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EUROSYSTEM MONETARY TRANSMISSION NETWORK

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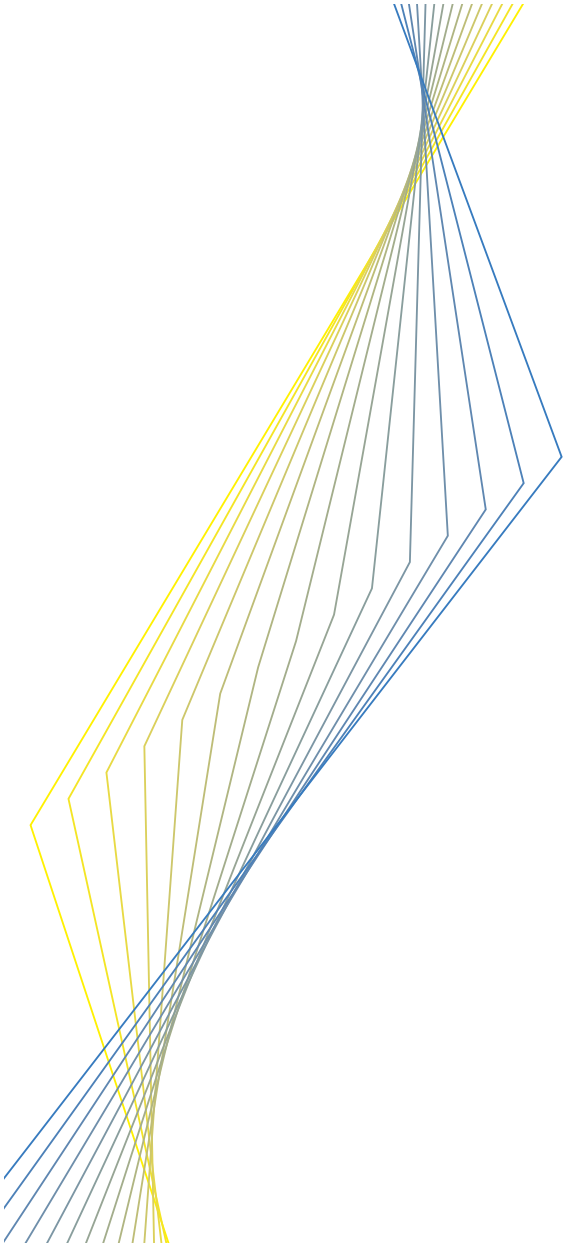

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1 *European Central Bank.*
2 *Banca d'Italia.*
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4 *Banque de France and Université Paris Val de Marne.*
5 *Deutsche Bundesbank.**This paper represents the authors' personal opinions and does not necessarily reflect the views of the institutions they are affiliated to. We would like to thank the members of the Eurosystem's Monetary Transmission Network and the participants of the monetary economics workshop at the NBER Summer Institute 2001 for helpful discussions and feedback, and especially Ignazio Angeloni, Ignacio Hernando, Anil Kashyap, Claire Loupias, Benoit Mojon and Fred Ramb for their comments and suggestions.*

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 offers a comprehensive comparison of the structure of banking and financial markets in the euro area. Based on this, several hypotheses about the role of banks in monetary policy transmission are developed. Many of the predictions that have been proposed for the U.S. are deemed unlikely to apply in Europe. Testing these hypotheses we find that monetary policy does alter bank loan supply, with the effects most dependent on the liquidity of individual banks. Unlike in the US, the size of a bank does generally not explain its lending reaction. We also show that the standard publicly available database, BankScope, obscures the heterogeneity across banks. Indeed, for several types of questions BankScope data suggest very different answers than more complete data that reside at national central banks.

JEL classification system: C23, E44, E52, G21
Key words: monetary policy transmission, financial structure, bank lending

Non-technical summary

This paper analyses the role of banks in monetary policy transmission in the euro area. Banks are of major importance for the financing of firms in the euro area, which implies that the way they adjust lending in response to monetary policy actions can potentially constitute an important channel through which monetary policy works.

Banks are exposed to problems of informational asymmetry. It has been shown in several recent contributions on the US economy, that this may have consequences for the reaction of banks to monetary policy. Essentially, it has been shown that a change in interest rates can lead to distributional effects across banks that are informationally opaque to a different degree. For example, smaller banks have been found to be more affected by monetary policy tightenings than large banks, and as such have been forced to restrict their lending more strongly. Similar effects have been shown for banks with different levels of liquidity and capitalisation.

When conducting tests of this kind for the euro area, we argue that the specificity of European banking and financial structures has to be kept in mind. We therefore compile a comprehensive overview of banking and financial market characteristics that we consider relevant for the role of banks in monetary policy transmission, and compare them both to the US and across the euro area countries. We argue that there are several reasons why the evidence found for the US should not necessarily be found for the euro area as well. Mainly, we would expect that the size of a bank need not be informative for the way it adjusts lending after a monetary contraction, whereas its liquidity might very well be.

These hypotheses are then tested in an empirical analysis, where we employ both a publicly available dataset that has frequently been used in recent contributions on this topic, and more complete datasets residing at the national central banks of the euro area. Additionally, we draw on results obtained in several companion papers to complete our analysis.

We find that a monetary policy tightening generally reduces bank lending, and that for most countries, the size of a bank does not explain its lending reaction, whereas its degree of liquidity does.

We also show that the publicly available database suffers from a representation bias. Since small banks are not adequately covered, the *microeconomic* distributional effects are estimated on a biased sample of banks. This might explain contradictory findings in the previous literature as well as the few cases of coinciding evidence in this and earlier studies. When estimating the *macroeconomic* importance of the bank loan response, this bias is less important, however. Since the coverage of large banks is relatively good, both the estimates calculated with the publicly available database and those obtained with the complete population of banks arrive at quantitatively similar conclusions.

The Eurosystem datasets, on the other hand, produce a set of stable and robust results that improves markedly on the existing evidence on the role of banks in monetary policy transmission in the euro area to date.

1. Introduction

On January 1st, 1999, eleven European countries fixed the exchange rates of their national currencies irrevocably and started monetary union with the conduct of a single monetary policy under the responsibility of the Governing Council of the European Central Bank.[1] This creation of a single currency for several countries raises the need to better understand the transmission process of monetary policy in the new currency area. While theory offers a wide array of different transmission channels (e.g., the exchange rate, asset price or interest rate channels,...), those that offer an important role for banks are of special interest here, mainly for two reasons.

First, most European countries rely much more heavily on bank finance than for example the US (see table 1). Comparing the ratio of bank total assets to GDP across the four largest countries of the euro area[2] and the US it turns out that banks are much less important in the US than in any of the European countries. Accordingly, the financial structure of the corporate sector in Europe relies much more heavily on bank loans, with the mirror image of this being the larger stock market capitalisation and the more prominent role of debt securities issued by the corporate sector in the US.

