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# IS THERE A BANK LENDING CHANNEL OF MONETARY POLICY IN SPAIN?

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December 2001

EUROSYSTEM MONETARY TRANSMISSION NETWORK

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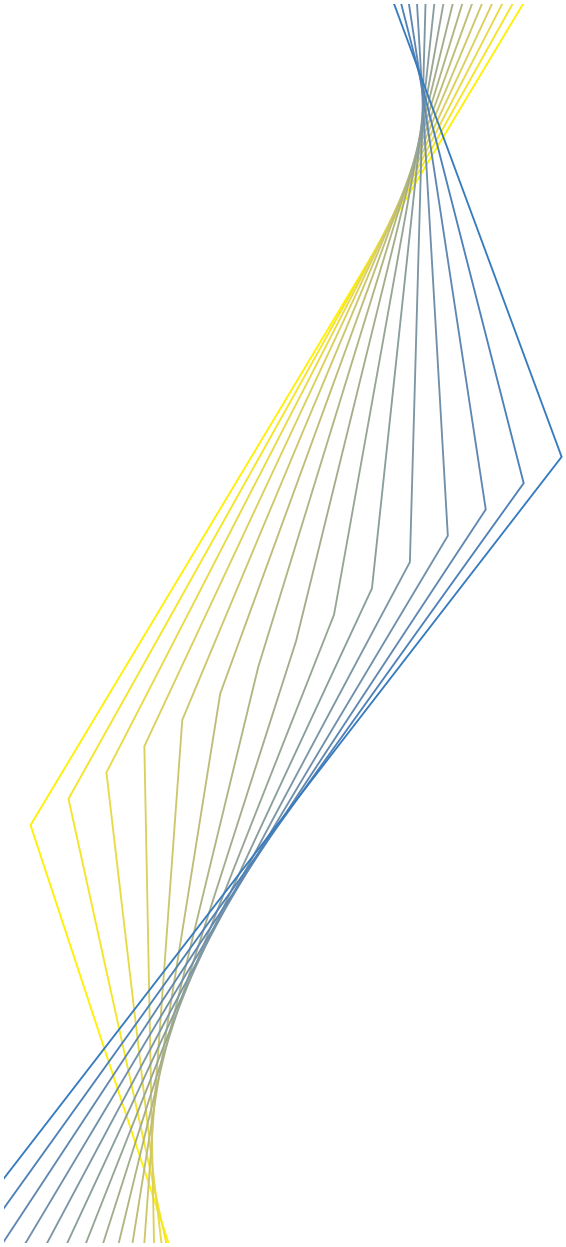

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# IS THERE A BANK LENDING CHANNEL OF MONETARY POLICY IN SPAIN?[1]

BY IGNACIO HERNANDO AND JORGE MARTÍNEZ-PAGÉS*

December 2001

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1 *This paper is part of a joint project undertaken within the Monetary Transmission Network (MTN) of the Eurosystem. It has benefited greatly from extensive discussions within that group. The authors also wish to thank J. Ayuso, J. Galí, L. Gambacorta, F. Restoy, T. Sastre and J. Vallés for their useful comments and suggestions. Nevertheless, the opinions expressed in the paper are of the authors alone.*

## The Eurosystem Monetary Transmission Network

This issue of the ECB Working Paper Series contains research presented at a conference on "Monetary Policy Transmission in the Euro Area" held at the European Central Bank on 18 and 19 December 2001. This research was conducted within the Monetary Transmission Network, a group of economists affiliated with the ECB and the National Central Banks of the Eurosystem chaired by Ignazio Angeloni. Anil Kashyap (University of Chicago) acted as external consultant and Benoît Mojon as secretary to the Network.

The papers presented at the conference examine the euro area monetary transmission process using different data and methodologies: structural and VAR macro-models for the euro area and the national economies, panel micro data analyses of the investment behaviour of non-financial firms and panel micro data analyses of the behaviour of commercial banks.

Editorial support on all papers was provided by Briony Rose and Susana Sommaggio.




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## Contents

## Abstract

This paper uses panel data on banks, for the period 1991-98, to test the existence of a bank-lending channel in the Spanish economy. In order to distinguish between loan demand and supply movements, several exercises are performed. First, we analyse the differential responses, to monetary policy changes, of bank lending by banks with different size, liquidity and capitalisation. Second, we analyse the response to an exogenous deposit-reducing shock (a tax-induced shift from deposits to mutual fund shares). As this involves a pure loan supply shock, it best solves the above-mentioned identification problem. Our results are mostly against the existence of a bank-lending channel in the period under analysis. This result appears to be related to the important role of many small banks as collectors of savings, meaning they have a large volume of resources available for lending.

*JEL classification:* C23, E44, E52, G21

*Keywords:* bank lending, bank funding, monetary transmission mechanism

## Non technical summary

The literature on the credit channel in the monetary transmission mechanism emphasizes the role of bank lending. Two mechanisms have been suggested for monetary policy changes to affect bank loan supply: the balance sheet channel and the bank lending channel. This paper focuses on this latter channel and tries to find evidence of its existence in the Spanish economy in the 1990s, using a comprehensive panel dataset on banks.

The bank lending channel is based on the existence of asymmetric information among banks and their lenders. More precisely, a monetary policy tightening, since it translates into a reduction in deposits, entails a lower amount of loanable funds. To the extent that banks (at least, some of them) are unable to offset this reduction in loanable funds, due to informational frictions between them and their providers of funds, there will also be a fall in bank loan supply. Since informational frictions are expected to be more important for small and less capitalised banks, the use of panel data is particularly useful in this context. It is also usually assumed that banks with more liquid assets are able to cushion their loan customers from reductions in deposits.

Consequently, both the responses of bank deposits and bank loans to monetary policy changes are analysed. We found that deposits tend to fall after a monetary policy tightening, although the evidence on this is somewhat weak. On the loan side, we have tried to overcome the critical identification problem of disentangling loan supply effects from loan demand effects when analysing the response of bank loans to monetary policy changes.

For this purpose, we have followed first the approach of Kashyap and Stein (1995), by analysing cross-sectional differences in the response of total loans and of different types of loans (loans to firms, mortgage loans and consumer loans) to changes in monetary policy. We fail to find differences in the response of loan growth to monetary policy changes for Spanish banks either of different sizes or of different degrees of capitalisation. However, we find some evidence that less liquid banks may display a stronger response than banks with a higher degree of liquidity, although this evidence seems to be explained mostly by a loan-portfolio-composition effect rather than by a genuine difference in the loan-supply response.

Moreover, we perform an alternative test, based on the response to an exogenous shock to deposits, that has the advantage of better identifying loan supply movements and of being of greater importance in our sample period. The particular shock we use derives

from the tax-induced development of mutual funds in the Spanish economy during this period. This being a deposit-reducing shock, there is no reason to expect it to affect loan demand. Therefore, any impact of the shock on loan growth can be safely interpreted as a supply effect and, consequently, can be taken as evidence in favour of the bank-lending channel. However, we find no evidence that the sizeable reduction in deposits due to the shifts towards mutual fund shares affected the ability of even the smaller, less liquid and less capitalised banks to satisfy loan demand.

Overall, although the comparison between the balance sheets of large and small banks and of their different balance-sheet responses to a funding shock points towards a significant difference in the ability of small and large banks to resort to uninsured market sources of financing, our results are mostly against the existence of an operative bank-lending channel in the Spanish economy in the 1990s. One factor that seems to be critical to these results is the role of liquidity. Spanish banks –and, particularly, small banks- have maintained during the 1990s levels of liquid assets sufficient to offset even very significant shocks to their traditional sources of funds. The reason why small banks maintain high levels of liquid assets might be related to the role of main collectors of savings that they have traditionally played in the Spanish economy. In some cases, it appears that this role of collecting savings is more important than the role of funding customers. It is an open question whether this characteristic of the Spanish banking system will persist in a future, more competitive, environment and, consequently, whether the results found in this paper will still be valid.

## 1. Introduction

Although the analysis of the monetary transmission mechanism –i.e., how monetary policy changes affect the economy- has been one of the most researched areas in economic literature, we are still far from understanding in detail how it works. In particular, one relatively recent strand of this literature has emphasised the role of the so-called credit channel. In the case of this channel, monetary policy affects the level of economic activity not only by modifying short-term interest rates, but also by altering the availability and terms of bank loans. Since firms and consumers (at least, some of them) lack perfect substitutes for bank loans, they will not be able to offset the reduced availability of these loans simply by greater recourse to alternative sources of funds[1].

Underlying this mechanism are market frictions generated by the existence of asymmetric information among market participants. Two mechanisms have been suggested for monetary policy changes to affect bank loan supply (Bernanke and Gertler, 1995). The balance sheet channel is based on the idea that monetary policy changes can affect the net worth of borrowers, which, in turn, affects the external finance premium those borrowers face in the credit markets. A decline in borrowers' net worth translates into an upward shift in the bank loan supply curve for those borrowers, due to the existence of asymmetric information among banks and their borrowers. But this mechanism is not specific to banks, since other lenders to firms or households are equally affected by it. The bank lending channel, by contrast, is based on the existence of asymmetric information among banks and their lenders. More precisely, a monetary policy tightening, since it translates into a reduction in deposits, entails a lower amount of loanable funds. To the extent that banks are unable to offset this reduction in loanable funds, due to informational frictions between them and their providers of funds, there will also be a fall in bank loan supply.

The existence of asymmetric information with respect to firms and households is relatively well established and accepted. But, the relevance of asymmetric information with respect to banks is much more controversial. In particular, some economists argue that, in today's world, banks have free access to non-deposit sources of funds that allow them to offset any potential monetary policy-induced fall in deposits (Romer and Romer, 1990). However, others argue that at least some banks cannot frictionlessly tap uninsured sources of funds (Kashyap and Stein, 1995 and 2000).

[1] For one of the first formalisations of these ideas, see Bernanke and Blinder (1988).

In this paper we focus on this specific channel in the process of transmission of monetary impulses. The critical assumption for the existence of a bank-lending channel is the ability of changes in monetary policy to affect bank loan supply, via changes in the availability of insured deposits. Therefore, we can distinguish two necessary steps in the process. First, a monetary policy tightening should reduce the demand for insured deposits. Second, this reduced demand for deposits cannot be offset with other sources of funds without additional costs and, therefore, loan supply falls.

As regards the first step, nowadays, monetary policy operates mainly through changes in the short-term market interest rate. In practice, increases in the short-term interest rate are usually followed by declines in bank deposits. But this is because banks have tended to adjust deposit-interest rates only partially to the change in market interest rates. This raises the important issue of how banks set their deposit rates and how the way in which they do so is related to the interest sensitivity of depositors. Are there any differences across banks? Is this going to change with the growing sophistication of depositors? These are important questions for the future of the bank lending channel that Goodfriend (1995) underlined and that we are not going to tackle here. From now on, we assume that banks may not adjust perfectly their deposit interest rates following a monetary policy change because there are costs involved in doing so.

The second step follows from the failure of the Modigliani-Miller (M-M) proposition for (at least some) banks[2]. To offset the lower demand for insured deposits, banks must either increase other sources of funds or reduce assets. If the M-M proposition were valid, banks should not have any problem in raising uninsured funds. But if there are informational asymmetries, banks cannot frictionlessly tap uninsured sources of funds. Liquid assets can act as a buffer stock shielding the loan stock from changes in deposits, but reducing liquidity also has a cost if this is used as a buffer. Therefore, after a fall in deposits, some banks will suffer an increase in the marginal cost of funds and the bank loan supply curve will shift upward. This effect will be greater for small and less capitalised banks, which have more difficulty raising alternative forms of financing, and for less liquid banks that are less able to cushion the effect on loans[3].

We analyse both the responses of bank deposits and bank loans to monetary policy changes. But, our main focus is on the loan supply. In this respect, analysing the response of bank loan supply to monetary policy changes raises the key and difficult issue

[2] See the theoretical model in Stein (1998).

[3] By less liquid, we mean banks with less liquid assets as a proportion of total assets.

of disentangling loan supply effects from loan demand effects[4]. To overcome this identification problem, the empirical literature has shifted from the analysis of aggregate data to microeconomic data on non-financial firms and banks[5].

Following the approach of Kashyap and Stein (1995), we, first, analyse cross-sectional differences in the response of bank loans to changes in monetary policy. Under the assumption of homogeneous loan demand across banks, cross-sectional differences in loan behaviour will be reflecting supply effects. Moreover, if the bank lending channel is at work, we should find that the effect of monetary policy on lending is more pronounced for those banks suffering from a higher degree of informational asymmetries. This is the result that Kashyap and Stein (1995 and 2000) and Kishan and Opiela (2000) obtain for the US.

However, this approach is critically dependent on the assumption of homogeneous loan demands across banks[6]. In the case of Spain, because of the important differences in the composition of bank lending, the differential response across banks might be reflecting either a genuine difference in loan supply behaviour or a difference induced by diverse demand-side behaviour of the different types of loans. For this reason, we have additionally checked whether the results change when looking at the behaviour of three different categories of bank loans: loans to firms, consumer loans and mortgage loans.

