confirm the existence of a link between changes in a bank's capital and its ability to lend. In the presence of perfect markets the level of capital of a financial institution would have no effect on the amount of financing granted to projects with an appropriate return-to-risk ratio. However, the existence of various financial frictions (such as those arising from information asymmetries between banks and their customers) means that the supply of credit may be limited when the level of capital of an institution is below certain levels. Specifically, in a recessionary environment, the existence of minimum capital requirements, rising default rates that eventually lead to a fall in capital and the greater difficulty of obtaining additional capital may, in principle, have a negative impact on the supply of credit.

To be able to distinguish between the contributions of supply and demand-side factors to changes in lending, it is necessary to solve what in economics terminology is known as an identification problem. The impact of changes in banks' capital on the amount of credit available cannot be inferred simply from changes over time in aggregate lending, owing to the existence of factors that simultaneously affect the level of banks' capital and firms' demand for credit. To resolve this problem, the literature has frequently resorted to microeconomic data, in order to compare the lending of banks with different amounts of capital. However, these comparisons only enable the effect of supply-side factors to be isolated on the assumption that all banks face the same demand behaviour, which is unlikely when financial institutions often specialise in different types of agents, whose solvency may change in different ways over the business cycle. Other studies have combined information on banks and firms or have analysed the impact of one-off changes in capital, linked to factors or events that are barely correlated with changes in the demand for credit.

Following this latter approach, this article presents the results of a study that analyses the impact of changes in bank capital on lending to firms, by comparing financial institutions with different degrees of exposure to the real estate sector and facing different house price

1 This article is a summary of "The recent slowdown of bank lending in Spain: are supply-side factors relevant?", *Working Paper Series,* No. 1206, Banco de España.

changes (depending on the provinces in which they operate).[2] Following a brief review of the empirical literature that has analysed, using diverse methodological approaches, the impact of changes in banks' solvency position on their supply of credit, the methodological approach used to isolate the effect of factors associated with the supply of credit is described in greater detail. Finally, the results of this approach, based on disaggregated data obtained from the balance sheets of Spanish banks between 1995 and 2009, are summarised.

Previous results for the relationship between bank capital and the supply of credit

In the context of the current recession, various studies have used different methodologies to identify the extent to which the composition of banks' balance sheets affects their lending. Cornett et al. (2011) find that, in periods in which external financing conditions became more restrictive, US banks with a lower level of capital or liquidity reduced their lending to a greater extent, and that this contraction explains practically the whole of the fall in aggregate lending to firms. To control for demand factors, they use variables based on the geographical location of banks. In the European case, Hempell and Kok Sørensen (2010), using data from the ECB's Bank Lending Survey, also find that factors relating to banks' balance sheets explain part of the fall in aggregate lending to firms in the euro area, when the qualitative variables that, according to the responses to the Bank lending Survey, capture demand factors are held constant. Finally, Watanabe (2007) considers a legal change in Japan, which forced banks to recognise losses, generating a drastic change in the level of capital. Watanabe argues that the decline in lending in Japan in the period considered was practically entirely due to the reduction in capital.

An initial problem in these analyses is how to distinguish the effects on lending of changes in bank capital from those deriving from differences in firm solvency. A possible solution is to use linked data for firms and banks in order to fully accommodate the heterogeneity of the solvency of the former. The aim would be to compare whether banks with different levels of capital apply different credit standards to the same firm.[3] The results differ according to the country and period considered. Albertazzi and Marchetti (2010) find, for a set of Italian banks, that supply-side factors affect lending growth, while Jiménez et al. (2010) find a limited role for increases in Spanish bank liquidity during the upswing, when it is taken into account that firms that receive less credit than desired from a bank can supplement it with loans from other suppliers. In any event, these studies only use firms that receive loans from at least two banks during a particular time period. This may distort the results, since such firms have specific characteristics which affect their level of solvency: they tend to be older, depend to a greater extent on bank financing and have a higher level of assets.[4] Accordingly, the factors that determine the growth of credit granted to these firms cannot always be extrapolated to the rest of the economy. Moreover, the supply of credit depends not only on the current level of capital, but also on its expected growth.