Table 1: Financial structures in the euro area and the US (% of GDP), 1999

	Euro area	France	Germany	Italy	Spain	US
Bank total assets [1]	181	180	195	122	144	99
Bank loans to corporate sector [1]	45.2	37.2	39.8	49.8	43.1	12.6
Debt securities issued by corporate sector [2]	3.6	7.6	0.7	1.0	4.4	25.7
Stock market capitalisation [3]	90	111	72	66	77	193

Source: [1] Eurosystem [2] BIS [3] International Federation of Stock Exchanges

Second, around the high overall level of bank dependence there are also some notable country-level differences. Thus, it is also natural to explore the implications of these differences. We document the differences in a comprehensive fashion in tables 2 and 3, and in what follows concentrate on the gaps that may have implications for the transmission of monetary policy.

For instance, we will show that firms depend to a different degree on bank finance in the various countries. Italian firms, for instance, use around ten times less debt finance than firms in France. Also, the maturity of bank loans is much shorter in Italy than in France.

[1] On January 1st, 2001, Greece joined the monetary union as the twelfth member state.
[2] These four countries, which form the group of countries studied in section 5, contribute approximately 80% to euro area GDP.

Such a shorter maturity structure of bank loans is likely to accelerate the monetary transmission, since loans have to be renewed much more frequently.

Another example is heterogeneity of the market structure of the banking industry across euro area countries. The national market concentration as measured by the Herfindahl index is much lower in Germany than for example in France. On the other hand, in both countries the five largest banks show a similar market share. Germany is therefore characterised by a banking system with many more very small banks, a large proportion of which is affiliated to a network. These differences in the national market structure can potentially alter the transmission of monetary policy impulses.

We try to quantify the importance of these considerations by focusing on three questions: (1) what is the role of banks (i.e. bank loans) in monetary transmission in the euro area, (2) are there differences in this respect across the member countries of EMU, and (3) are there distributional effects of monetary policy on different types of banks?

These issues have also been addressed in several recent studies on the monetary transmission process at the aggregate level.[3] However, the macroeconomic evidence is not conclusive, mainly because of the wide confidence intervals that are normally associated with those estimates. This paper makes use of microdata on banks. By using the cross-sectional information of these datasets, we hope to get more precise estimates, thus allowing for better inference on differences across countries. Read in conjunction with several companion papers analysing the country-level, this makes for a very complete analysis of the role of banks in monetary policy transmission in the euro area.

The central task in this effort is to identify the reaction of loan supply to monetary policy actions. This is important since bank loans are the most important link between banks and private non-banks, and because bank loans very often cannot be easily substituted by other forms of finance on the borrower's side. For the analysis of bank loan supply, cross-sectional differences between banks can aid in the identification problem.[4]

In particular, we investigate whether there are certain types of banks whose lending is more responsive to monetary policy impulses. This would be the case if a monetary policy induced decrease in deposits (or increase in the cost of funding) were differentially hard

[3] E.g., Ciccarelli and Rebucci (2001); Clements et al (2001); Mihov (2001); Sala (2001). For a model which explicitly takes into account the effect of differences in the bank lending channel on monetary policy see Gambacorta (2001a).

[4] This identification strategy has been used extensively in the literature on the bank lending channel. It attributes banks an active role in the transmission mechanism of monetary policy, arguing that banks reduce their loan supply following a monetary contraction. If bank loans are not perfectly substitutable by other forms of finance by borrowers, then this reduction in loan supply leads to real effects (given a certain degree of price rigidity). See, amongst others, Kashyap and Stein (1995, 1997).

for banks to neutralise. If the banks face different funding costs, the same impulse will lead to different reductions in lending across banks.

The prior literature has proceeded by positing several differences that could shape loan supply sensitivity to monetary policy. One strand of this literature checks whether poorly capitalised banks have a more limited access to nondeposit financing and as such should be forced to reduce their loan supply by more than well capitalised banks do (e.g., Peek and Rosengren, 1995). The role of size has been emphasised, for example, in Kashyap and Stein (1995): small banks are assumed to suffer from informational asymmetry problems more than large banks do, and find it therefore more difficult to raise uninsured funds in times of monetary tightening. Again, this should force them to reduce their bank lending relatively more when compared to large banks. Another distinction is often drawn between more and less liquid banks (e.g., Kashyap and Stein, 2000). Whereas relatively liquid banks can draw down their liquid assets to shield their loan portfolio, this is not feasible for less liquid banks.[5]

In section 2 we will provide a description of the financial markets in the countries of the euro area. We will argue that these characteristics are important for the role of banks in monetary policy transmission, and that some of the results found for the US are not likely to be applicable in the European context. Mainly, we believe that the size criterion is not necessarily a good indicator for distributional effects across banks. These presumptions will be tested in the empirical analysis, where we consider which bank characteristics, i.e. size, liquidity or capitalisation distinguish banks' responses to changes in the interest rates also in Europe. In this paper, we will perform regressions for the euro area as a whole and the four largest countries of the euro area, and furthermore draw on the results obtained in the companion papers. Whereas the companion papers are written with a national perspective, the main aim of this paper is to provide an overview of those results obtained at the national level, to produce a more comparable set of results by performing regressions in a harmonised approach, and to broaden the focus to the euro area as a whole.

The remainder of the paper is organised as follows. Section 2 describes the structure of the banking sector in the euro area and the consequences it might have for the role of banks in monetary policy transmission. The theoretical model underlying our analysis is introduced in section 3. Section 4 presents results for the entire euro area and the four largest member countries using individual bank balance sheet data provided by BankScope, which have been used extensively in the literature, in order to assess their quality for this type of analysis. Section 5 presents evidence on a national basis using databases on the full

[5] Stein (1998); Ashcraft (2001); Kishan and Opiela (2000); Van den Heuvel (2001).

population of banks collected by the respective national central banks. Section 6 provides some measures of the macroeconomic importance of the results obtained. Section 7 summarises the main conclusions.

2. The structure of the banking system in the euro area and its implications for the role of banks in monetary policy transmission

2.1 The structure of the banking system in the euro area

This section provides a short description of the structure of the banking system in the euro area. As a background, table 2 reports a number of statistics on the banking market in the individual euro area countries. It covers indicators for the availability of non-bank finance for firms, measures of concentration of the banking market, statistics on the performance of banks as well as an index of the role of the government in banking. The table shows that bank finance, as stated in the introduction, is of primary importance in most countries of the euro area, and gives some indication as to the heterogeneity of banking structures.

We believe several features of national banking structures to be important for the response of bank lending to a monetary policy action, and for the assessment of the macroeconomic importance of such responses. In the following, we highlight the most distinctive patterns that might be relevant in this context and refer the interested reader to the companion papers, which elaborate in more detail on the main features of the respective national banking systems.

Importance of banks for firms' financing

As mentioned in the preceding section, banks play an important role in firms' financing. Market financing of the corporate sector is less developed than in the US. Even in France, where it is more important than in many countries of the euro area (see table 1), only the largest firms can issue debt securities, and the role of banks in financing firms is still much more dominant than in the US. To give another example, in Germany and Italy in 1997, the ratio of bonds to total bank loans of firms stood at around 1 percent only. The business sector has therefore been heavily dependent on bank credit, while the smaller size of the capital market has limited diversification of bank assets. This indicates that changes in bank loan supply affect firms relatively strongly, since they cannot easily find substitutes for the bank finance.