All tests based on monetary policy shocks are potentially subject to the criticism of not having controlled adequately for differences in loan demand. Moreover, in our sample period, the information content of these monetary policy shocks could be relatively small, due to the limited sample variation in monetary policy. Therefore, we propose a different test based on the response of bank loans to an exogenous shock to bank deposits. The particular shock we use derives from the tax-induced development of mutual funds in the Spanish economy during this period. The advantage of this "mutual funds shock" is that, being a deposit-reducing shock, there is no reason to expect it to affect loan demand. Therefore, any impact of the shock to loan growth can be safely interpreted as a supply effect and, consequently, it can be taken as evidence in favour of the so-called second necessary step of the bank-lending channel.

[4] The loan demand effect is the usual reduction in loan demand as a result of the general increase in interest rates after a monetary policy tightening. This would be the interest rate channel. What we are looking for is an additional channel specifically related to the supply of bank loans relative to other sources of funds.

[5] For a good summary of the debate on the lending view see Kashyap and Stein (1995, 2000). And for a survey including results for European countries see Mojon (1999).

[6] That is the reason why Kashyap and Stein (2000) focused only on the small banks.

We have performed all these exercises with a panel of 216 banks operating in Spain over the period 1991-1998. Although we observe some features in the balance sheet structure of the Spanish banks that are consistent with the existence of informational frictions for the smaller banks[7], our results are mostly unfavourable to the existence of distributional effects related to the bank lending channel in the period considered. We find that the bank lending reaction to a monetary policy shock is, if anything, more pronounced in the case of the less liquid banks, but there are no significant differences according to either size or capitalisation. Results are even weaker when analysing the response of the different loan categories. Moreover, we find that the shift from deposits to mutual funds did not translate into a fall in credit even for the small, less liquid and less capitalised banks.

The paper is organised as follows. The next section introduces the main developments and characteristics of the Spanish economy and banking system in the 1990s. This serves as a background for the rest of the analysis. Section 3 describes the database and the variables used, while Section 4 discusses the econometric methodological approach that we use to test for the existence of a bank-lending channel in Spain. Section 5 then presents the results for the basic loan and deposit equations and Section 6 reports the results of the analysis of loan responses by type of loan. Section 7 analyses the effects of mutual fund development on bank loans and bank balance sheets and, finally, Section 8 concludes.

## 2. Characteristics of and developments in the Spanish banking system and the Spanish economy in the 1990s

### 2.1. Characteristics of the Spanish banking system

The Spanish financial system is clearly bank-dominated, which is why the analysis of banks' response to monetary policy is so important in Spain. According to the Spanish Financial Accounts, in 1998, credit institutions accounted for 66% of the total financial assets of all financial institutions. Of the remaining 34%, 14% were accounted for by mutual funds, of which 90% corresponded to funds managed by companies belonging to banking groups. These also have important market shares in the businesses

[7] In particular, small banks are notably more dependent on deposit financing than medium or large banks.

relating to securities and insurance markets, in accordance with the universal banking model prevailing in the Spanish economy.

The relevance of banks is also clear from the point of view of the borrowers. Loans from Spanish credit institutions accounted for 44% of the total financial liabilities of non-financial firms (excluding shares). That is, more than seven times the amount of securities other than shares issued by Spanish non-financial firms. As regards households, 63% of their total financial liabilities are bank loans from Spanish credit institutions.

Some banks also have significant strategic shareholdings in non-financial Spanish firms, although these only account for less than 2% of the total assets of the Spanish banking system.

In this paper, we focus on the Spanish deposit-money institutions, since other kinds of credit institution are much less important quantitatively[8] and from the point of view of the bank lending channel, since they are not allowed to raise funds from the public in the form of deposits.

Among the Spanish deposit-money institutions, three different institutional groups can be distinguished: commercial banks, savings banks and co-operative banks. Although regulatory differences in the operations they can perform vanished more than a decade ago, there are still important differences between them at the institutional level and in their business specialisation, which may help give rise to different responses after monetary policy shocks. Commercial banks are public limited companies, more focused on corporate business. The traditional business of savings banks and co-operative banks has been, in contrast, that of collecting savings, mainly from households, and granting loans to households and small and medium-sized firms; in the first case, particularly in the form of mortgage loans. Savings banks are private foundations controlled -to different degrees in each institution- by representatives of regional governments, employees, depositors and founding institutions. Although this means some degree of governmental control, there are no special government guarantees or -since 1989- special regulations affecting these banks. As regards co-operative banks, these are owned by their members and subject to some limited restrictions on their operations. Generally, they are very small and, despite their number, only account for less than 5% of total assets and loans and less than 8% of total deposits. Savings banks, by contrast, had a 53% share of the deposit market and 42% of the loan market in 1998, around 10 p.p. above the levels of a decade earlier. The

[8] They account for a declining share of the loan market that does not exceed 12% in our sample.

expansion of savings banks has mainly been due to the elimination of some remaining geographical barriers at the end of the 1980s and to the faster growth of their traditional business. Although there is some degree of co-operation between groups of savings banks and co-operative banks, this is relatively loose and each entity operates basically according to its own means.

Each group of institutions has its own deposit insurance fund, which basically covers all non-bank depositors up to a relatively low amount of EUR 15,000 in 1998 (EUR 9,000 in 1988). Nevertheless, there were very few bank failures in the period under consideration and, with the exception of the crisis at a big bank in 1993, all of them affected very small banks. The crisis in 1993 was resolved through government intervention and subsequent sale to another private bank, thereby avoiding any loss for any kind of depositor.

Competition between Spanish banks increased considerably during the 1990s, stimulated by the entry of foreign banks, the removal of the remaining restrictions on the geographical expansion of savings banks, technological advances and the process of integration of the Spanish economy in Europe. As a result of this, the average net interest margin (net interest income over total assets) fell from around 4% at the beginning of the decade to slightly above 2% at the end. Also, there was a process of consolidation leading to a decline in the number of institutions operating in Spain. Between 1988 and 1998, the number of savings banks and co-operative banks fell from 79 and 117, respectively, to 51 and 97. The number of commercial banks actually increased in the same period because the entry of foreign institutions more than offset the consolidation among domestic institutions, including the biggest ones.

Other characteristics of the Spanish banking system can be seen in Table 1. This Table is based on the final sample used in the estimations below, which is different from the total population, but can be considered as representative of the whole population of banks in Spain.

Out of a total of 216 banks, 61 are commercial banks, 57 savings banks and 98 co-operative banks. Co-operative banks are very small (91% of them are under the 50th percentile for size) and account for 6% of total deposits (5% of total loans) against 52% (46%) and 42% (50%) for savings banks and commercial banks, respectively. However, most of the commercial and savings banks are also very small. Thus, while 75% of the observations corresponding to the smaller banks account for 14% of total assets, the

largest 10% of banks account for 67%. Concentration is lower for loans and deposits but still very high.

Small banks tend to have more liquid assets and capital, and to be more dependent on deposit financing[9]. Thus, while only 4% of bank liabilities for the group of smaller banks correspond to borrowing (interbank borrowed funds plus securities other than shares issued), this figure is 17% for banks in the upper 10 percentiles. This may indicate that smaller banks have difficulty resorting to uninsured sources of funds, due to informational asymmetries potentially leading to the existence of a bank-lending channel of monetary policy. On the other hand, the higher liquidity and capitalisation of smaller banks may be an endogenous response to such asymmetric information problems, thus, reducing their impact on the monetary policy response of small banks.

Co-operative banks are particularly well capitalised and liquid, with around half of them having a capitalisation of above 10% and more than 40% of their assets as liquid assets. This latter result is particularly significant, since it means that these banks maintain an extraordinary buffer of liquid assets in their portfolios.

As regards the loan portfolio composition, mortgage loans and loans to households in general are much more important for savings banks and co-operative banks than for commercial banks (the latter channel, on average, 73% of their lending to firms). It is also important to bear this in mind since, as we will see below, different types of loan behaved differently during our sample period[10].

### 2.2. Economic developments during the 1990s

Figure 1 summarises the main macroeconomic developments in the Spanish economy during the 1990s. After strong growth at the end of the 1980s, the economy slowed down, reaching a trough in 1993, recovering thereafter to record 3% average real GDP growth between 1995 and 1998. As regards inflation, inflationary pressures at the end of the 1980s were followed by a steadily declining trend during the 1990s. This helps explain the declining trend also seen in nominal short-term interest rates.

Since 1990, there have been only two periods of monetary policy tightening. The first one, in 1992, was associated with the crises in the European Monetary System (EMS)

[9] For the definition of variables, see the Annex.

[10] The importance of differences in bank specialisation for the analysis of their behaviour is well documented in Saéz, Sánchez and Sastre (1994) and Sánchez and Sastre (1995). Manzano and Galmés (1996) show how this affects, in particular, the pricing policies of Spanish banks. See also Sastre (1998).

of that year. The second one, in the first half of 1995, was associated with some signs of inflationary pressure just when the new inflation-targeting monetary policy strategy of the Bank of Spain started to be applied. In both cases, monetary policy tightening was relatively limited and short-lived. Short-term interest rates went up by between 1.5 and 2 percentage points, and returned to their original level in less than one and a half years. This may limit our ability to capture adequately the response of bank loans to a monetary policy tightening and should be taken into account when interpreting the results below.

Turning to loan growth, this has been clearly pro-cyclical, with real growth above 10% in the expansionary phases (see Figure 2). But two points are worth mentioning in this respect. First, the steep fall in loan growth between 1989 and 1990 resulted from the introduction of direct credit restrictions by the Bank of Spain. Faced with strong economic and loan growth, increasing inflation rates and restrictions on its capacity to increase interest rates because of the exchange rate commitments implied by the EMS, the Bank of Spain announced, in July 1989, a ceiling on the rate of growth of loans to the end of that year. A new lower ceiling was announced later on for the year 1990. Although the restrictions were not formally imposed, they were very effective in pulling down loan growth[11], and when they disappeared, at the beginning of 1991, the economy was slowing down and loan growth did not surge. The difficulty in capturing this effect adequately explains why, in the analysis below, we do not take into account the years before 1991[12]. Second, as Figure 3 clearly shows, different types of loan behaved differently. While loans to firms reached negative growth rates in the trough, mortgage loans never grew by less than 14% (in nominal terms), averaging annual growth of 21.4% over the whole period. That is to say mortgage loans were clearly less pro-cyclical than consumer loans and, especially, loans to firms.

With respect to deposits (see Figure 2), they were less pro-cyclical than loans and their behaviour was affected by some particular events. Thus, the extraordinary growth of deposits around 1990 and 1991 was boosted by strong competition among banks on time-deposit interest rates at that time. On the other hand, the lower growth around 1992-93 and 1997-98 can be explained by a process of substitution of mutual fund shares for bank deposits. This process of substitution was triggered by changes in the tax treatment of capital gains on mutual fund shares. Taxes on those capital gains were lowered twice in the decade; first in 1991 and then in 1996. The process of substitution was very intense

[11] However, part of this financing was simply replaced temporarily by lending through short-tem securities issued by firms.

[12] Note that since the ceiling was the same across the board, the impact should have been different for each bank depending on the loan growth rates they had recorded prior to the introduction of the restrictions.

(see Figures 4 and 5) and led by banks, that, through affiliates, dominated the market for management of those mutual funds. But it also had strong implications for banks, which faced a lower demand for deposits. We will say more about this below since we take advantage of this particular phenomenon to test the assumptions behind the bank-lending channel of monetary policy.

The different cyclical behaviour of loans and deposits helps explain movements in the average liquidity of banks. Figures 6a and 6b show, for each period, the mean and median of liquidity and capitalisation of the banks included in the final sample used in the regressions. Average liquidity increased during the cyclical downturn, reaching a maximum of around 35% of total assets in the years from 1994 to 1996. Since then, it has declined steadily towards levels of around 25%. This means that liquidity acts as a buffer. When loan demand growth falls behind deposit growth, banks accumulate the excess funds as liquid assets (mainly, government securities). Thus, the deposit business is not just a business deriving solely from the need to fund loans, but, at least for some banks, a business in itself. This is important since it means that liquidity need not be just at the minimum necessary for precautionary motives. For those banks for which the business of collecting deposits is more important (mainly, savings banks and co-operative banks in the case of Spain) liquidity may be well above the minimum precautionary level, and therefore, a reduction in deposits may not necessarily lead to a fall in loan supply, as the bank-lending channel assumes. Finally, with respect to average capitalisation there is no clear cyclical pattern (see Figure 6b).

## 3. Data

The data used in this paper come from the bank statements reported to the Banco de España by all Spanish deposit-money institutions. Given the aim of this paper, we focus on all deposit-money institutions apart from branches of foreign banks[13]. Initially, we have observations for the period 1988-1998.However, to avoid the problems generated by the existence of direct credit restrictions in 1989 and 1990 (see Section 2), the observations prior to 1991 are excluded from the analysis. The choice of 1998 as the end of the sample period is determined by the start of the single monetary policy in the euro

[13] H. Pill (1996) finds that after a monetary policy shock, foreign banks in Spain behave differently from domestic banks and actually increase their lending. He interprets this as evidence that foreign banks have greater access to external sources of funds, allowing them to offset falls in domestic deposits. This must be particularly true for branches of foreign banks. Therefore, we exclude them from our sample.

area in 1999. We want to analyse the behaviour of the Spanish banking system prior to this potentially structural change. Therefore, the initial sample considered is an unbalanced panel with 8,367 quarterly observations corresponding to 299 banks over the period 1991-1998.