Bank capital, exposure to the real estate sector and supply of credit

To estimate the impact of the level of banks' capital on lending, Hernando and Villanueva (2012) propose analysing a sample of banks that have experienced greater difficulty generating capital during the period analysed for reasons largely unrelated to the solvency of the firms demanding bank funds. If these banks reduce their lending by a greater degree

2 See Hernando and Villanueva (2012).

3 Econometrically, the way to implement this strategy involves including dummy variables for year and borrowing firm in a regression of lending granted to a firm on the capital ratio of each lending bank. Albertazzi and Marchetti (2010), Jiménez et al. (2010, 2011), Gan (2007) and Khwaja and Mian (2008) use variants of this methodology to explain either the probability that a loan is rejected or else the growth in lending to a firm.

4 See Karaivanov et al. (2010).

than the banking system as a whole, it would be reasonable to think that supply-side factors have played an important role in the growth of their lending. Hernando and Villanueva (2012) argue that banks specialising in real estate development are, owing to their greater exposure to house price changes, less able to generate capital during a recession like the current one, without the solvency position of the firms to which they lend necessarily being worse than that of other firms.

The database used contains data for all Spanish commercial and savings banks and combines information on capital and risk-adjusted assets at the consolidated group level with data for total lending by each bank at the sector level (distinguishing between 20 sectors) and for problem loans (with the same sectoral breakdown). Specialisation in the real estate sector is measured in terms of the average proportion of total lending to real estate development during the period 1995-97, i.e. before the start of the upswing that ended in 2007. The database is organised in such a way that each observation represents the credit extended by each bank to each industry, so that the sample has around 1,300 observations for each year.

The strategy to identify the effects of bank capital on the supply of credit using these data consists of two steps. First, it is established that financial institutions specialising in real estate development between 1995 and 1997 experienced greater falls in capital at the start of the recession.[5] Second, it is examined, by estimating linear models again, whether these same banks, which specialise in the financing of real estate development, reduced their lending to other sectors to a greater extent.[6]

In order to take into consideration the effects of possible expected changes in capital, the rate of problem loans, which approximates these anticipated future capital requirements, is introduced as an explanatory variable.[7]

Results

The first stage of our analysis examines the growth of banks' capital from 2004, distinguishing on the basis of level of specialisation in real estate development. The growth of capital is determined, among other factors, by the ability to retain earnings, so the banks specialising in real estate development can be expected to have been less able to accumulate capital from 2008, when house prices began to fall.

Analysis of the growth of capital between 2004 and 2011 reveals that the banks which concentrated a larger fraction of their banking book in real estate development loans between 1995 and 1997 recorded, in the years leading up to the 2009 recession, very similar growth in capital to that of other banks.[8] By contrast, specialisation in real estate development does explain the lower growth of capital in 2009 when house prices had already been falling for around one year (see left-hand panel of Chart 1). Specifically, in a comparison of banks which are similar except for a 1 pp difference in their specialisation in the real estate development sector in 1995, the capital of the most highly specialised banks grew by 1 pp less in 2009.

5 This analysis is performed using linear regression models for each year during the period 2004-09. In the linear regression other variables are held constant, such as nine indicators of the region in which the bank has the largest number of offices, the ratio of capital to assets and the proportion of problem loans in 1998, the type of bank (savings or commercial) and the increase in average house prices in the provinces in which the bank operates, weighted by the number of branches.

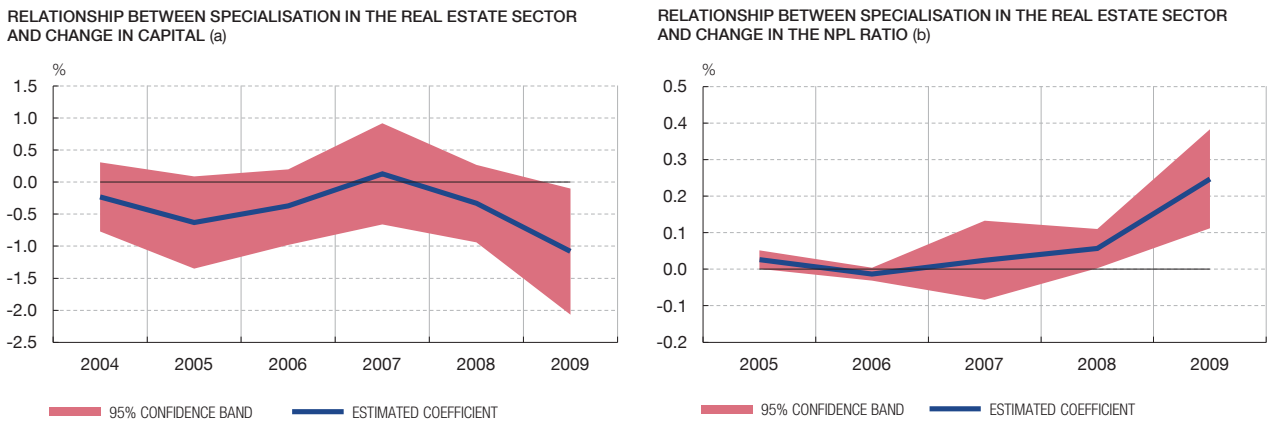
6 The variables mentioned in Footnote 5 and dummy variables for each industry are held constant in each linear regression.