Maturity of loans, collateralisation

The loans supplied by Italian banks are to a large extent short-term and come with variable interest rates. The same tendency is present in Spain. This can accelerate the transmission of monetary policy impulses to lending rates and thus borrowing costs. On the other hand, countries like Austria and the Netherlands have a longer maturity of loans and a higher share of fixed rate contracts.[6] In countries like Italy, where a high percentage of loans is backed by collateral, the response of bank loans to monetary policy could be furthermore accentuated through the so called "balance sheet channel".[7]

Relationship lending

In several European countries, the market for intermediated finance is characterised by relationship rather than arm's length lending. It is very common that bank customers establish long lasting relationships with banks, with a prominent example being the German system of "house banks", in which firms conduct most of their financial business with one bank only.[8] With most German banks operating as universal banks, and therefore supplying their customers with the full range of financial services, this implies a much closer linkage to a single bank than in many other countries. For the creditor, this could also imply an implicit guarantee to have access to (additional) funds even if the central bank follows a restrictive monetary policy.[9] In such a case, the reaction of bank loan supply to monetary policy should be at least muted. Typically, house bank relationships exist between relatively small banks – for which the loan business with non-banks is still a central activity – and their customers. Italy shows a similar pattern, where many small banks entertain close relationships with their customers, which are especially small firms.[10] This is true for France as well, where most small firms have business relationships with one bank only. However, although being numerous, these small firms do not account for a large share of GDP.

Market concentration and size structure

The banking markets in the countries of the euro area have been characterised by a steadily increasing concentration during the 1990's. It stands at different levels in the various countries, however. According to the Herfindahl index, Germany and Italy are at the lower end of market concentration in the euro area, as opposed to Belgium, Greece, the Netherlands, and especially Finland.

[6] Borio (1996).
[7] See, among others, Bernanke and Gertler (1989), Mishkin (1995), Oliner and Rudebusch (1996) and Kashyap and Stein (1997).
[8] See, e.g., Elsas and Krahnen (1998).
[9] See, e.g., Rajan and Zingales (1998).
[10] Angelini, Di Salvo and Ferri (1998).

Tables A3 and A4 in the appendix provide a more detailed comparison of the size structure in the four largest countries of the euro area. We split the population of banks into small and large banks with respect to a relative national threshold (with respect to their size in comparison to the national distribution – table A3), as well as according to an absolute criterion in terms of the value of their total assets (table A4).

For all countries, a small number of large banks holds a major share in both the loan and deposit market: the 75% smallest banks hold only around 8% to 15% of deposits, and account for around 5% to 12% of loans, whereas the 5% largest banks hold around 52% to 71% of deposits and have a market share of around 56% to 77% in loans. Table A3 reports similar data on the US as a benchmark. Also there, the 75% smallest banks account for a small market share in terms of total assets, loans and deposits, whereas the top 5% account for the lion's share in each respect.

The comparison with respect to the absolute threshold in table A4 shows that, although there are many more banks with assets larger than 10 billion euros in Germany than elsewhere, there are many fewer large banks in relation to the overall banking population: 2% of the German banks are large in an absolute sense compared to 7% of the French banks. The relatively atomistic structure of the German banking sector can also be seen when comparing the loan market share of small banks across the four economies. It stands at 19% for Germany, as opposed to 3% in France.[11]

The structure of these small banks varies considerably across countries. Whereas French, Italian and Spanish small banks are on average very liquid, there does not seem to be a difference in this respect in Germany. Similarly with capitalisation, where small banks are on average better capitalised in France, Italy and Spain, whereas there is only a small difference in Germany.

On the euro area scale, German banks are the least capitalised. The low degree of capitalisation in Germany is usually explained by the low riskiness of the asset structure of German banks in an international comparison: on average, German banks hold more public bonds and other less risky assets, like e.g. interbank assets. It is interesting to note that in Italy, the small banks hold a much larger market share in the deposit market than in the loan market, which turns out to be less extreme in the other countries.

[11] These discrepancies might also partly reflect differences in the way cooperative bank networks are considered in each country. In France, these networks have been, except for one of them, considered as a unique entity, rather than a multitude of banks. Nevertheless, those networks are globally less important in France than in Germany.

Table 2: Banking structure of the euro area countries pre EMU, 1997

	AT	BE	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES
Availability of non-bank finance												
Domestic debt securities issued by corporates												
As a % of GDP	1.9	6.5	4.6	5.1	0.4	..	4.8	0.5	..	3.8	8.8	2.8
As a % of bank loans to corporate sector	3.0	15.7	7.2	13.8	1.0	..	..	1.1	..	6.7	22.4	7.4
Stock market capitalisation (% of GDP)	18.5	58.2	63.5	49.5	39.9	29.6	59.1	30.6	186.2	132.1	40.9	56.2
% of net incurred liabilities of non-fin. corp. corresponding to securities issu. (avge. 95-99)	42.2	54.9	59.6	53.9	20.9	..	..	25.2	..	27.1	..	17.8
Market Concentration												
Market share of large banks (total assets ≥ 6 billion euros)	60.5	91.0	66.0	..	71.7	68.7	49.9	75.0	61.7	..	83.9	73.0
Population share of large banks (total assets ≥ 6 billion euros)	3.0	16.4	0.9	..	3.1	12.5	10.4	6.0	12.1	..	16.4	6.6
No of institutions per mio inhabitants	123	13	68	22	42	5	19	16	498	11	4	8
Herfindahl index*1000	75	106	337	45	19	110	126	29	29	192	94	40
Market share of five largest banks	45.3	57.0	78.8	32.6	31.5	57.3	35.9	30.1	22.4	24.7	48.6	38.0
Bank Performance												
ROE: profit after tax/capital and reserves (avge. 91-97, %)	7.0	7.9	-15.1	2.9	5.8	16.5[1]	14.2[2]	2.8	11.8[1]	11.1	6.6[1]	6.9
Provisions/gross income (avge.91-97,%)	18.3	13.9	-0.6	22.2	15.4	10.7[1]	3.7[2]	19.1	16.7[1]	7.9	17.1[1]	17.3
Operating expens./gross inc.(avge.91-97,%)	66.5	67.9	123.5	68.1	63.5	61.5[1]	58.4[2]	66.5	42.8[1]	67.5	60.2[1]	60.7
No of employees per mio inhabitants	8798	7550	4998	6779	8749	5505	12022	6029	47176	7718	6086	6159
State influence												
% of assets of top 10 banks owned or controlled by the government, 1995	50.4	27.6	30.7	17.3	36.4	70.0	4.5	36.0	5.1	9.2	25.7	2.0

Sources: National financial accounts (net incurred liabilities). International federation of stock exchanges (stock market capitalisation). Corvoisier and Gropp (2001; Herfindahl index and top five market share). OECD (profit, operating expenses, provisions). LaPorta et al. (2000; State influence). Eurosystem data otherwise