For each bank and period, a set of variables is defined[14]. We are mainly interested in the behaviour of loans and deposits. In both cases, we consider operations with the domestic non-financial private sector. That is, loans to and deposits of the public sector are not included. As mentioned in the previous section, all these deposits are partially insured (up to the amount of EUR 15,000 in 1998). We cannot separate deposits by size, and therefore these include both small deposits which are fully insured and big deposits which are largely uninsured. As regards loans, we can distinguish between loans to firms, consumer loans, mortgage loans and other loans, although this breakdown is not available for all banks (see Section 6 below).

On the asset side, we also distinguish liquid assets from other assets. As liquid assets, we include interbank deposits and securities net of repos. That is, we subtract from the outstanding amount of securities those that have been repoed to third parties and add those acquired in reverse repos[15]. On the liabilities side, three main sources of funds are distinguished: deposits, borrowing and capital and reserves. Borrowing includes all uninsured market sources of funds (interbank borrowing, excluding borrowing through repos, plus securities issued other than shares).

As indicators of the potential existence of asymmetric information problems we consider three bank characteristics: size, liquidity and capitalisation. Size is defined as the log of total assets, while liquidity is the ratio of liquid assets (as defined above) to total assets. With respect to capitalisation, we use two alternative measures. The first one is the standard ratio of capital and reserves to total assets. The second one tries to take into account the fact that not all assets are equally risky. This is important in our sample since we have very heterogeneous banks, some of them strongly focused on the traditional business of deposits and loans while others are focused on money- and capital-market activities. Since Basel capital ratios are not available for all banks and with the necessary frequency, we opted for a simple approximation based on the ratio of capital and reserves

[14] See the Annex for all definitions.

[15] Cash and balances in the central bank are not included in our measure of liquidity, since they are generally limited to the minimum necessary for operating reasons and to comply with regulatory requirements. Since these requirements changed significantly along our sample period, movements in cash and balances in the central bank reflect mainly these regulatory changes.

to total assets excluding liquid assets and loans to the domestic public sector. All measures have been standardised, by defining them in terms of deviations with respect to their average sample value, except size which is defined in terms of deviations with respect to the period-by-period averages, to eliminate the trend in average values.

The original dataset is modified to take into account mergers and outliers as explained in the Annex. The final sample, after this cleaning process, is an unbalanced panel containing 5,551 observations corresponding to 216 banks, that account for 83% of the total loans in the original sample, 89% of the total deposits and 80% of the total assets.

## 4. Econometric approach

Our baseline econometric model is a dynamic reduced form specification for both the deposits and the loan equations that takes the following general form:

$$\Delta z_{it} = \sum_{j=1}^{4} r_j \Delta z_{it-j} + \sum_{j=0}^{4} b_{1j} \Delta x'_{t-j} + b_2 c'_{it-1} + \sum_{n=1}^{N} \sum_{j=0}^{4} b^n_{3j} c^n_{it-1} \Delta x'_{t-j} + e_{it} \quad (1)$$

where the variable $z$ will represent either the log of deposits or the log of loans, $x$ is a vector of macroeconomic variables –the monetary policy indicator among them-, $c$ denotes a vector of $N$ bank-specific characteristics and $e$ is an error term. This general specification is used to test whether there are differences in the impact of monetary policy shocks among banks classified according to different bank characteristics. For this purpose, some macroeconomic variables are included to control for demand effects and the different bank characteristics are used to proxy potential asymmetric information problems leading to a differential response across banks to a common monetary policy shock.

As the model is estimated with quarterly data, we need to take into account the seasonal properties of the data in order to satisfactorily choose the method of estimation. In our sample, both loans and deposits present a seasonal pattern that varies across banks (Figure 7 illustrates this for the case of loans), suggesting that, at least some banks face demands for loans and deposits displaying very different seasonal patterns. In this case, seasonality is not adequately handled simply by including seasonal dummies.

Thus, in designing our empirical model we take explicitly into account the seasonal characteristics of the data (see Álvarez ,1999, for a similar dynamic and seasonal

panel data model). To allow for a seasonality that varies across individuals we consider the following structure for the error term of the baseline model:

$$e_{it} = \sum_{s=1}^{4} d_{st}\ l_{si} + u_{it} \tag{2}$$

where the $d_{st}$ are seasonal dummy variables and the $l_{si}$ are seasonal individual effects.

We further assume that the aggregate macroeconomic variables are exogenous and that the error term $u_{it}$ is uncorrelated with lagged values of the dependent variable and the bank characteristics:

$$E(u_{it}x_s) = 0, \quad \text{for all } t \text{ and } s \tag{3}$$

$$E(u_{it}\Delta z_{it-k}) = E(u_{it}c_{it-k}) = 0, \quad k > 1 \tag{4}$$

To obtain consistent estimates of the parameters of equation (1), two specific features of the model must be taken into account. On the one hand, the individual effects are correlated with the lagged values of the dependent variable. The standard approach to deal with this problem –to estimate a standard transformation of the model (first differences, orthogonal deviations,…)- is not useful in our case given the seasonal pattern of the individual effects. On the other hand, an instrumental-variable (IV) estimation method is required to take into account that some of the bank characteristics that are interacted with the macroeconomic variables (for instance, the liquidity share) are likely to be simultaneously determined with both deposits and credit. In what follows we present the orthogonality conditions for a model that combines these two features.

Given (1) to (4), and taking into account that $D_4 d_{st} = 0$ and $\Delta_4 e_{it} = \Delta_4 u_{it}$, the following moment conditions hold:

$$E(\Delta z_{is}\Delta_4 e_{it}) = 0, \qquad s = 1,\ldots\ t-5 \tag{5}$$

$$E(c_{is}\Delta_4 e_{it}) = 0, \qquad s = 1,\ldots\ t-5 \tag{6}$$

Given the exogeneity of the macroeconomic variables we also have the following orthogonality conditions:

$$E(x_s\Delta_4 e_{it}) = 0, \qquad \text{for all } t \text{ and } s \tag{7}$$

Thus, to estimate model (1) we employ a GMM estimator that makes use of the set of identifying restrictions given by expressions (5) to (7).

## 5. The response of total loans and deposits to monetary policy changes

In this section we analyse the responses of both total bank deposits and bank loans to monetary policy changes. A necessary condition for the bank lending channel to exist is that both fall after a monetary policy tightening. However, as already pointed out in the Introduction, a fall in loan growth may simply reflect a lower demand due to the higher level of interest rates in general. To disentangle loan supply from loan demand effects, we follow the identification approach of Kashyap and Stein (1995). The basic idea is to look at cross-sectional differences in the response of bank loans to a monetary policy shock. By controlling for possible differences in loan demand, the remaining differences in the behaviour of loans among banks should be due to supply movements. Were these differences to be related to indicators of the degree of informational asymmetries existing between banks and their lenders (like size, liquidity or capitalisation), then this would support the idea of the existence of a bank-lending channel.

The estimation results of the baseline deposits and loans equations are presented in Tables 2 and 3, respectively. More precisely, in these baseline equations, the dependent variables are the first difference of the log of total deposits and the first difference of the log of total loans to the non-financial private sector, respectively [16].

We consider the log of real GDP and the log of the CPI, among the set of macroeconomic variables included in the model, to control for demand effects. The model includes the first difference of the three-month money market rate as the monetary policy indicator, whose differential impact on deposits and loans is what we are mainly interested in. Finally, we have included the contemporaneous change in the ratio of the net worth of money-market and fixed-income mutual funds to GDP in the equation for deposits to take into account the influence that the developments in mutual funds have had on the growth of deposits. As bank characteristics we have considered size, liquidity and two alternative definitions of capitalisation (see Section 3).

[16] Results do not change when we use outstanding loans plus unused loan commitments instead of just outstanding loans, as a way of better capturing loan supply movements. Morgan (1998) finds that, in the US, loan commitments are important to determine the dynamic response of loan growth to monetary policy changes. However, we are focusing on the long-run effect, so that it is understandable that loan commitments matter less in this case.

In order to identify differential responses of loans and deposits we have interacted the monetary policy indicator with the bank characteristics[17]. If there is a bank lending channel, we should expect a positive coefficient for the interaction of the monetary policy measure with each of the bank characteristics in the loan equation. The response of the amount of deposits across banks with different characteristics may differ, but the theory is not clear-cut in this respect. Finally, in the case of deposits, we also allow for differential impact across banks of the expansion of mutual funds, by interacting the variable that measures this expansion with the different bank characteristics.

For these baseline models, the dynamic structure is adequately handled by introducing four lags of the endogenous variable, and the contemporaneous value and four lags of the regressors[18]. In accordance with the discussion in Section 4, equation (1) –both for the cases of deposits and loans- has been estimated in first seasonal differences using a GMM estimator based on the orthogonality conditions defined by expressions (5) to (7). Regarding the statistical properties of the estimates reported in Tables 2 and 3, we only find fourth-order residual autocorrelation, as was to be expected given that the model is estimated in first seasonal differences. Moreover, the existence of residual autocorrelation of other orders is rejected in all cases. Finally, the validity of the instruments is never rejected, according to the Sargan test.

Table 2 summarises the long-run impact on deposits of the different explanatory variables in six different models.[19] In the first four specifications, we introduce just one bank characteristic at a time. In the final two models, we simultaneously include size, liquidity and one capitalisation ratio. The long-run elasticities of deposits with respect to both GDP and prices are always positive and significant. As regards the impact of monetary policy, this is negative and significant in some cases, but far from being robust across models. Therefore, it seems that the evidence with respect to the first necessary step of the bank lending channel is not very strong. Looking at the significance of the interaction terms (fifth row in Table 2), distributional effects are found for banks with different liquidity ratios: deposits of more liquid banks suffer less from the tightening of

[17] Estimates with all the macroeconomic variables (real GDP growth, CPI inflation and monetary policy) interacted with banks' characteristics give similar qualitative results although with clear signs of overfitting.

[18] There are two exceptions. For bank characteristics only the first lag is introduced whereas for the mutual funds variable, only its contemporaneous value is included.

[19] The complete set of short-run coefficients is available from the authors upon request. The reason why we focus on the analysis of the estimated long-run coefficients is that, in some instances, the short-run coefficients display alternating signs, which may signal a problem of overfitting due to the high number of purely time-series explanatory variables in the model. However, long-run effects are more robust and economically sensible.

monetary policy. This result might be due to the fact that credit co-operatives and small savings banks are among the most liquid banks. To the extent that these institutions operate in local (and more concentrated) markets, they may face, at least to a certain degree, a less interest rate sensitive demand for deposits. Finally, we find that the growth in mutual funds has a clear negative contemporaneous effect on deposit growth for all banks, although the impact is greater for large, less-liquid banks.[20] These banks may have put more effort into promoting mutual funds because of the higher share of their groups in the market for mutual fund management and their lower share in the market for low-cost deposits. Also, small banks might have been less affected because of a lower interest-rate sensitivity on the part of their depositors.

Table 3 reports the corresponding results for loans. The effects of the macroeconomic variables are robust across the different models. The long-run elasticity of credit to GDP is always significant and larger than one. The response of credit to prices is always negative and significant.[21] With respect to the monetary policy impact, we find that, in all models, the long-run multipliers of monetary policy have the expected negative sign and are significantly different from zero for the average bank in the sample (according to each of the bank characteristics considered).

As for the interactions of the bank characteristics with the monetary policy measure, in the case of size, we never find a significant differential effect of money shocks across banks. On the other hand, the estimates of the model including liquidity (especially in the model containing size, liquidity and the second definition of capitalisation) show that there are differences across banks in the loan response to monetary policy shocks[22]. More precisely, the loan response of banks with a lower share of liquid assets is significantly stronger than that of more liquid banks. Results are far from clear in the case of both indicators of capitalisation given that the interaction terms are weakly significant in the models including size and liquidity as well. Moreover, in both cases, the sign of the interaction is negative, which suggests that when facing a monetary policy shock, well-capitalised banks display a stronger response.

Ehrmann et al. (2001) report the estimates of the same model with an alternative sample arising from an homogeneous treatment of data for the four largest economies in

[20] Large banks are also less liquid on average. Hence, both results may stem from the same cause.

[21] This coefficient picks up both the positive effect of inflation on nominal loan growth and the potential negative effects of higher inflation via higher nominal interest rates. This second effect is important in our sample since inflation fell significantly during the 1990s (see Section 2).

[22] In the model containing size, liquidity and the first definition of capitalisation, the p-value is 0.14.

the euro area[23]. In addition, they also report the estimates of a similar model in which the macroeconomic variables are replaced by a complete set of time dummies. Comparison of the results in Ehrmann et al. (2001) with those presented in Table 3 shows that there are some quantitative differences but not qualitative differences with respect to the coefficients of the macroeconomic variables (including the monetary policy measure). As regards the interaction terms, liquidity is even more significant in Ehrmann et al. (2001), while capitalisation is not at all. For size, the interaction term is negative and significant in some cases. Overall, the only robust conclusion that can be drawn from the interaction terms in Tables 3 and in the results reported in Ehrmann et al. (2001) is that less liquid banks display a stronger reaction to monetary policy changes.