7 See Hernando and Villanueva (2012).

8 The coefficient of a linear regression of year-on-year growth in capital on specialisation in real estate development between 1995 and 1997 is around zero in the expansionary period.

SPECIALISATION IN THE REAL ESTATE SECTOR AND CHANGE IN CAPITAL AND IN THE NPL RATIO

CHART 1



SOURCE: Hernando and Villanueva (2012).

a The chart shows the estimated effect (in linear regressions for each year of the sample) on capital growth of a 1 pp rise in exposure to the real estate sector (measured as a percentage) between 1995 and 1997.

b The chart shows the increase in the fraction of non-performing loans predicted to arise from a 1 pp increase in exposure to the real estate development sector for a bank located in a province in which the rise in house prices between 2004 and the year in question stood in the 10th percentile.

The results also suggest that the banks which at the beginning of the expansion had a larger fraction of their credit portfolio concentrated in real estate development loans experienced a very similar increase in the proportion of doubtful loans to that of other banks during the period 2004-2007. However, from 2008 non-performing loans (NPL) ratios began to increase among banks specialising in real estate development, and this trend became more marked in 2009 (see right-hand panel of Chart 1). Thus, from 2008 these banks faced not only lower growth of capital, but also higher capital requirements in the future.

Significantly, the differences in the NPL ratio associated with specialisation in the real estate development sector are only appreciated in the loans to that sector (see Chart 2). In other productive sectors, the relationship between the fraction of doubtful loans and specialisation in real estate development is statistically very weak. This suggests that the solvency of the non-real estate firms which borrowed from these specialised banks in 2009 was not very different from that of the firms which borrowed from non-specialised banks.

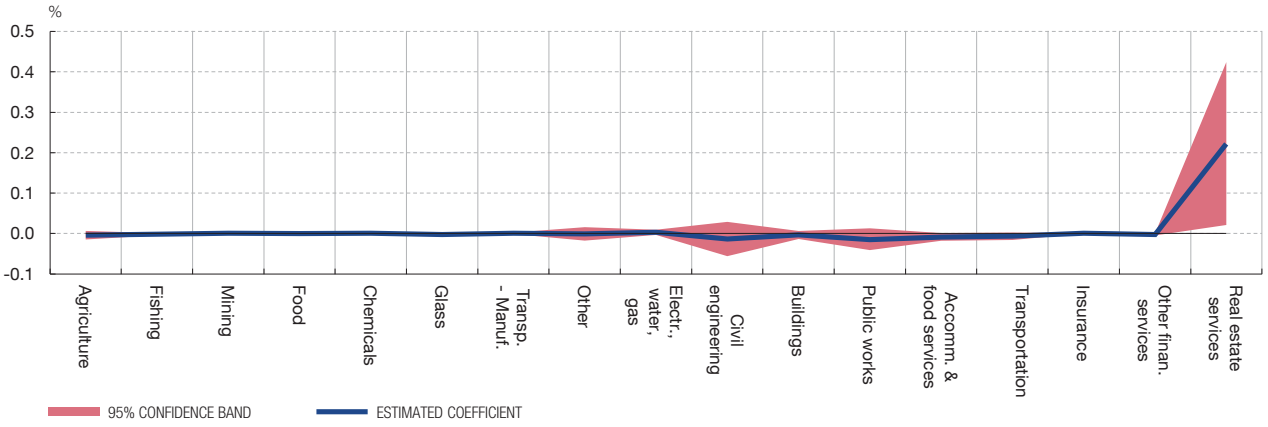
The second stage of our analysis looks at whether banks specialising in real estate development granted less credit than others. For this purpose, use is again made of linear regressions of year-on-year credit growth (by bank and by sector) on specialisation in real estate development.[9] More specifically, an estimate is made of whether, in each year considered and holding constant the entity type, its regional branch distribution and a 10-year lag in the NPL ratio and the asset level, the banks specialising in real estate development reduced their lending to a standard sector more than other lenders did.