1 Commercial banks only.

2 Average 1995-97.

Table 3: The structure of national financial systems

	AT	BE	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES
Importance of banks for firms' financing[1]	Very important	Important	Important	Important	Very important	Very important	Important	Very important	Important	Important	Important	Very important
Fraction of short-term loans[2]	Average	Average	Low	Low	Low	High	Low	High	N.A.	Low	Low	High
Fraction of loans at variable interest rates[3]	Low	High	High	Average	Low	High	High	High	N.A.	Low	High	High
Relationship lending	Very important (house banks)	Not very important (many SMEs, family-owned, less proned to traditional relationship lending)	Important, but declining	Not important except for small firms	Very important (house banks)	Not important any more	Very important for commercial lending	Very important	N.A.	Important	Not important (firms often initially borrow from a single bank, but then switch to borrowing from several banks[7])	Not important
Market concentration[4]	Medium	High	High	Medium	Low	High	High	Low	Low	High	High	Medium
State influence[5]	Strong (public guarantees for most savings banks)	Medium	Strong (blanket public guarantee in the aftermath of the banking crisis)	Medium	Strong (public guarantees in the savings banks' sector)	Strong	Weak	Strong, but declining	Weak	Weak	Medium	Weak (no public guarantees of savings banks)
Deposit insurance[6]	Average (approx. 15,000 euros in 1990, 20,000 in 1998)	Average (approx. 12,500 euros per depositor until 1998, 15,000 in 1999, 20,000 euros since)	High initially, average now (practically complete in 1990, approx. 25,000 euros in 1998)	High (76,000 euros since 1999; at a similar level, but not unified across banks before)	Practically complete	Average (20,000 euros, complete for deposits with the Postal Savings bank)	Average (20,000 euros)	High (103,000 euros; until 1996 also 75% coverage between 103,000 and 516,000 euros)	Modest	Average (approx. 18,000 euros in 1990, 20,000 since 1995)	Average (15,000 euros fully insured, second 15,000 euros 75%, third 15,000 euros 50%)	Modest (9,000 euros per depositor in 1990, 15,000 euros in 1998, 20,000 euros now)

Table 3 (ctd): The structure of national financial systems

	AT	BE	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES
Bank networks of independent banks	Very important (most banks are in a network, with very strong links to the head institution)	Not important (Credit Agricole consists of two member banks, Credit Professionnel has weak links)	Very important (the vast majority of banks is organised in groups with very close ties between banks)	Important	Very important (most banks are in a network, with very strong links to the head institution)	Not important (no networks)	Very important (for retail banks)	Very important (most banks are in a network, with links to the head institution)	Not important (network of mutual agricultural credit banks supplies data on the aggregate level)	Not important (bank groups like, e.g., ABN Amro, Rabo or ING have consolidated balance sheets, and can thus be regarded as one bank)	Not important (network of mutual agricultural credit banks supplies data on the aggregate level)	Not important (they exist but weak links between member banks and head institution)

1 See table 2. Countries ranked "very important" are those that comply with all of the following four conditions: debt securities to GDP <4%, debt securities to bank loans <10%, stock market capitalisation to GDP <60% and funds raised through securities issuance <50%. Countries that fail to comply with at least one of those conditions are ranked "important". No country was ranked as "less important", which would apply for example for the US with debt to GDP at 26%, debt to bank loans higher than 100% and stock market capitalisation at 193% of GDP (see table 1).

2 Source: Borio, 1996. "low": fraction of short term loans <20%; "high": >35%

3 Source: Borio, 1996. "low": fraction of loans at variable interest rates <40%; "high": >50%. Source in case of Germany: Bundesbank internal paper, based on survey data for 1997.

4 See table A1. Concentration is ranked low when Herfindahl index and the market share of the five largest banks are in the range of 30 or below. It is ranked high when the Herfindahl index stands at around 100, and the market share of the five largest banks does not give conflicting evidence. It is ranked medium for intermediate cases.

5 Countries are ranked according to the percentage of the assets of the top 10 banks controlled by the government (see table 2): "strong" (>30%), "medium" (between 10% and 30%) and "weak" (<10%). This is checked to be consistent with other available information on public guarantees or ownership. The evaluation refers roughly to the first half of the 1990s. State influence declined steadily during the sample period in almost all countries. Therefore, the present ranking is based on a rough average for the sample period considered in the estimates and does not necessarily reflect the ranking at the end of the sample period.

6 Source: Eurosystem. "Average" for values around 20,000 euros.

7 See Farinha and Santos, 2000.

State influence and ownership structure

Although steadily declining over time, the role of the government in banking markets is an important issue in Europe.[12] State influence has been much more common than in the US, as is documented in LaPorta et al. (2000). State influence is exerted either through direct public ownership of banks, through state control, or through public guarantees. Public ownership of banks was, during the sample period studied, most widespread in Austria, but significant also in most other countries of the euro area. In Finland, the government issued a guarantee for all bank deposits following the banking crisis of the early 1990s, and maintained this until 1998. In Greece, the market share of the state-controlled banks is currently around 50%, down from 70% in 1995. In other countries, the influence of the state is rather limited, like for example in Spain, where state-owned banks represented 13% of total loans and 3% of total deposits at the start of the sample period (1988), but have been completely privatised by the end of the sample. Savings banks in Spain are not publicly guaranteed, despite the involvement of some local governments in their control.

Deposit insurance

The degree of effective deposit insurance differs considerably across European countries during the sample period studied. Deposit insurance in Spain covered all deposits of non-financial entities up to a relatively modest amount (9000 euros per depositor in 1990 and 15000 euros in 1998). In Germany, on the other hand, the statutory deposit insurance system, a private safety fund as well as cross-guarantee arrangements in the savings banks' and in the cooperative banks' sectors, respectively, effectively amount to a full insurance of all non-bank deposits. France appears to be in an intermediate position with a complete insurance for deposits up to 76000 euros per depositor.

Bank failures

In most countries of the euro area, bank failures have been occurring much less frequently than in the US.[13] Around 1500 bank failures are reported for the US for the period 1980-1994. Even between 1994 and 2000, i.e. in an economic boom, there were 7 bank failures per year on average.[14] This is a considerably higher fraction of the banking population than for example in Germany, where only around 50 private banks have failed since 1966.

[12] For example, in Italy the share of total asset held by banks and groups controlled by the State passed from 68 per cent in 1992 to 12 per cent in 2000.

[13] A direct comparison of these numbers is complicated by the fact that the definition of bank failures might be different across countries. Especially numbers on prevented bank failures are difficult to obtain for the euro area countries. Some cases are listed in Gropp et al. (2001).

[14] See Federal Deposit Insurance Corporation (1998) for 1980-1994, and www.fdic.gov.

Also in Italy many fewer bank failures occurred.[15] In Spain, two banking crises occurred during the last 25 years. The first one (1978-1985) was more widespread, affecting 58 banks (accounting for 27% of deposits), while the second one (1991-1993) affected very few banks but involved one of the biggest institutions. In both cases, due to the potential systemic implications, most of the banks were either acquired by other solvent institutions, or the government intervened, so that depositors' losses were very limited. Besides these two periods, there was only one failure of a very small bank in Spain. A banking crisis was also experienced in Finland during the early 1990s. However, because of strong government intervention, only one bank failure materialised.