The evidence provided by the estimates of the baseline models is not conclusive with respect to the existence of a bank-lending channel in Spain in the 1990s. On the one hand, there is weak evidence that deposits fall after a monetary policy tightening and some evidence that the loan supply of banks with less liquid assets is affected more strongly in such a case. But, on the other hand, there is no robust differential response between large and small banks, and between more and less capitalised banks. However, this may result from measurement problems. Both Pill (1996) and Sánchez and Sastre (1995) argue that the analysis of banks by size may yield misguided results because of the importance of other bank characteristics correlated with size, like the type of institution or the bank specialisation. On the other hand, results for capitalisation may be influenced by the mismeasurement of the relevant level of capital (e.g., Basel ratios instead of simple balance-sheet ratios).

## 6. Analysis of the loan portfolio composition

A possible objection to the results of the estimation of equation (1) for total loans is that, because of the important differences across banks in the composition of bank lending -i.e. different types of banks concentrate on (specialise in) different categories of

[23] Starting from the same original database, there are two main divergences in the treatment of data that give raise to differences between the sample used in this paper and that used in Ehrmann et al. (2001). These differences are the treatment of bank mergers and the trimming process. Regarding the treatment of bank mergers, they make a backward aggregation of the banks involved in the merger while in this paper we follow the approach described in the Annex. As for the treatment of outliers, the main difference is that in this paper we exclude all the observations with credit shares or deposit shares below 10 %. Apart from the different samples, there is also a different definition of liquid assets, since Ehrmann et al (2001) use the more standard but less refined definition of cash and balances in the central bank plus interbank assets plus government securities (not adjusted for repos).

loan[24]-, we might be inadequately controlling for loan demand in the baseline model. Therefore, the differential response across banks to the shocks analysed might be reflecting either a genuine difference in loan-supply behaviour or a difference induced by divergences in the demand-side behaviour of the different types of loans (see Figure 3). For instance, the stronger response of banks with less liquid assets might actually be reflecting differential loan-supply behaviour or might be explained by the fact that banks with less liquid assets have a higher share of mortgage loans (see Table 1) and these loans are more sensitive to monetary policy changes.

A first attempt to address this objection has been to estimate equation (1) for total loans using bank-specific demand-scale variables for real activity and prices, instead of using the log of real GDP and the log of the CPI. These bank-specific variables have been constructed as weighted averages of sectoral indicators of activity and prices, with the weights given by the composition of each bank's loan portfolio.[25] The purpose of this exercise is to consider demand-scale variables that properly control for demand effects arising from the different composition of total loans. The estimates of the model with bank-specific demand-scale variables are reported in Table 4. The coefficients of the interaction terms display a similar pattern to that presented in Table 3. Nevertheless, these bank-specific demand-scale variables showed no information content additional to the aggregate GDP and CPI variables[26]. Moreover, these estimates yield the result that the long-run effect of monetary policy on total loans for the average bank is no longer significant[27]. Also, the alternative exercise of allowing for different responses to GDP and the CPI across banks with different characteristics does not yield better results (see footnote 17 above).

Therefore, we focus on the analysis of three different categories of bank loans separately: loans to firms, consumer loans and mortgage loans[28]. The main drawback of this approach comes from the fact that the information on these loan categories is not available, on a quarterly basis, for all the banks. In particular, this is the case for most co-

[24] See the references cited in footnote 10.

[25] As the breakdown of lending by type of loan is only available on a yearly basis for some institutions in the sample, for those institutions we have considered constant weights over four consecutive quarters.

[26] That is, when we add the difference between the bank-specific variable and the aggregate variable to the model with the aggregate variables, those differences are non-significant in all cases.

[27] One possible explanation for this negative result is the difficulty in finding appropriate scale variables for all the types of loan. Hence, although the inclusion of bank-specific scale variables is a refinement of the model, their usefulness would depend on the usefulness of the sectoral scale variables available.

[28] These three categories account for over 90% of total loans. Only other loans to households are excluded from this analysis.

operative banks, for which the information requirements are less demanding. When we remove from the sample those banks for which the composition of lending is not available, the size of the sample is substantially reduced.[29] Moreover, the distribution of the sample according to the bank characteristics considered in our analysis is significantly altered. As Figure 8 shows, we mainly lose observations of banks with a small size, high proportion of liquid assets and high capitalisation, as these are the standard attributes of the co-operative banks. Nevertheless, it is noteworthy that the range of the distribution hardly changes. Although in a significantly smaller proportion, the reduced sample also contains observations corresponding to small banks, banks with a high level of liquid assets and highly capitalised banks. This feature may be behind the fact that, in spite of the significant differences in the sample composition, the pattern of the results reported in Table 3 is reproduced when we re-estimate the baseline equation for total loans with the reduced sample. Therefore, this is a valid basis for the analysis of the impact of different loan portfolio compositions across banks.

Another potential drawback of the separate analysis of loan components is that there may be idiosyncratic reasons why some banks, facing a funding constraint, decide to reduce one particular type of loan while other banks decide to reduce another type of loan. In this case, we should not expect to find significant interaction terms even if there is a constraint on the total supply of bank loans. However, we think that this is not the more likely scenario. We assume that, in general, when facing a monetary contraction, each bank reduces proportionately the supply of each type of loan or, alternatively, that if there is a particular reason for restricting the supply of one kind of loan more than the others, this will be common to most of the banks.

To analyse the response of the different loan categories, we have slightly modified the baseline specification, the main reason being the difficulty in finding adequate demand-scale variables for the different loan categories (see footnote 27). Instead of including a group of macroeconomic variables to control for demand effects, we estimate the model with a complete set of time dummies.

Table 5 summarises the long-run differential impact on each type of bank loan of the monetary policy shock (proxied again by the first difference of the three-month

[29] Whereas in the estimates with the whole sample (section 5) we make use of 4035 observations corresponding to 216 banks, in the estimates with this reduced sample, only 2100 observations corresponding to 116 banks are available.

money-market rate).[30] For all types of loan, we never find any significant differential impact of the monetary policy shock. More precisely, in the case of the models including the interaction of monetary policy and liquidity, the interaction terms are always positive but never significant.

The absence of asymmetric responses by the different categories of bank loan to monetary policy changes among more and less liquid banks suggests that the differential response of total loans among these types of banks reported in Section 5 reflects mostly a loan portfolio composition effect rather than a genuine difference in the loan-supply response. However, this result is not free from criticism. Therefore, in the next section we perform a different test based on the response of bank loans to an exogenous shock to bank deposits.

## 7. The impact of mutual funds development on bank loans

All tests based on the analysis of the response of loans to a monetary policy shock are potentially subject to the criticism of not having controlled adequately for differences in loan demand. Moreover, due to the relatively short time period of our sample, it may be the case that we are not able to capture accurately the response of banks to monetary policy changes[31]. Therefore, we perform an additional test for the bank lending channel, which is based on the response of bank loans to an exogenous shock to deposits arising from the tax-induced growth of mutual funds in the period under consideration. The importance of this "mutual funds shock" in the sample period analysed in this paper makes it very informative. However, its main advantage is that there is no reason to expect it to affect loan demand, whereas, under the assumptions of the bank-lending-channel theory, it should affect loan supply. Thus, any impact of the shock on loan growth can be safely interpreted as evidence in favour of the bank-lending channel.[32] In what follows, we present in more detail the arguments supporting the use of this second test.

[30] Although not reported to save space, the statistical properties of these estimates are satisfactory. As expected, there is residual fourth-order autocorrelation, but the existence of residual autocorrelation of other orders is rejected in all cases. Finally, the validity of the instruments is never rejected, according to the Sargan test.

[31] In their paper, Kashyap and Stein (2000) analyse data for 17 years, while we have only 8 years, in which interest rates follow a declining trend with only minor deviations around trend.

[32] Insofar as the assumptions necessary for a monetary-policy-induced fall in deposits to affect loan supply are valid. Of course, deposits should fall in the first place.

As explained in Section 2, the shift of investors from bank deposits towards mutual fund shares was one of the most significant developments in the Spanish economy in the 1990s. An important characteristic of the process was that, during the sample period analysed in this paper, mutual fund shares were very close substitutes for bank deposits. As is clearly apparent in Figure 4, growth in mutual funds is almost entirely explained by the growth of money-market and fixed-income mutual funds. Moreover, due to the poor development of private-debt markets in Spain, the funds channelled to these mutual funds were invested almost exclusively in public debt –directly or through repos- and frequently the portfolio had a very low duration. Consequently, they were very liquid and safe and their return before taxes was not significantly different from the return on bank time deposits (once management fees are taken into account). Therefore, most of the explanation for the surge in mutual funds throughout the decade should be attributed to the tax reforms of 1991 and 1996, that reduced the tax on the medium-term capital gains generated by shares in mutual funds. Only from 1998, with the consolidation of a scenario of low and stable inflation and interest rates, and the increasing involvement of households in capital markets –also stimulated by the process of privatisation of state-owned firms- did a significant non-tax-related demand for mutual fund shares arise. Also, tax rules were changed again in 1999, this time reducing the tax advantage of mutual funds over time deposits.

To the extent that, in the period under review, the growth in the demand for mutual funds stemmed mainly from tax considerations, it can be considered as an exogenous negative shock to bank deposit demand, without any impact on loan demand.

According to the bank-lending-channel theory, monetary policy influences bank loan supply through its impact on deposit demand. A restrictive monetary policy reduces deposit demand, while an expansionary policy increases it. In a non-MM world, banks would have problems in offsetting a monetary-policy-induced fall in deposits with other sources of funds and, consequently, they would reduce their loan supply. The negative shock to deposit demand implied by the development of mutual fund shares should have had the same effect (i.e., an inward shift in loan supply for those banks subject to asymmetric information problems).

To implement this testing strategy we use the change in the ratio of the net worth of money-market and fixed-income mutual funds to GDP, as a measure of the mutual-

funds shock[33]. This is the measure used in the deposit equation of Section 5, where we find that deposits fall contemporaneously with the increase in the net worth of mutual funds, for all banks. Although there are some differences in the impact on deposits across banks, these differences do not seem to be related to loan demand factors and since all banks appear to be negatively affected by the mutual-funds shock, this is a valid basis for a test of the assumptions underlying the bank-lending channel.

We estimate the loan equation considered in Section 5 but enlarged by including the contemporaneous mutual-funds shock and the interactions of this shock with the bank characteristics (size, liquidity and capitalisation). According to the bank-lending-channel theory, we should expect a negative coefficient for the mutual-fund shock and positive coefficients for the interaction terms in the loan equation. Table 6 reports the results of this test.[34] This table shows that the expansion of mutual funds has not led to bank lending growth falling in all cases, except when size, the liquidity ratio and the second measure of capitalisation are simultaneously included. Even then, the shock is only significant at the 10% confidence level. The interaction terms are never significant.

Therefore, contrary to what the bank-lending theory assumes, it appears that even those banks which are more prone to suffer from an adverse shock to deposit demand – small, with less liquid assets and poorly capitalised- have been able to offset the fall in deposits in some way. Thus, there is no impact on banks' supply of loans. This is very surprising since the shock to deposits was quite big. According to the most conservative estimate (corresponding to the first column in Table 2), e.g., the steady increase in mutual funds net worth in the last three years of our sample would have meant, for the average bank, a fall in deposits equivalent to that resulting from an 8 p.p. increase in the monetary policy interest rate.

In what follows, we study in more depth, what the response of Spanish banks to this type of shock has been. In particular, we try to understand how those banks that are more likely to suffer from a shortfall in deposits have altered their sources of financing.

[33] This is preferable to a dummy variable due to the long duration of the process of substitution. To the extent that the timing of the shift towards mutual funds could have been affected by changes in interest rates, this would be controlled by the inclusion of the interest rate in the loan equation.

[34] Table 6 shows the long-run effect on total loans of a one per cent permanent increase in the ratio of mutual fund net worth to GDP. The long-run coefficients for GDP growth, CPI inflation and the monetary policy shock, not reported to save space, are similar to those displayed in Table 3. Again, the statistical properties of the estimates are satisfactory.

The surge in mutual funds is concentrated in two main sub-periods, corresponding, more or less, to the aftermath of the tax reforms of 1991 and 1996. The first sub-period, 1991 Q2 to 1994 Q1, is characterised by weak economic conditions and loan demand. This weak loan demand allowed banks to confront the shock to deposits without significant funding problems. The second sub-period, 1995 Q4 to 1998 Q4, is characterised by strong loan demand and, consequently higher funding problems for banks.

Table 7 reports the cumulative changes in the main balance-sheet items for this second sub-period, distinguishing among banks by size, liquidity and capitalisation. Column 7 of the Table shows that, in all categories, there is a growing gap between loans and deposits as a percentage of total assets. Part of this growing gap is cyclical[35] and part of it results from the impact of mutual-fund growth. Column 8 shows that this growing gap is possible because of the reduction in liquid assets. Only large banks –and, to a lesser extent, some medium-sized banks- resort significantly to securities issuance and interbank borrowing (see column 9). Although there are no causality tests here, the evidence is consistent with some banks being more able to resort to market financing and, thus, with the existence of informational or other kind of frictions for smaller banks. However, the existence of a buffer of liquid assets appeared to allow even the less liquid banks to compensate for the insufficient growth of deposits[36].