During the expansionary phase between 2004 and 2007, the variables representing specialisation in real estate development and growth in lending to firms showed a correlation

9 Specialisation includes variables such as entity type and the region in which the bank's branches are mostly located, as well as a dummy variable for sector.

RELATIONSHIP BETWEEN SPECIALISATION IN THE REAL ESTATE SECTOR AND THE RISE IN NPLs in 2009, BY PRODUCTIVE SECTOR (a)

CHART 2



SOURCE: Hernando and Villanueva (2012).

a The chart shows the increase in the NPL ratio of each industry predicted to arise from a 1 pp increase in exposure to the real estate development sector for a bank located in a province in which the rise in house prices between 2004 and the year in question stood in the 10th percentile.

GROWTH OF CAPITAL AND CREDIT IN 2009 AND EXPOSURE TO THE REAL ESTATE SECTOR BETWEEN 1995 AND 1997 (a)

TABLE 1

	Effect of a 1 % increase in specialisation in real estate development on:		Effect of a 1 % increase in capital on:
	Increase in capital (b)	Credit growth (c)	Credit growth
Without considering anticipated future changes in capital			
1 All sectors	-1.00	-0.91	0.789
2 Sectors not related to construction	-1.00	-0.95	0.830
Considering anticipated future changes in capital			
3 All sectors	-1.50	-1.46	0.638
4 Sectors not related to construction	-1.50	-1.63	0.610

SOURCE: Hernando and Villanueva (2012).

a Data from banks' accounting returns, on credit and fraction of doubtful loans by industry and on consolidated group capital in 2009 are used [see Hernando and Villanueva (2012)]. All the coefficients are significant at 5 %.
b The coefficients, measured by ordinary least squares, measure how the growth of capital changes in 2009 on the basis of the fraction of assets between 1995 and 1997 assigned to real estate development. Held as constant are the type of bank (commercial or savings bank), the region where its presence is greatest, the change in average house prices between 2005 and 2008 in the provinces where the bank operates, and its level of assets and doubtful assets in 1998. Rows 3 and 4 add interaction between specialisation in real estate development and average house prices between 2005 and 2008.
c The coefficients measure how the growth in credit changes in 2009 according to the fraction of assets between 1995 and 1997 that was allocated to real estate development. In addition to the regressors mentioned in footnote b, the specification includes 21 industry indicators.

of around zero. The relationship between these two variables changed in 2009, in which year a linear regression suggests that 1% higher specialisation in real estate development reduces the growth of credit to the industry of reference by 1%. Combining these results with those from the previous stage, a fall in capital of 1 pp results in an average contraction of credit extension of 0.79 pp (see Table 1) when anticipated changes in the bank's capital are disregarded, whereas when anticipated future losses are taken into account the contraction decreases to 0.64 pp.

To use these results to estimate what portion of the fall in credit extension between 2008 and 2009 is explained by the supply-side factors identified in this study, we now have to factor in the change in banks' capital in this period. Although most banks raised their levels of capital between 2008 and 2009, it is generally accepted that the markets required more capital. This lag with respect to the "desired" capital ratios would foreseeably operate the same as a capital shortfall. Thus, taking a level of 7% as a reference point for the ratio of capital to risk-adjusted assets, the bank capital channel would explain only 6% of the contraction in credit extension in 2009. If the reference point were a level of 8%, the bank capital channel would account for around 27% of the fall in credit in 2009.

Conclusion

The evaluation of the relative contributions of demand and supply factors to credit growth comes up against what in economic terminology are known as identification problems, i.e. the existence of factors (the business cycle, among others) which determine simultaneous movements in credit supply and demand. Bank lending surveys (conducted by the central banks of the main developed economies), which explicitly distinguish between the two components, are limited to qualitative information. To assess empirically the influence of changes in capital on lending, a methodological approach based on analysing the impact of capital variations not linked to demand has been proposed. Specifically, the historical exposure to the real estate sector is used to proxy the change in capital at the onset of the crisis.

The results suggest that the banks traditionally most highly exposed to the real estate development sector reduced their lending comparatively more to sectors not related to construction. However, the size of that reduction was modest.

11.2.2013

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