Bank networks

In several countries of the euro area, banks have set up networks of various kinds. Especially the savings banks and credit cooperatives are frequently organised in networks, although with a varying degree of collaboration in the different countries. To give an example, in Germany most banks (and especially the vast majority of small banks) belong to either the cooperative sector (in the 1990s about 70% of all banks) or the savings banks' sector (almost 20%). Both sectors consist of an "upper tier" of large banks serving as head institutions. The "lower tier" banks generally entertain very close relationships to the head institutions of their respective sector, leading to an internal liquidity management: on average, the "lower tier" banks deposit short-term funds with the "upper tier" banks, and receive long-term loans in turn.[16]

Similar structures can be found in many countries of the euro area. In Austria, 750 of 799 banks in 1996 belonged to the savings banks or credit cooperative network, which have structures comparable to those described for Germany. In Finland, cooperative banks are organised in the OKO Bank group, which has a centralised liquidity management. In Spain, on the other hand, savings and cooperative banks' networks exist, but their central institutions play only a relatively minor role.

2.2 Some conjectures on the role of banks in monetary policy transmission

The structure of the banking markets in the individual countries is likely to determine the response of bank lending to monetary policy. Several features of European banking markets are significantly different from those found in the US. It is therefore most likely that the distributional effects across banks that have been documented for the US will not be identical to those we can expect for the countries of the euro area. Additionally, there

[15] In the period 1980-1997, 40 (in almost all cases very small mutual) banks were placed in administrative liquidation. The share of deposits of failed banks was always negligible and reached around 1% only three times, namely in 1982, 1987 and 1996 (see Boccuzzi, 1998).

[16] See Upper and Worms (2001) and Deutsche Bundesbank (2001, p. 57).

are significant differences across European countries, such that we would not necessarily expect results to be identical for the various countries.

One important issue is the relevance of informational frictions in the banking markets. If depositors and players in the interbank markets are confronted with strong informational asymmetries, then distributional effects are likely to occur between banks that are informationally opaque to different degrees. This would suggest the use of the size criterion as is standard in the literature. However, several features mentioned above are capable of reducing the importance of informational frictions in Europe significantly. A first indication that in general, informational asymmetries may be less important is the relatively low risk involved in lending to banks, given the few numbers of bank failures experienced in many countries.

The role of governments in the banking markets similarly reduces the risk of depositors: An active role of the state in the banking sector is obviously able to reduce the amount of informational asymmetries significantly. Publicly owned or guaranteed banks are therefore unlikely to suffer a disproportionate drain of funds after a monetary tightening, and distributional effects in their loan reactions are hence unlikely to occur.

Under a government guarantee, it is also possible that weaker banks engage in a "gamble for resurrection" by extending their loan portfolio despite potential increases in its riskiness. Evidence for this is provided in Virhiälä (1997, p.166), who detects such a pattern among cooperative banks in Finland during the early 1990s. He finds, that the lower the degree of capitalisation of a bank, the more expansive was its loan supply.

The extensive degree of effective deposit insurance in countries like Germany and Italy makes it furthermore difficult to believe that deposits at small banks are riskier than deposits held at large banks.

The network arrangement between banks can also have important consequences for the reaction of bank loan supply to monetary policy. In networks with strong links between the head institutions and the lower tier, the large banks in the upper tier can serve as liquidity providers in times of a monetary tightening, such that the system would experience a net flow of funds from the head institutions to the small member banks. Ehrmann and Worms (2001) show that in Germany, indeed, small banks receive a net inflow of funds from their head institutions following a monetary contraction. This indicates that the size of a bank need not be a good proxy to assess distributional effects of monetary policy across banks.

Additionally, banking networks consist frequently of mutual assistance agreements, as is the case for example for the Austrian and German credit cooperative sectors. These help

to diminish informational asymmetries for a single bank, since it is the sector as a whole rather than the single bank that determines the riskiness of a financial engagement with a member bank.

Under the assumption that relationship lending implies that banks shelter their customers from the effects of monetary policy to some degree, we would expect that those banks show a muted reaction in their lending behaviour. Since it is often small banks which maintain these tight lending relationships, it might very well be that smaller banks react less strongly to monetary policy than large banks (which would be the opposite to the findings for the US). At least, size does not always need to be a good indicator for distributional effects across banks. Of course, the small banks need to have the necessary sources of funds at hand to maintain their loan portfolio even in times of monetary tightenings. This can be either achieved through a higher degree of liquidity of those banks like, e.g., in Italy or in France, through the liquidity provisions within the bank networks as, e.g., in Germany, and/or thanks to a better capitalisation as in France, Italy and Spain.

Overall, we would therefore expect the consequences of informational frictions to be much less important in most countries of the euro area than they are in the US. The reaction of a bank's lending might thus depend much more on the importance it attributes to maintaining a lending relationship than on the necessity to fund a certain loan portfolio. In most European countries, the role of size as a bank characteristic that explains differential loan supply reactions to monetary policy could be either irrelevant or possibly even reversed with respect to the usual assumptions of the literature. However, there may still be distributional effects, which might depend more on other factors. For example, in some European countries, some groups of small banks have traditionally acted as collectors of retail deposits to the whole banking system. Consequently, those banks tend to be more liquid on average. It may be the case that these banks react differently to monetary policy changes.

In order to understand how strong distributional effects across banks are in the various countries, and which bank characteristics should be relevant, it is therefore necessary to consider the institutional peculiarities of each country.[17] Table 3 looks at the various characteristics discussed above and provides a rough ranking of the euro area countries. Relationship lending, for example, emerges as an important feature in Austria, Germany

[17] Several papers have already ranked countries with respect to the effectiveness of a bank lending channel (Kashyap and Stein (1997), Cecchetti (1999), DNB (2000)). They rely on indicators from three main categories: the importance of small banks, bank health, and the availability of alternative finance. Despite differences with respect to some countries, the rankings reach relatively similar conclusions. For the four largest economies, both Kashyap and Stein (1997) and Cecchetti (1999) rank Italy as the strongest, France and Germany in the mid range, and Spain as the country with the least exposure to a bank lending channel.

and Italy. We would expect that some banks in these countries shelter their customers from monetary policy tightenings, with an accordingly muted response of their lending. Bank characteristics like size that proxy informational asymmetries should not be particularly revealing in most of the euro area countries. In particular, in countries like Austria or Germany, where bank networks are important and many banks are publicly owned or guaranteed, or in Finland, where for some time there has been a government guarantee and most banks are organised within a banking group, we would not believe that a smaller bank is subject to stronger informational asymmetries and as such forced to reduce its lending more strongly after a monetary tightening.

3. The model

We base our analysis of bank lending on a very simple version of the model by Bernanke and Blinder (1988). We restrict the model of the deposit market to an equilibrium relationship, assuming that deposits (D) equal money (M) and that both depend on the policy interest rate i as follows:

$$M = D = -\psi i + \chi \tag{1}$$

The demand for loans (L_i^d) which a bank faces is assumed to depend on real GDP (y), the price level (p) and the interest rate on loans (i_l):

$$L_i^d = \phi_1 y + \phi_2 p - \phi_3 i_l \tag{2}$$

The supply of loans of a bank (L_i^s) depends on the amount of money (or deposits) available, the interest rate on loans and the monetary policy rate directly. This direct effect of the monetary policy rate arises in the presence of opportunity costs for the bank, when banks use the interbank market to finance their loans or in the case of mark-up pricing by banks, which pass on increases in deposit rates to lending rates.[18] The supply of loans is therefore modelled as:

$$L_i^s = \mu_i D_i + \phi_4 i_l - \phi_5 i \tag{3}$$

[18] For the reaction of interest rates to monetary policy at the aggregate level, Mojon (2000) provides evidence for several countries of the euro area. For some evidence at the bank level for France, see Baumel and Sevestre (2000).