## 8. Conclusions

In this paper we have tried to provide evidence on the existence of a bank-lending channel in the Spanish economy over the 1990s. To this end, we have analysed both the responses of bank deposits and bank loans to monetary policy changes. First, we have tested whether a monetary policy tightening reduces the demand for insured deposits. The evidence on this is somewhat weak, although this might be a result of the relatively short sample period available. On the loan side, we have tried to overcome the identification problem of disentangling loan supply effects from loan demand effects when analysing the response of bank loans to monetary policy changes.

[35] Due to the different output elasticity of loans and deposits, during upturns loans grow faster than deposits and during downturns loans grow more slowly than deposits.

[36] In the theoretical model of Stein (1998), liquidity also acts as a buffer to counteract funding shocks, but a reduction in liquidity is not without cost. Therefore, the offsetting reaction of liquidity is not perfect and loan supply is affected.

For this purpose, we have followed first the approach of Kashyap and Stein (1995), by analysing cross-sectional differences in the response of bank loans to changes in monetary policy. We fail to find differences in the response of loan growth to monetary policy changes for Spanish banks either of different sizes or of different degrees of capitalisation. However, we find some evidence that less liquid banks may display a stronger response than banks with a higher degree of liquidity, although this evidence seems to be explained mostly by a loan-portfolio-composition effect rather than by a genuine difference in the loan-supply response.

Moreover, we perform an alternative test, based on the response to an exogenous shock to deposits, that has the advantage of better identifying loan supply movements and of being of greater importance in our sample period. The particular shock we use derives from the tax-induced development of mutual funds in the Spanish economy during this period. This being a deposit-reducing shock, there is no reason to expect it to affect loan demand. Therefore, any impact of the shock on loan growth can be safely interpreted as a supply effect and, consequently, can be taken as evidence in favour of the bank-lending channel. However, we find no evidence that the sizeable reduction in deposits due to the shifts towards mutual fund shares affected the ability of even the smaller, less liquid and less capitalised banks to satisfy loan demand.

Overall, although the comparison between the balance sheets of large and small banks and of their different balance-sheet responses to a funding shock points towards a significant difference in the ability of small and large banks to resort to uninsured market sources of financing, our results are mostly against the existence of an operative bank-lending channel in the Spanish economy in the 1990s. One factor that seems to be critical to these results is the role of liquidity. Spanish banks –and, particularly, small banks- have maintained during the 1990s levels of liquid assets sufficient to offset even very significant shocks to their traditional sources of funds. The reason why small banks maintain high levels of liquid assets might be related to the role of main collectors of savings that they have traditionally played in the Spanish economy. In some cases, it appears that this role of collecting savings is more important than the role of funding customers. It is an open question whether this characteristic of the Spanish banking system will persist in a future, more competitive, environment and, consequently, whether the results found in this paper will still be valid.

## Annex

### Treatment of mergers

With respect to the treatment of bank mergers in the data, we consider three possible alternative approaches:

- Option 1: Merged entities are reconstructed backward as the sum of the merging banks before the merger.

- Option 2: A new bank is considered after any merger or acquisition. The merging banks are removed from the sample following the bank merger.

- Option 3: Intermediate strategy. In mergers of banks of similar sizes (when total assets of the merged bank are greater than 140% of any of the merging banks) the merger is treated as in option 2. In mergers of banks of significantly different sizes (for instance, when a large bank buys a small one), the data of the merged bank is considered as data of the largest merging institution and no new bank appears. Growth rates of balance-sheet data are adjusted in this case, to avoid jumps arising from acquisitions.

Option 3 is our preferred alternative and, therefore, the results reported throughout the paper make use of the sample arising from this third option. Option 1 (mergers reconstructed backward) allows for a high coverage but reduces the number of institutions and observations available. Option 2 (new institution after each M&A) can result in the complete elimination of an institution existing over the whole period if it has been involved in several small acquisitions along the period, resulting in there not being enough consecutive quarters available.

### Treatment of outliers

In order to handle outliers and to have enough time-series observations available to estimate the model, the following filters have been considered:

- Exclude bank-quarter data when credit shares or deposit shares are lower than 10%.

- Remove observations with nonsense values of the variables considered (e.g., zero total assets, capitalisation ratio higher than one,…).

- Remove observations in the upper and lower percentiles of the distributions defined in terms of the growth rates of total assets, loans and deposits.

- Remove observations in the upper and lower percentiles of the distributions defined in terms of the levels and changes in the liquidity ratio and the two capitalisation ratios.

- Remove banks without at least 9 consecutive quarterly observations.

**Definition of variables**

- Loans: loans to the domestic non-financial private sector.

- Liquid assets: interbank deposits plus fixed-income securities net of repos.

- Deposits: deposits from the domestic non-financial private sector.

- Borrowing: interbank borrowed funds, excluding funds raised through repos, plus securities other than shares issued.

- Loan commitments: outstanding unused loan commitments.

- Bank-specific scale variables: sectoral indicators of activity and prices weighted by the sectoral composition of the credit granted by the bank.

- Size: log of total assets of bank i at time t, minus average log of total assets of all banks at time t.

- Liquidity: liquid assets divided by total assets of bank i at time t, minus average liquid assets divided by total assets in the whole sample.

- Capitalisation-1: Capital and reserves divided by total assets of bank i at time t, minus average capital and reserves divided by total assets in the whole sample.

- Capitalisation-2: Capital and reserves divided by total adjusted assets of bank i at time t, minus average capital and reserves divided by total adjusted assets in the whole sample. The adjustment consists of subtracting from total assets, liquid assets and loans to the domestic public sector.

- Monetary policy shock: first difference of the three-month money market rate.

- Mutual fund shock: first difference of the ratio of money-market and fixed-income mutual fund net-worth to GDP.

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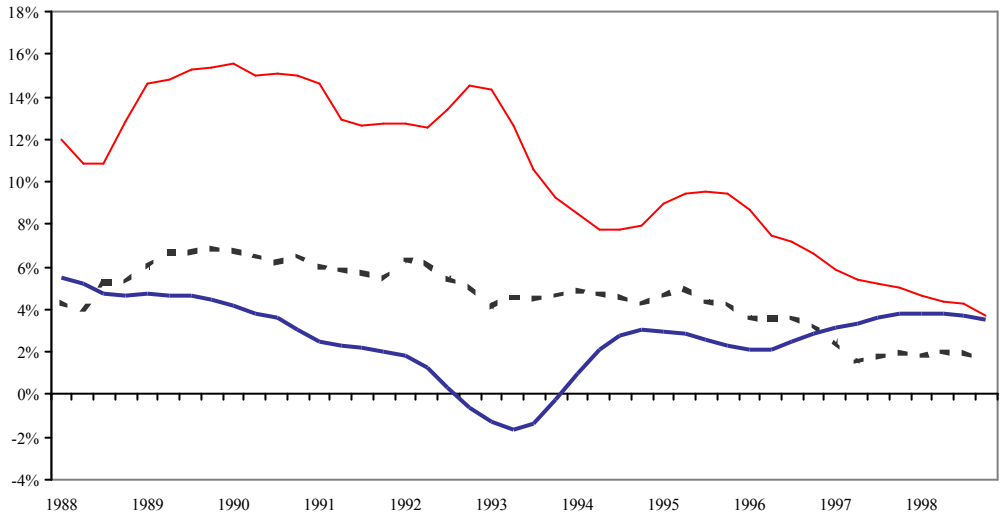
**Sastre, T. (1998):** "The role of the banking system in the monetary transmission mechanism", in J.L. Malo de Molina et al (ed.): *Monetary policy and inflation in Spain*, Banco de España.

**Stein, J. (1998):** "An adverse selection model of bank asset and liability management with implications for the transmission of monetary policy", *Rand Journal of Economics*, 29, pp. 466-86.

## Figure 1. Main macroeconomic developments




## Figure 2. Bank loans and deposits

(annual real growth rates)

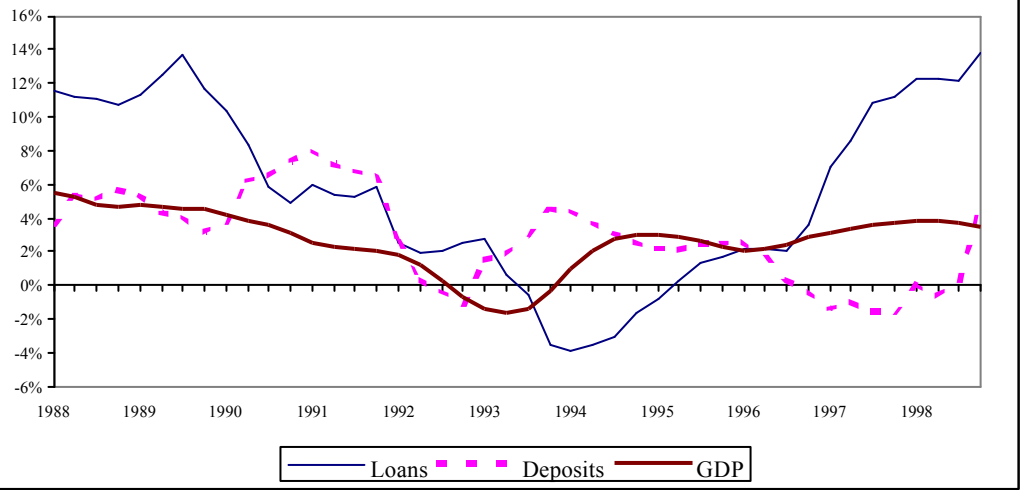
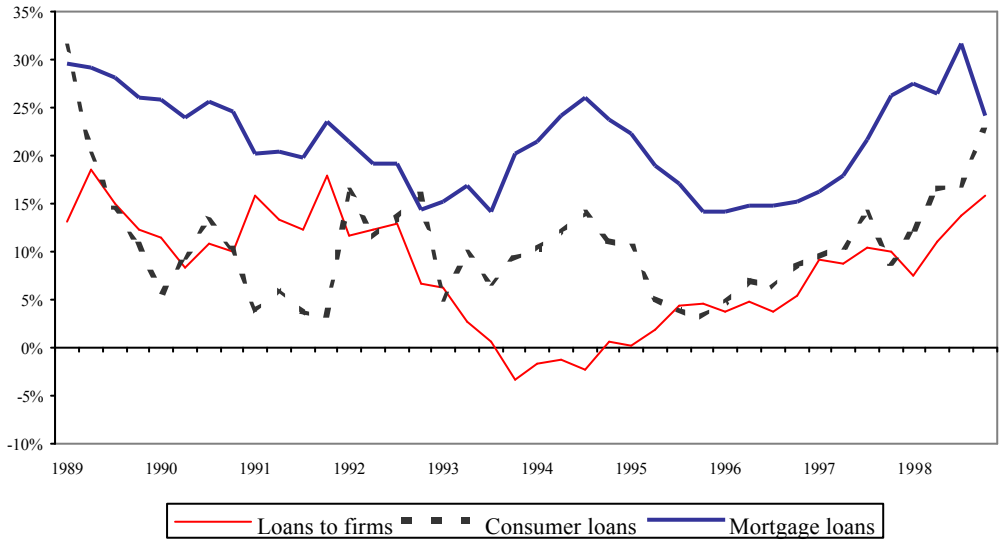
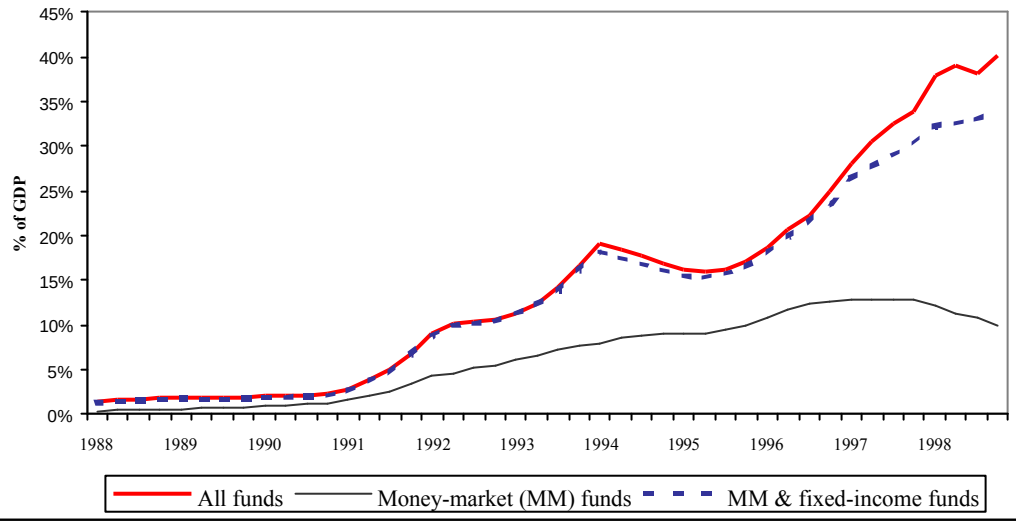


**Figure 3. Bank loans. Breakdown by type of loan**
(annual growth rates)



## Figure 4. Mutual funds development




## Figure 5. Mutual funds and deposits

(% of total financial assets of non-financial firms and households)

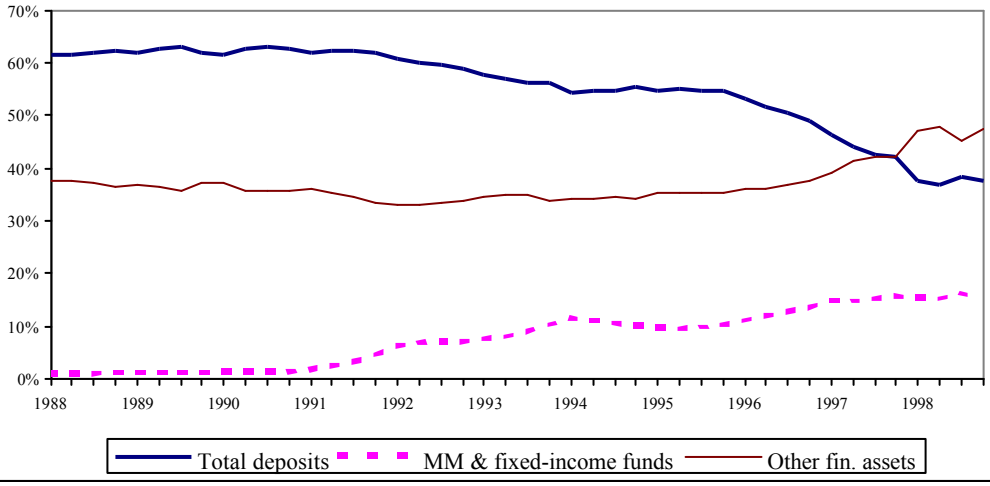


**Figure 6a. Liquid assets over total assets**

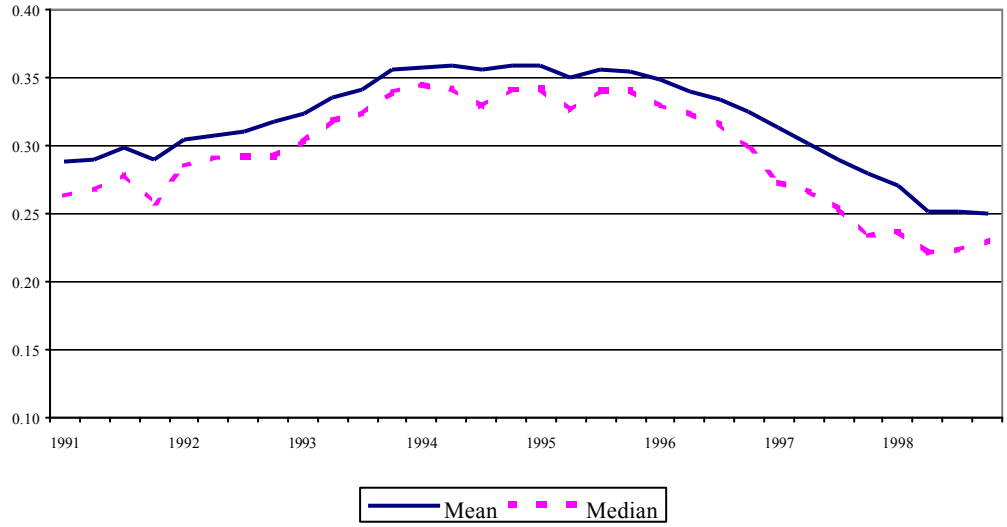
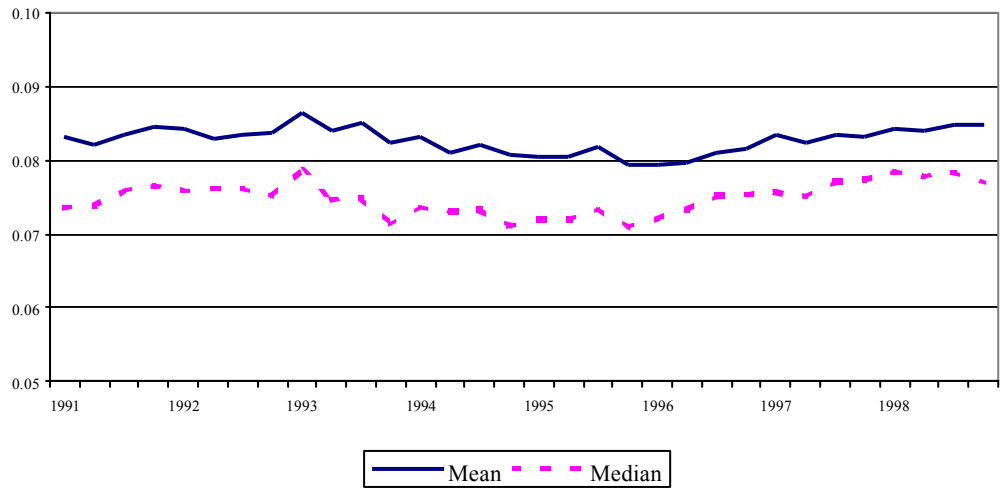
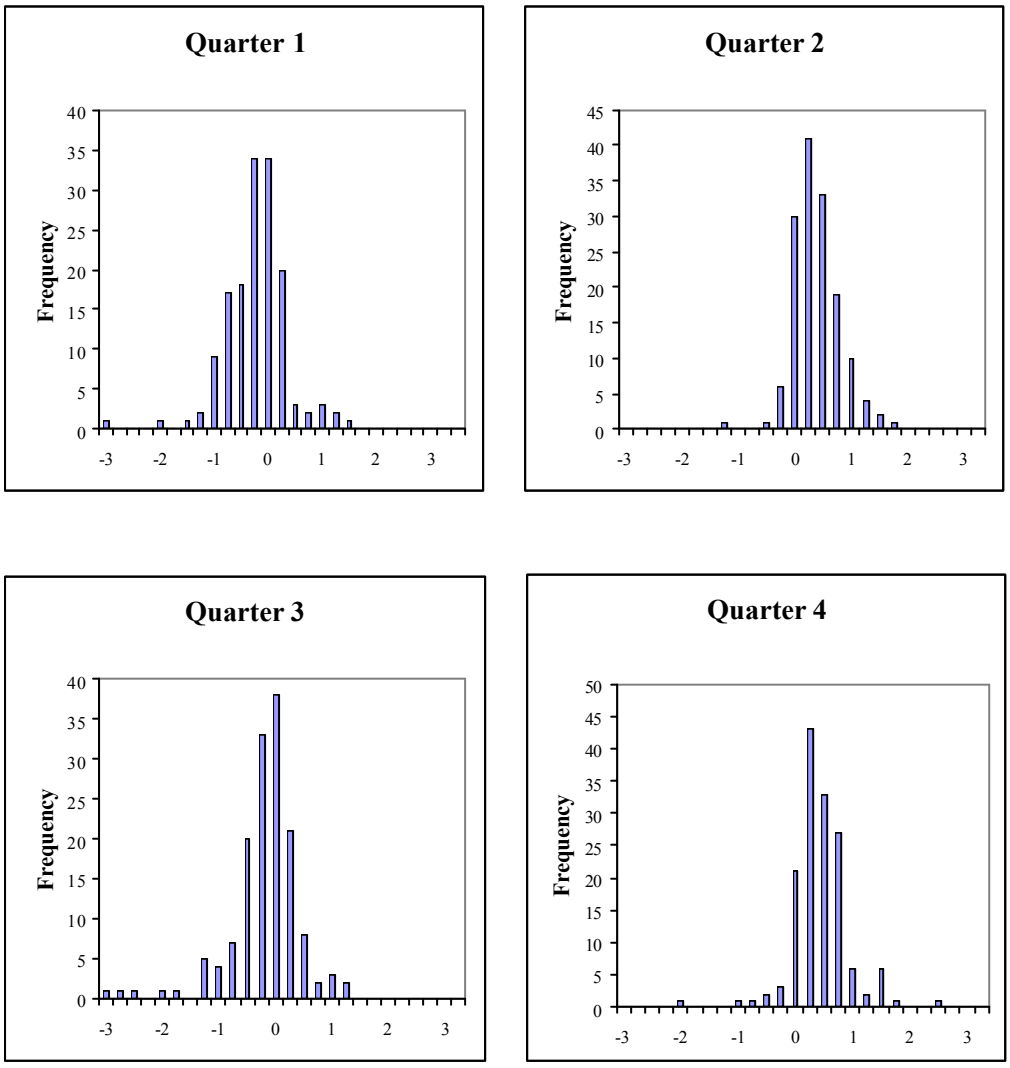



**Figure 6b. Capital and reserves over total assets**

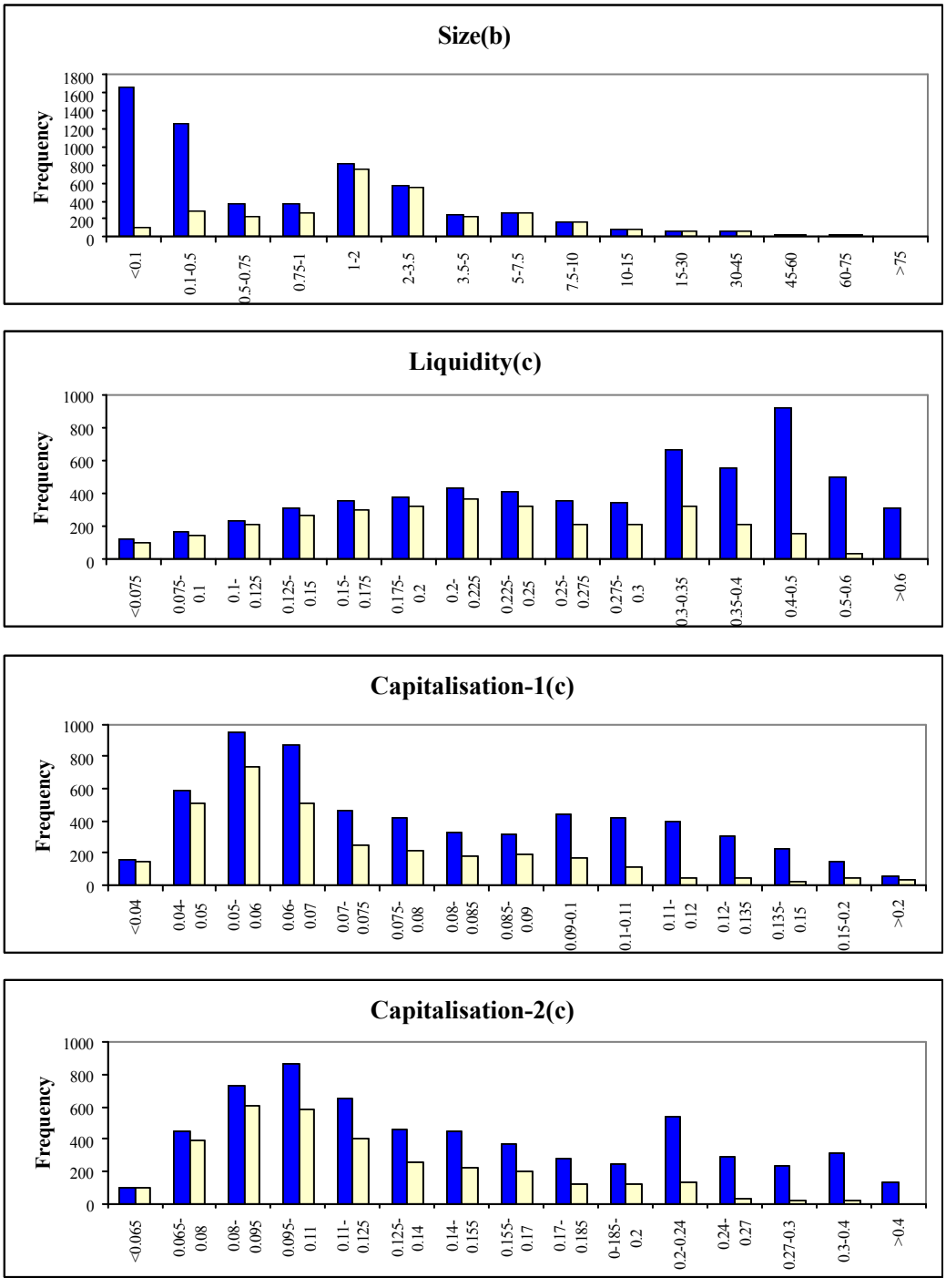


## Figure 7: Seasonal patterns of credit growth across banks(a)




(a) Each histogram corresponds to the distribution across banks of the "seasonal factor" of the corresponding quarter. The "seasonal factor" for bank i in the $k^{th}$ quarter is calculated as the difference between the median of the credit growth of bank i in the $k^{th}$ quarter and the median of the credit growth of bank i in all quarters. This difference is re-scaled by the interquartile range of credit growth of bank i in the $k^{th}$ quarter to have an idea of the statistical significance of the difference.

## Figure 8: Comparison of samples(a)




(a) Each figure represents the distribution for a specific variable of both the whole sample and the reduced sample. This reduced sample includes those observations for which the data on loans by type is available.

(b) Total assets in billions of euro.

(c) See Annex for the precise definition.