We furthermore assume that not all banks are equally dependent on deposits. We model the impact of deposit changes to be lower, the higher the bank characteristics size, liquidity or capitalisation (x_i):

$$\mu_i = \mu_0 - \mu_1 x_i \tag{4}$$

The clearing of the loan market, together with equations (1) and (4), leads to the reduced form of the model:

$$L_i = \frac{\phi_1\phi_4 y + \phi_2\phi_4 p - (\phi_5 + \mu_0\psi)\phi_3 i + \mu_1\psi\phi_3 i x_i + \mu_0\phi_3\chi - \mu_1\phi_3\chi x_i}{\phi_3 + \phi_4} \tag{5}$$

which can be simplified to

$$L_i = ay + bp - c_0 i + c_1 i x_i + d x_i + const \tag{6}$$

The coefficient $c_1 = \frac{\mu_1\psi\phi_3}{\phi_3 + \phi_4}$ relates the reaction of bank lending to monetary policy to the bank characteristic. Under the assumptions of the above model, a significant parameter for c_1 implies that monetary policy affects loan supply. This requires, in particular, that the interest elasticity of loan demand which is faced by a bank is independent of its characteristic x_i, i.e. ϕ_3 is the same across all banks.

This assumption of a homogeneous reaction of loan demand across banks is therefore crucial for the identification of loan supply effects of monetary policy. It excludes cases where, for example, large or small bank customers are more interest rate sensitive. Given that bank loans are the main source of financing for firms in the euro area, and readily available substitutes in times of monetary tightenings are very limited even for relatively large firms, we see this as a reasonable benchmark for most countries. Several of the companion papers can improve on this identification issue by including bank specific loan demand proxies that allow for differences in loan demand across banks. The results seem to be rather robust to these changes (see, e.g., Worms, 2001).

Moreover, in the empirical model, we allow for asymmetric responses of bank lending to GDP and prices by the inclusion of these variables interacted with the bank

characteristics.[19] We also introduce some dynamics and estimate the model in first differences.[20] The regression model is therefore specified as in equation (7):

$$\begin{aligned}\Delta\log(L_{it}) = a_i + \sum_{j=1}^{l} b_j \Delta\log\left(L_{it-j}\right) + \sum_{j=0}^{l} c_j \Delta r_{t-j} + \sum_{j=0}^{l} d_j \Delta\log\left(GDP_{t-j}\right) + \sum_{j=0}^{l} e_j infl_{t-j} \\ + f\, x_{it-1} + \sum_{j=0}^{l} g_{1j} x_{it-1} \Delta r_{t-j} + \sum_{j=0}^{l} g_{2j} x_{it-1} \Delta\log\left(GDP_{t-j}\right) + \sum_{j=0}^{l} g_{3j} x_{it-1} infl_{t-j} + \varepsilon_{it}\end{aligned} \tag{7}$$

with $i = 1,...,N$ and $t = 1,...,T_i$ and where N denotes the number of banks and l the number of lags. L_{it} are the loans of bank i in quarter t to private non-banks. Δr_t represents the first difference of a nominal short-term interest rate, $\Delta\log(GDP_t)$ the growth rate of real GDP, and $infl_t$ the inflation rate. The bank specific characteristics are given as x_{it}. The model allows for fixed effects across banks, as indicated by the bank specific intercept a_i.

The approach followed in model (7) is based on the assumption that we can capture the relevant time effect with the inclusion of the macroeconomic variables. We estimate a second model with a complete set of time dummies, in order to ensure that this assumption holds. This second model is therefore estimated as

$$\begin{aligned}\Delta\log(L_{it}) = a_i + \sum_{j=1}^{l} b_j \Delta\log\left(L_{it-j}\right) + f\, x_{it-1} + \sum_{j=0}^{l} g_{1j} x_{it-1} \Delta r_{t-j} \\ + \sum_{j=0}^{l} g_{2j} x_{it-1} \Delta\log\left(GDP_{t-j}\right) + \sum_{j=0}^{l} g_{3j} x_{it-1} infl_{t-j} + \lambda_t + \varepsilon_{it}\end{aligned} \tag{8}$$

where all variables are defined as before, and λ_t describes the time dummies.

We see a comparison of the estimated coefficients on the interaction terms between the two models as a sort of specification test. To the extent that they are similar it gives us some confidence that we can use model (7) to infer the direct effect of interest rates on lending for the average bank from the coefficients c_j.

In both models, the distributional effects of monetary policy should be reflected in a significant interaction term of the bank specific characteristic with the monetary policy indicator. The usual assumptions met in the literature are that a small, less liquid or less capitalised bank[21] reacts more strongly to the monetary policy change than a bank with a

[19] This is equivalent to allowing for different values of ϕ_1 and ϕ_2 among banks with different size, liquidity and capitalisation.

[20] The underlying idea is that banks react to a change in the interest rate by adjusting the new loans. Since the average maturity of loans in Europe is longer than one year, the level of loans approximates the stock of loans for both quarterly and annual data, whereas the flow can be approximated by the first difference. In the estimates below, the exact specification may change from country to country, depending on the empirical properties of the data (see the Appendix for the exact specification in each case).

[21] For size, see e.g. Kashyap and Stein (1995), for liquidity, see, e.g. Kashyap and Stein (2000) and for capital, see, e.g., Peek and Rosengren (1995).

high value of the respective bank characteristic. This would imply positive coefficients on the interaction terms.

As a monetary policy indicator, we use the change in the short term interest rate. The three measures for bank characteristics size (*S*), liquidity (*Liq*) and capitalisation (*Cap*) are defined as follows:

$$S_{it} = \log A_{it} - \frac{1}{N_t}\sum_i \log A_{it}$$

$$Liq_{it} = \frac{L_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{L_{it}}{A_{it}} \right)$$

$$Cap_{it} = \frac{C_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{C_{it}}{A_{it}} \right)$$

Size is measured by the log of total assets, A_{it}. Liquidity is defined as the ratio of liquid assets L_{it} (cash, interbank lending and securities) to total assets, and capitalisation is given by the ratio of capital and reserves, C_{it}, to total assets.

All three criteria are normalised with respect to their average across all the banks in the respective sample in order to get indicators that sum to zero over all observations. For the regression model (7), the average of the interaction term $x_{it-1}\Delta r_{t-j}$ is therefore zero, too, and the parameters c_j are directly interpretable as the overall monetary policy effects on loans. In case of size, we normalise not just with respect to the mean over the whole sample period, but also with respect to each single period. This removes unwanted trends in size (reflecting that size is measured in nominal terms).

Due to the inclusion of lags of the dependent variable, we use the GMM estimator suggested by Arellano and Bond (1991). This ensures efficiency and consistency of our estimates, provided that instruments are adequately chosen to take into account the serial correlation properties of the model (the validity of these instruments is tested for with the standard Sargan test). To ensure econometrically sound estimates for each country, the harmonised model needs to be amended slightly country by country, e.g. by choosing the appropriate treatment of seasonality, lag structure and an adequate set of instrumental variables. The actual regression models for each country are therefore slight modifications of equations (7) and (8).