## TABLE 1. DESCRIPTIVE STATISTICS. Spanish Banking Sector: 1991-1998 (1).

| | All | Type | | | Size | | | Liquidity | | | Capitalisation(3) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Commer. banks | Savings banks | Co-oper. banks | (<p75) | (p75-90) | (>p90) | (<p30) | (p30-70) | (>p70) | (<p30) | (p30-70) | (>p70) |
| Number of institutions | 216 | 61 | 57 | 98 | 171 | 45 | 23 | 119 | 152 | 107 | 106 | 134 | 95 |
| Number of observations | 5551 | 1339 | 1637 | 2575 | 4175 | 837 | 539 | 1679 | 2223 | 1649 | 1679 | 2223 | 1649 |
| **Size indicators** | | | | | | | | | | | | | |
| Average number of bank-branches | 187 | 342 | 296 | 37 | 62 | 261 | 1036 | 239 | 261 | 34 | 355 | 161 | 51 |
| Average number of bank employees | 1229 | 2807 | 1660 | 138 | 302 | 1726 | 7633 | 1488 | 1815 | 178 | 2348 | 1052 | 328 |
| Average total assets(2) | 3026.2 | 6867.3 | 4257.2 | 246.2 | 549.9 | 3857.5 | 20915.5 | 3299.2 | 4723.0 | 460.8 | 6262.6 | 2347.8 | 645.4 |
| Median total assets(2) | 592.6 | 1877.9 | 2042.5 | 82.5 | 233.6 | 3471.7 | 10760.2 | 1923.8 | 812.3 | 59.5 | 1712.0 | 635.4 | 55.1 |
| **Market share (%) of** | | | | | | | | | | | | | |
| Total assets | 100.0 | 54.7 | 41.5 | 3.8 | 13.7 | 19.2 | 67.1 | 33.0 | 62.5 | 4.5 | 62.6 | 31.1 | 6.3 |
| Loans | 100.0 | 49.7 | 45.7 | 4.6 | 16.6 | 21.9 | 61.5 | 40.8 | 55.8 | 3.4 | 57.7 | 34.4 | 7.9 |
| Deposits | 100.0 | 41.7 | 52.4 | 5.9 | 18.6 | 21.9 | 59.6 | 39.2 | 56.4 | 4.4 | 58.0 | 34.6 | 7.4 |
| **Other structural indicators** | | | | | | | | | | | | | |
| Average total assets per branch(2) | 14.3 | 15.8 | 12.8 | 14.3 | 12.9 | 16.9 | 20.9 | 15.3 | 13.6 | 14.1 | 13.7 | 13.3 | 16.1 |
| Average total assets per employee(2) | 2.1 | 2.0 | 2.3 | 2.0 | 1.9 | 2.3 | 2.7 | 2.1 | 2.0 | 2.2 | 2.1 | 1.9 | 2.3 |
| **Asset composition (percent of year-end total)** | | | | | | | | | | | | | |
| Loans | 50.6 | 56.9 | 54.2 | 45.0 | 49.2 | 57.5 | 50.7 | 62.9 | 52.1 | 36.1 | 53.0 | 53.0 | 44.9 |
| Liquidity | 32.0 | 25.1 | 21.9 | 42.0 | 35.2 | 20.4 | 24.5 | 15.8 | 30.1 | 50.9 | 25.9 | 29.7 | 41.3 |
| Other assets | 17.5 | 18.0 | 24.0 | 13.0 | 15.6 | 22.1 | 24.7 | 21.4 | 17.8 | 13.0 | 21.1 | 17.3 | 13.9 |
| **Liabilities composition (percent of year-end total)** | | | | | | | | | | | | | |
| Deposits | 72.7 | 55.5 | 73.4 | 81.2 | 76.1 | 65.8 | 56.7 | 68.2 | 70.9 | 79.6 | 69.1 | 73.0 | 75.9 |
| *Sight deposits* | *32.1* | *26.3* | *33.9* | *34.1* | *32.8* | *31.2* | *28.9* | *32.0* | *31.6* | *33.0* | *31.2* | *33.1* | *31.7* |
| *Other deposits* | *40.5* | *29.2* | *39.5* | *47.1* | *43.4* | *34.6* | *27.7* | *36.2* | *39.3* | *46.6* | *37.9* | *39.9* | *44.1* |
| Borrowing | 6.1 | 15.3 | 5.2 | 1.9 | 3.9 | 10.2 | 17.3 | 9.0 | 6.8 | 2.3 | 10.2 | 5.9 | 2.3 |
| Capital & reserves | 9.0 | 9.4 | 7.2 | 9.9 | 9.4 | 8.4 | 7.3 | 8.6 | 8.4 | 10.3 | 6.0 | 8.4 | 12.8 |
| Other liabilities | 12.2 | 19.7 | 14.2 | 6.9 | 10.6 | 15.5 | 18.7 | 14.3 | 13.8 | 7.8 | 14.7 | 12.6 | 9.0 |
| **Loan portfolio composition (percent of year-end total)** | | | | | | | | | | | | | |
| Number of observations(4) | 3552 | 1339 | 1637 | 576 | 2177 | 836 | 539 | 1552 | 1496 | 504 | 1436 | 1476 | 640 |
| *(% of the total)* | *64.0* | *100.0* | *100.0* | *22.4* | *52.1* | *99.9* | *100.0* | *92.4* | *67.3* | *30.6* | *85.5* | *66.4* | *38.8* |
| Loans to firms | 58.0 | 72.9 | 47.6 | 52.6 | 58.5 | 55.3 | 60.0 | 54.5 | 60.9 | 60.1 | 53.7 | 61.3 | 59.9 |
| Mortgage loans | 25.4 | 13.7 | 35.4 | 24.2 | 23.5 | 30.0 | 26.0 | 29.0 | 23.7 | 19.1 | 29.6 | 23.8 | 19.7 |
| Consumer loans | 7.8 | 5.6 | 8.9 | 9.6 | 8.0 | 7.5 | 7.2 | 8.2 | 7.1 | 8.4 | 8.2 | 7.2 | 8.2 |
| Other loans to households | 8.8 | 7.8 | 8.1 | 13.6 | 10.0 | 7.2 | 6.8 | 8.3 | 8.3 | 12.4 | 8.5 | 7.7 | 12.2 |

Source: Banco de España

(1) The analysis is performed on the whole sample period, so that statistics are averages for the 1991-1998 period. For this purpose, percentiles are calculated period by period, and each observation assigned to the corresponding group in each period. This means that one bank can appear in different groups at different times. Hence, the number of institutions per group do not necessarily sum up to total. For all definitions, see Annex.

(2) In millions of euro.

(3) Capital and reserves over total assets (capitalisation-1).

(4) This information is not available for all co-operative banks. Hence, we report the number of observations with data in each group and the percentage it represents of total observations in the group.

## TABLE 2. BASIC MODEL (*)

**Dependent variable: first difference of total deposits**

GMM estimation. Number of observations: 4035. Number of banks: 216

| | Bank charact.: SIZE | | Bank charact.: LIQ | | Bank charact.: CAP1 | | Bank charact.: CAP2 | | B.ch.: SIZE,LIQ,CAP1 | | B.ch.: SIZE,LIQ,CAP2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Long-run coefficients** | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error |
| Real GDP growth | 0.540 *** | 0.207 | 0.470 * | 0.244 | 0.770 *** | 0.206 | 0.653 *** | 0.216 | 0.597 *** | 0.200 | 0.347 | 0.235 |
| Inflation (CPI) | 1.651 *** | 0.244 | 2.944 *** | 0.415 | 2.112 *** | 0.291 | 1.558 *** | 0.260 | 2.658 *** | 0.350 | 2.619 *** | 0.355 |
| Monetary policy(MP) | -1.100 *** | 0.293 | 0.527 | 0.430 | -0.376 | 0.305 | -0.829 *** | 0.318 | 0.017 | 0.358 | 0.253 | 0.406 |
| Mutual funds growth (MF) | -0.564 *** | 0.095 | -0.480 *** | 0.107 | -0.539 *** | 0.095 | -0.575 *** | 0.103 | -0.539 *** | 0.098 | -0.577 *** | 0.106 |
| Bank char.*MP: Size | 0.015 | 0.059 | | | | | | | 0.030 | 0.080 | 0.047 | 0.079 |
| Liq | | | 1.786 * | 1.009 | | | | | 2.589 ** | 1.110 | 3.510 ** | 1.528 |
| Cap | | | | | -6.173 | 5.221 | 0.195 | 1.679 | -7.683 | 5.832 | -3.087 | 2.495 |
| Bank char.*MF: Size | -0.084 ** | 0.035 | | | | | | | -0.098 * | 0.054 | -0.095 * | 0.054 |
| Liq | | | 1.725 *** | 0.569 | | | | | 1.447 ** | 0.701 | 1.776 ** | 0.890 |
| Cap | | | | | -2.063 | 2.449 | 0.996 | 0.954 | -5.658 * | 2.903 | -2.019 | 1.612 |
| MP effect for: large bank | -1.039 *** | 0.384 | | | | | | | 0.140 | 0.450 | 0.444 | 0.486 |
| small bank | -1.114 *** | 0.296 | | | | | | | -0.010 | 0.374 | 0.212 | 0.420 |
| high liquid | | | 0.936 * | 0.550 | | | | | 0.610 | 0.454 | 1.056 * | 0.569 |
| low liquid | | | 0.202 | 0.410 | | | | | -0.455 | 0.399 | -0.386 | 0.462 |
| high cap | | | | | -0.703 * | 0.406 | -0.802 * | 0.426 | -0.391 | 0.473 | -0.177 | 0.522 |
| low cap | | | | | -0.160 | 0.361 | -0.845 *** | 0.323 | 0.285 | 0.412 | 0.499 | 0.460 |
| MF effect for: large bank | -0.909 *** | 0.154 | | | | | | | -0.942 *** | 0.224 | -0.967 *** | 0.224 |
| small bank | -0.492 *** | 0.105 | | | | | | | -0.454 *** | 0.118 | -0.496 *** | 0.125 |
| high liquid | | | -0.086 | 0.161 | | | | | -0.208 | 0.165 | -0.171 | 0.198 |
| low liquid | | | -0.794 *** | 0.156 | | | | | -0.802 *** | 0.180 | -0.901 *** | 0.220 |
| high cap | | | | | -0.648 *** | 0.177 | -0.436 ** | 0.181 | -0.839 *** | 0.192 | -0.858 *** | 0.264 |
| low cap | | | | | -0.467 *** | 0.114 | -0.655 *** | 0.118 | -0.341 ** | 0.133 | -0.416 *** | 0.152 |
| | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value |
| **Residual autocorr. tests** | | | | | | | | | | | | |
| m1 | 0.513 | 0.608 | 1.047 | 0.295 | 0.336 | 0.737 | 0.119 | 0.905 | 0.942 | 0.346 | 1.334 | 0.182 |
| m2 | 0.177 | 0.860 | 0.391 | 0.696 | 0.368 | 0.713 | 0.005 | 0.996 | 0.167 | 0.867 | 0.053 | 0.957 |
| m4 | -7.983 | 0.000 | -7.853 | 0.000 | -7.223 | 0.000 | -7.894 | 0.000 | -7.863 | 0.000 | -8.106 | 0.000 |
| m8 | 0.815 | 0.415 | 1.066 | 0.286 | 0.573 | 0.567 | 0.797 | 0.425 | 0.479 | 0.632 | 0.481 | 0.631 |
| **Sargan test (2-step)** | 196.507 | 0.755 | 189.461 | 0.854 | 201.240 | 0.674 | 193.488 | 0.801 | 188.803 | 1.000 | 188.043 | 1.000 |

Note: */**/*** denotes significance at the 10%/5%/1% level.

(*) The estimated model is given by expression (1) in the main text. The regressors are four lags of the endogenous variable, the first lag of the bank characteristics, the contemporaneous value and four lags of the macro-economic variables (GDP growth, inflation, monetary policy indicator) and of the interaction of the bank characteristics with the monetary policy indicator, the contemporaneous value of the mutual funds shock and the inter-action of this shock with the bank characteristics.

Instruments: macroeconomic variables (including the mutual funds shock), lags 5 to 8 of the endogenous variable and of the bank characteristics, and the interactions of the monetary policy indicator and of the mutual funds shock with the bank characteristics at t-5.

## TABLE 3. BASIC MODEL (*)

**Dependent variable: first difference of total loans to non-financial private sector**

GMM estimation. Number of observations: 4035. Number of banks: 216

| | Bank charact.: SIZE | | Bank charact.: LIQ | | Bank charact.: CAP1 | | Bank charact.: CAP2 | | B.ch.: SIZE,LIQ,CAP1 | | B.ch.: SIZE,LIQ,CAP2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Long-run coefficients** | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error |
| Real GDP growth | 1.710 *** | 0.355 | 2.027 *** | 0.377 | 1.870 *** | 0.358 | 1.551 *** | 0.338 | 1.715 *** | 0.339 | 1.490 *** | 0.345 |
| Inflation (CPI) | -0.989 *** | 0.325 | -1.691 *** | 0.437 | -0.790 ** | 0.377 | -1.346 *** | 0.349 | -1.488 *** | 0.409 | -1.728 *** | 0.419 |
| Monetary policy(MP) | -1.566 *** | 0.423 | -2.579 *** | 0.512 | -1.547 *** | 0.466 | -1.493 *** | 0.413 | -2.310 *** | 0.466 | -2.087 *** | 0.493 |
| Bank char.*MP: Size | -0.132 | 0.109 | | | | | | | -0.109 | 0.144 | -0.092 | 0.135 |
| Liq | | | 3.403 * | 1.997 | | | | | 3.150 | 2.163 | 5.692 ** | 2.213 |
| Cap | | | | | -6.045 | 6.979 | -0.157 | 4.125 | -14.836 * | 8.152 | -9.308 * | 5.129 |
| MP effect for: large bank | -2.106 *** | 0.541 | | | | | | | -2.755 *** | 0.697 | -2.466 *** | 0.699 |
| small bank | -1.452 *** | 0.454 | | | | | | | -2.216 *** | 0.499 | -2.008 *** | 0.519 |
| high liquid | | | -1.800 ** | 0.732 | | | | | -1.589 ** | 0.659 | -0.784 | 0.638 |
| low liquid | | | -3.198 *** | 0.586 | | | | | -2.883 *** | 0.628 | -3.123 *** | 0.691 |
| high cap | | | | | -1.867 *** | 0.643 | -1.515 ** | 0.749 | -3.096 *** | 0.678 | -3.381 *** | 0.946 |
| low cap | | | | | -1.335 *** | 0.488 | -1.480 *** | 0.495 | -1.791 *** | 0.511 | -1.343 ** | 0.574 |
| | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value |
| **Residual autocorr. tests** | | | | | | | | | | | | |
| m1 | 0.211 | 0.833 | -0.165 | 0.865 | -0.364 | 0.716 | -0.123 | 0.902 | -0.027 | 0.978 | -0.017 | 0.987 |
| m2 | 0.282 | 0.778 | -0.015 | 0.988 | 0.237 | 0.813 | 0.282 | 0.778 | -0.077 | 0.939 | 0.017 | 0.987 |
| m4 | -9.074 | 0.000 | -9.242 | 0.000 | -9.040 | 0.000 | -9.020 | 0.000 | -9.081 | 0.000 | -9.020 | 0.000 |
| m8 | -0.229 | 0.819 | 0.295 | 0.768 | -0.413 | 0.679 | -0.232 | 0.816 | -0.229 | 0.819 | -0.321 | 0.748 |
| **Sargan test (2-step)** | 197.367 | 0.741 | 192.760 | 0.811 | 193.844 | 0.796 | 196.273 | 0.759 | 195.835 | 1.000 | 192.762 | 1.000 |

Note: */**/*** denotes significance at the 10%/5%/1% level.

(*) The estimated model is given by expression (1) in the main text. The regressors are four lags of the endogenous variable, the first lag of the bank characteristics and the contemporaneous value and four lags of the macro-economic variables (GDP growth, inflation, monetary policy indicator) and of the interaction of the bank characteristics with the monetary policy indicator.

Instruments: macroeconomic variables, lags 5 to 8 of the endogenous variable and of the bank characteristics, and the interactions of the monetary policy indicator with the bank characteristics at t-5.

## TABLE 4. BASIC MODEL WITH BANK-SPECIFIC DEMAND-SCALE VARIABLES (*)

**Dependent variable: first difference of total loans to non-financial private sector**

GMM estimation. Number of observations: 4035. Number of banks: 216

| | Bank charact.: SIZE | | Bank charact.: LIQ | | Bank charact.: CAP1 | | Bank charact.: CAP2 | | B.ch.: SIZE,LIQ,CAP1 | | B.ch.: SIZE,LIQ,CAP2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error |
| **Long-run coefficients** | | | | | | | | | | | | |
| Bank-specific growth index | 0.536 *** | 0.109 | 0.340 *** | 0.108 | 0.475 *** | 0.114 | 0.602 *** | 0.112 | 0.338 *** | 0.104 | 0.376 *** | 0.102 |
| Bank-specific price index | -0.362 *** | 0.110 | -0.195 * | 0.109 | -0.314 *** | 0.114 | -0.444 *** | 0.113 | -0.209 ** | 0.106 | -0.264 ** | 0.104 |
| Monetary policy(MP) | -0.095 | 0.278 | -0.003 | 0.234 | 0.158 | 0.259 | 0.077 | 0.265 | -0.104 | 0.250 | -0.056 | 0.240 |
| Bank char.*MP: Size | -0.124 | 0.132 | | | | | | | -0.164 | 0.150 | -0.129 | 0.143 |
| Liq | | | 2.693 | 2.134 | | | | | 1.788 | 2.169 | 4.864 ** | 2.281 |
| Cap | | | | | -6.620 | 7.940 | -0.514 | 5.048 | -14.161 * | 8.329 | -9.380 * | 5.203 |
| MP effect for: large bank | -0.604 | 0.528 | | | | | | | -0.777 | 0.630 | -0.583 | 0.617 |
| small bank | 0.012 | 0.331 | | | | | | | 0.038 | 0.299 | 0.055 | 0.278 |
| high liquid | | | 0.614 | 0.607 | | | | | 0.306 | 0.589 | 1.058 * | 0.589 |
| low liquid | | | -0.493 | 0.382 | | | | | -0.429 | 0.434 | -0.941 ** | 0.466 |
| high cap | | | | | -0.193 | 0.536 | 0.006 | 0.832 | -0.854 | 0.520 | -1.359 * | 0.805 |
| low cap | | | | | 0.389 | 0.340 | 0.119 | 0.399 | 0.392 | 0.373 | 0.695 | 0.439 |
| | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value | Test | p-value |
| **Residual autocorr. tests** | | | | | | | | | | | | |
| m1 | -0.590 | 0.555 | -0.425 | 0.671 | -1.358 | 0.175 | -1.114 | 0.265 | -0.832 | 0.405 | -0.729 | 0.466 |
| m2 | -0.114 | 0.909 | 0.114 | 0.909 | 0.094 | 0.925 | -0.348 | 0.728 | 0.162 | 0.871 | -0.069 | 0.945 |
| m4 | -9.200 | 0.000 | -9.093 | 0.000 | -9.126 | 0.000 | -9.120 | 0.000 | -8.977 | 0.000 | -8.883 | 0.000 |
| m8 | 0.022 | 0.982 | -0.117 | 0.907 | -0.214 | 0.831 | 0.145 | 0.885 | -0.577 | 0.564 | -0.549 | 0.583 |
| **Sargan test (2-step)** | 202.409 | 1.000 | 196.712 | 1.000 | 197.834 | 1.000 | 201.835 | 1.000 | 194.371 | 1.000 | 191.031 | 1.000 |

Note: */**/*** denotes significance at the 10%/5%/1% level.

(*) The estimated model is given by expression (1) in the main text. The regressors are four lags of the endogenous variable, the first lag of the bank characteristics and the contemporaneous value and four lags of the bank-specific demand-scale variables, of the monetary policy indicator and of the interaction of the bank characteristics with the monetary policy indicator.

Instruments: monetary policy indicator, lags 5 to 8 of the endogenous variable, of the bank-specific demand-scale variables and of the bank characteristics, and the interactions of the monetary policy indicator with the bank characteristics at t-5.

## TABLE 5. ANALYSIS OF LOAN PORTFOLIO COMPOSITION (*)

**Long-run coefficients of the interaction terms**

GMM estimation. Number of observations: 2100. Number of banks: 116

| | Bank characteristic | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SIZE | | LIQUIDITY | | CAPITALISATION-1 | | CAPITALISATION-2 | |
| **Dependent variable** | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error |
| Loans to firms | -0.494 | 0.628 | 5.406 | 4.842 | -1.138 | 9.650 | 0.771 | 8.141 |
| Consumer loans | 0.466 | 1.036 | 10.483 | 17.849 | -19.131 | 30.413 | -12.065 | 28.197 |
| Mortgage loans | -0.028 | 0.573 | 6.225 | 8.940 | -24.014 | 19.449 | -15.278 | 12.721 |

(*) The results reported in this table are based on the sample of banks for which the composition of lending is available.

The estimated model is a slightly modified version of expression (1) in the main text. Instead of including a group of macroeconomic variables, the model introduces a complete set of time dummies. Thus, the regressors are four lags of the endogenous variable, the first lag of the bank characteristics, the contemporaneous value and four lags of the interaction of the bank characteristics with the monetary policy indicator, and a complete set of time dummies.

Instruments: time dummies, lags 5 to 8 of the endogenous variable and of the bank characteristics, and the interactions of the monetary policy indicator with the bank characteristics at t-5.

## TABLE 6. THE IMPACT OF THE MUTUAL FUNDS SHOCK (*)

**Dependent variable: first difference of total loans to non-financial private sector**

GMM estimation. Number of observations: 4035. Number of banks: 216

| | **Bank charact.: SIZE** | | **Bank charact.: LIQ** | | **Bank charact.: CAP1** | | **Bank charact.: CAP2** | | **B.ch.: SIZE,LIQ,CAP1** | | **B.ch.: SIZE,LIQ,CAP2** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Long-run coefficients** | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error | Coeff. | S.Error |
| Mutual funds growth (MF) | -0.062 | 0.142 | -0.222 | 0.149 | -0.083 | 0.142 | -0.197 | 0.140 | -0.174 | 0.137 | -0.245 * | 0.139 |
| Bank char.*MF: Size | 0.018 | 0.057 | | | | | | | -0.025 | 0.076 | -0.015 | 0.073 |
| Liq | | | -1.155 | 0.960 | | | | | -0.837 | 1.043 | -0.180 | 1.206 |
| Cap | | | | | -0.888 | 3.801 | -1.445 | 1.717 | -1.865 | 4.475 | -1.092 | 2.432 |

(*) The estimated model is given by expression (1) in the main text. The regressors are four lags of the endogenous variable, the first lag of the bank characteristics, the contemporaneous value and four lags of the macroeconomic variables (GDP growth, inflation, monetary policy indicator) and of the interaction of the bank characteristics with the monetary policy indicator, the contemporaneous value of the mutual funds shock and the interaction of this shock with the bank characteristics.

Instruments: macroeconomic variables (including the mutual funds shock), lags 5 to 8 of the endogenous variable and of the bank characteristics, and the interactions of the monetary policy indicator and of the mutual funds shock with the bank characteristics at t-5.

## TABLE 7: IMPACT OF MUTUAL-FUNDS' GROWTH ON BANKS' BALANCE SHEETS (1995Q4-1998Q4).

| Groups (a) | No. of banks (b) (1) | Average(c): total assets(d) (2) | Average(c): liquid assets(e) (3) | Average(c): capital & reser.(e) (4) | Market share(c) Credit (5) | Market share(c) Deposits (6) | Average cumulated change in: credit-deposit(e) (7) | liquid assets(e) (8) | borrowing (e)(f) (9) | capital & reser.(e) (10) | other items(e) (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent banks | 20 | 3939 | 0.30 | 0.09 | 0.16 | 0.14 | 0.19 | -0.13 | 0.06 | 0.01 | -0.05 |
| Small banks | | | | | | | | | | | |
| Low liq | 25 | 276 | 0.30 | 0.08 | 0.02 | 0.02 | 0.11 | -0.11 | 0.01 | 0.01 | 0.00 |
| Average liq | 24 | 136 | 0.45 | 0.10 | 0.01 | 0.01 | 0.13 | -0.12 | 0.01 | 0.01 | -0.01 |
| High liq | 24 | 88 | 0.59 | 0.10 | 0.00 | 0.01 | 0.10 | -0.12 | 0.00 | 0.00 | 0.00 |
| Low cap | 25 | 292 | 0.38 | 0.07 | 0.02 | 0.02 | 0.12 | -0.13 | 0.00 | 0.01 | 0.00 |
| Average cap | 24 | 136 | 0.45 | 0.09 | 0.01 | 0.01 | 0.14 | -0.14 | 0.00 | 0.00 | -0.01 |
| High cap | 24 | 72 | 0.51 | 0.13 | 0.00 | 0.01 | 0.09 | -0.08 | 0.01 | 0.00 | 0.00 |
| Medium banks | | | | | | | | | | | |
| Low liq | 19 | 2841 | 0.20 | 0.08 | 0.15 | 0.16 | 0.13 | -0.07 | 0.03 | 0.01 | -0.01 |
| High liq | 18 | 1971 | 0.34 | 0.08 | 0.08 | 0.10 | 0.14 | -0.13 | 0.00 | 0.01 | 0.02 |
| Low cap | 19 | 2161 | 0.26 | 0.06 | 0.11 | 0.12 | 0.12 | -0.10 | 0.01 | 0.01 | 0.00 |
| High cap | 18 | 2689 | 0.28 | 0.10 | 0.12 | 0.13 | 0.15 | -0.10 | 0.02 | 0.01 | 0.00 |
| Large banks | 12 | 22930 | 0.26 | 0.07 | 0.58 | 0.57 | 0.13 | -0.06 | 0.07 | 0.00 | 0.00 |

(a) Groups are defined according to banks' characteristics at 1995Q3. Dependent banks include affiliates of other banks plus two partially state-controlled banks. Among independent banks, small banks are those under the 60th percentile and large banks those above the 90th percentile. The corresponding thresholds for liquidity and capitalisation, inside each size group, are percentiles 33 and 66 for the small banks and percentile 50 for the medium banks. Large banks are not further split because of the reduced number of large institutions.

(b) This table is based on the data for those banks that remain in the sample between 1995Q4 and 1998Q4.

(c) At 1995Q3.

(d) Millions of euro.

(e) Over total assets.

(f) Securities issued and interbank borrowing.

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