We will estimate models (7) and (8) using two different datasets. The first is BankScope, a publicly available database provided by the rating agency Fitch Ibca that covers balance sheet data on banks in all the euro area countries, although not the full population in each. This data is available on an annual basis only. It has been used in all published papers for

the euro area that are based on microdata on banks so far. The second dataset consists of bank balance sheet data collected by the national central banks of the euro area. These data are likely to be of a better quality, because they are available at least on a quarterly basis and cover the full population of banks in a country. To provide a comprehensive picture and to enable an assessment of the adequacy of BankScope for this type of exercise, we will make parallel use of both types of datasets.

4. Evidence from BankScope data

The existing literature on the role of banks in monetary policy transmission in Europe has so far been using the publicly available database BankScope. In order to achieve comparability with those studies, we will provide estimates on the basis of BankScope in this section. In the subsequent section we will then move on to the more comprehensive datasets available in the Eurosystem. This will give an indication as to how representative the BankScope results are.

The existing studies using BankScope show rather inconclusive results.[22] For instance, both de Bondt (1999) and King (2000) report that size and liquidity are important bank characteristics. However, they find such effects in different countries. Whereas King identifies them in France and Italy, de Bondt finds them to be particularly weak in these two countries. Instead, he finds evidence for size and liquidity effects in the Netherlands, which King does not.

Table 4: Comparison of the coverage of BankScope with the full population (1998)

		France	Germany	Italy	Spain
Number of banks	BankScope	456	2021	576	159
	Eurosystem datasets	*1191*	*3246*	*918*	*396*
Average total assets (in mio euros)	BankScope	9997	3413	3657	8422
	Eurosystem datasets	*2365*	*1583*	*1671*	*2283*
Median total assets (in mio euros)	BankScope	1180	364	216	1599
	Eurosystem datasets	*164*	*182*	*141*	*302*

Note that the use of consolidated balance sheet data in BankScope, by counting also bank holdings abroad, leads to the sum of total assets for some countries to exceed the actual sum of total assets within that country.

Beyond the differences in specification, these contrasting results may be attributed to two intrinsic weaknesses of the BankScope data. First, the data are collected annually, which might be too infrequent to capture the adjustment of loans following a change in interest rates. Second, the sample of banks available in BankScope is biased toward large banks.

[22] Favero et al. (1999) find that loan growth is unrelated to size or liquidity in 1992 (a year when there was supposed to be a tightening of monetary policy).

This is shown for the four largest countries of the euro area in Table 4.[23] The coverage of the population of banks ranges from about 40% in France and in Spain to a little bit more than 60% in Italy and in Germany. However, the median and average bank size is several times larger in BankScope than in the actual population.

In terms of market share this poses less of a problem, since, as described in section 2.2, the larger banks make up a disproportionately larger fraction of the total loans. The biases are, however, stronger for the beginning of the sample (1992-1999), since the coverage of BankScope has improved markedly over the years.

BankScope data offer the choice between consolidated and unconsolidated balance sheets. For the purposes of this paper, we opted for consolidated balance sheets whenever available, and unconsolidated balance sheets otherwise. In order to assess financial constraints and informational asymmetries of a bank, it is important to know whether a bank is in fact a subsidiary of another, potentially large and well known, bank. In such a case, using the subsidiary's unconsolidated balance sheet would lead to a biased measurement of the informational problems of the bank. However, this choice is not without drawbacks. As mentioned in table 4, consolidated balance sheets can potentially exaggerate the size of a bank, especially if a bank is internationally oriented, and has bank holdings abroad. This might create problems when looking at individual countries, where the mismeasurement due to international operations of domestic banks is larger than when looking at evidence on the euro area aggregate level.

4.1 Evidence on the aggregate euro area level

To assess the role of banks in monetary transmission at the euro area level, we first estimate model (7) with the full BankScope dataset, i.e. including observations on banks in all euro area countries, without discriminating for national parameters. In order to proxy loan demand and the monetary policy changes for each bank as closely as possible, we regress loan growth of a bank in country *z* on country *z*'s GDP growth, inflation rate and the interest rate change. The model is therefore formulated as in equation (7a).

[23] Table A6 in the appendix extends the comparison to all countries of the euro area. Whereas for some countries the coverage is extremely poor (most noticeably for Finland, where only 5% of all banks are covered by BankScope, and where the average size of a bank in BankScope is roughly 50 times as big as the average bank in the actual population. This comes about because BankScope treats OKO Bank as one bank only), it is fair for many other countries.

$$\Delta \log(L_{it}) = a_i + b_1 \Delta \log(L_{it-1}) + \sum_{j=0}^{1} c_j \Delta r_{t-j} + \sum_{j=0}^{1} d_j \Delta \log(GDP_{t-j}) + \sum_{j=0}^{1} e_j infl_{t-j}$$
$$+ f\, x_{it-1} + \sum_{j=0}^{1} g_{1j} x_{it-1} \Delta r_{t-j} + \sum_{j=0}^{1} g_{2j} x_{it-1} \Delta \log(GDP_{t-j}) + \sum_{j=0}^{1} g_{3j} x_{it-1} infl_{t-j} + \varepsilon_{it} \quad (7a)$$

Table 5:
Long-run coefficients estimated in model (7a), BankScope data for the euro area

	Models estimated with the following bank characteristic variables									
Euro area BankScope data	Size		Liquidity		Capitalisation		Size Liquidity Capitalisation		Size Liquidity	
Monetary policy	**-1.321*** ***0.000***		**-0.527** ***0.040***		**-0.309** ***0.151***		**-1.539*** ***0.000***		**-1.494*** ***0.000***	
Real GDP	**1.881*** ***0.000***		**0.885** ***0.023***		**1.369*** ***0.002***		**1.689*** ***0.000***		**1.550*** ***0.000***	
Prices	**1.947*** ***0.000***		**0.105** ***0.812***		**0.642** ***0.111***		**0.846*** ***0.083***		**0.861** ***0.047***	
Char1*MP	**0.231** ***0.050***		**-5.105*** ***0.003***		**4.293** ***0.167***		**0.416*** ***0.004***		**0.408*** ***0.003***	
Char2*MP							**-1.392** ***0.430***		**-1.686** ***0.398***	
Char3*MP							**3.875** ***0.248***			
Char1*Char2*MP									**0.422** ***0.605***	
p-val Sargan	0.069		0.631		0.753		0.558		0.320	
p-val MA1, MA2	0.000	0.453	0.000	0.325	0.000	0.948	0.000	0.860	0.000	0.897
No of banks, obs.	3029	9662	2637	7963	2990	9507	2474	7370	2579	7766

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

The main results for model (7a) are summarised in table 5.[24] Each column presents the results from one of the specifications – first models with one of the bank characteristics each, then one model with all three characteristics simultaneously, and last a specification where size and liquidity enter, both in single and double interactions. Through double interactions, it is possible to test whether the effect of liquidity depends on the size of banks. The underlying idea is similar in spirit to Kashyap and Stein (2000), and assumes that the relief a bank gets from additional liquidity should be the larger, the smaller the bank.

We report the estimated long-run coefficients only. These are calculated as the sum of the coefficients of the various lags of the indicated variable, divided by one minus the sum of the coefficients on the lagged endogenous variable.

The model with size as the only bank characteristic performs best – size dominates all other characteristics, both in the specification with all three of them and in the one with

[24] Table A8 shows that the time effects are well captured, since the coefficients in a model with time dummies do not change very much.

double interactions. The average bank reduces lending after a monetary tightening by 1.3% following a 100 basis point increase in interest rates. Smaller banks, however, reduce their lending by more than large banks do.

Whereas capitalisation does not enter the models significantly, liquidity at first sight seems to be a good discriminatory device to trace the differential loan response of banks, too, given the highly significant interaction term (which has an unexpected negative sign). However, this model is not robust. Table A8 reveals that the liquidity specification is not stable when the macro variables are replaced by time dummies.[25]

4.2 Evidence on single countries in a pooled regression

The regression performed in the preceding section treated all banks in the same way by restricting all coefficients to be the same across countries. In this section, the model is extended to exploit the information on cross-country differences. The parameters of interest, i.e. those on the bank characteristic, the first difference of the interest rate, and the interaction of the two, are now allowed to vary across countries through the introduction of country specific dummies:

$$\begin{aligned}\Delta \log(L_{it}) = a_i + b_1 \Delta \log(L_{it-1}) + \sum_{j=0}^{1} c_j \Delta r_{z,t-j} + \sum_{j=0}^{1} d_j \Delta \log(GDP_{z,t-j}) + \sum_{j=0}^{1} e_j infl_{z,t-j} \\ + f\, x_{it-1} + \sum_{j=0}^{1} g_{1j} x_{it-1} \Delta r_{z,t-j} + \sum_{j=0}^{1} g_{2j} x_{it-1} \Delta \log(GDP_{z,t-j}) + \sum_{j=0}^{1} g_{3j} x_{it-1} infl_{z,t-j} \\ + \sum_{j=0}^{1} \omega_{1cj} c_c \Delta r_{z,t-j} + \omega_{2cj} c_c x_{it-1} + \sum_{j=0}^{1} \omega_{3cj} c_c x_{it-1} \Delta r_{z,t-j} + \varepsilon_{it}\end{aligned} \tag{7b}$$

where the set of country dummies is denoted by c_c. The model is again estimated with size, capitalisation and liquidity as discriminatory bank characteristics, leaving aside more complicated models with two or three characteristics. Table A9 reports the estimated coefficients and standard errors on monetary policy and the interaction term for each country.[26]

This model cannot replicate the results obtained at the aggregate euro area level. The coefficients on Germany in the specification with size suggest that the large number of German banks (roughly 50% in the sample) dominates the results, although this is not the

[25] This result might be driven by the fact that a liquidity measure is provided only for relatively few banks in some countries covered in BankScope. For example, only one third of observations are available in the Italian case.

[26] The "national coefficients" are calculated as $\Sigma_{j=0}^{1}(c_j + \omega_{1cj})$ and $\Sigma_{j=0}^{1}(g_{1j} + \omega_{2cj})$. The robustness tests for this model have been performed with either a set of time dummies, or alternatively a set of time dummies per country. The results are robust to these changes.

case for the other specifications. In any case, these results are very difficult to interpret with respect to the role of banks in the individual countries.

There are two potential explanations for this result. On the one hand, it might be that there is a considerable degree of heterogeneity in the data, which would imply that pooling the data and restricting the coefficients to be identical across countries does not necessarily constitute a useful exercise. On the other hand, the aggregate model contains more variability in the interest rates; with national interest rates, the model incorporates a much richer variation in interest rates on which it can draw inference, namely across time in each country, but also across countries for a given time. This additional variation can potentially alleviate problems stemming from the short sample of the BankScope data.

4.3 Evidence on France, Germany, Italy and Spain in separate regressions

This section presents results from re-estimating model (7a) separately for each of the four largest countries of the euro area. These countries have the largest cross-sectional dimension, so that it might be possible to improve on the results of the preceding section for these countries. This also allows us to check for the consistency of the BankScope results with those reported in the subsequent section, obtained at the national level with the more comprehensive datasets. Table A7 presents the results of these regressions, and table A8 shows that the results of estimating model (8) are very similar.

For most of the estimated models, a tightening of monetary policy leads to the expected decrease of loans. However, with the exception of Germany, the results lack significance and robustness. The most extreme case is France, where not a single coefficient turns out to be significant and several coefficients even change sign across the different models. Also in Spain and Italy, the coefficients on the macro variables depend on the exact model specification, and frequently change sign. For Spain, the specification with liquidity as bank specific characteristic results as the model with the most significantly estimated effects, suggesting that banks with a lower degree of liquidity react more strongly. For Germany, the country with by far the best coverage in BankScope, the parameters are generally estimated to be significantly different from zero. The average bank reacts to a monetary tightening by decreasing loans. This coefficient is always estimated to be negative and significant at the 1% level, but its size varies considerably across the different specifications.

The lack of robustness and the few specifications that achieve significant estimates cast some doubt on the adequacy of BankScope to capture the distributional effects of monetary policy across banks.

5. Evidence from Eurosystem datasets

In this section, we employ the Eurosystem datasets for national models for each of the four largest countries of the euro area, and report the analysis of similar models for the other euro area countries covered in the companion papers. The results of models (7) and (8) for France, Germany, Italy and Spain are presented in tables 6a-6d and A10.[27]

The long-run effects of monetary policy on loans of an average bank are estimated to be negative in all countries, indicating that restrictive monetary policy reduces loan supply in the long run. As we had conjectured in section 2, size does not emerge as a useful indicator for the distributional effects of monetary policy. In the specifications with size only, we find it to be insignificant in France, Germany and Italy, and significantly negative in Spain.[28] Hence, the role of size as an indicator of informational asymmetries appears irrelevant in all countries, which is consistent with the structure of the banking market. Also capitalisation does not play an important role in distinguishing banks' reactions. Its interaction with the monetary policy indicator is insignificant in all countries, both when used as the only characteristic as well as in the complete specification with all three criteria. This could be caused by several reasons. For example, the measure of capitalisation we use could be too crude to capture the riskiness of a bank, and is thus not indicative for the informational asymmetry problems. This could very well be the case, since our capitalisation variable is derived from balance sheets without considering the structure of the loan portfolio or its risk characteristics. It might therefore not be capturing a risk-based measure like the Basel capital requirement.[29]

An alternative explanation could be that all banks are operating at levels of capitalisation sufficiently high to prevent market participants' doubts on the soundness of a bank. In such a case, capitalisation does not determine a bank's reaction to monetary policy any longer. Loupias et al. (2001) have estimated a model with a double interaction of size and capitalisation with monetary policy. This is a way to check whether, after a monetary policy tightening, small and under-capitalised banks restrict their loan supply by more than large banks do. The paper does not find any significant coefficient, thus confirming that capitalisation does not seem to affect banks loan supply in a significant way, at least in France. Moreover, when comparing the level of capitalisation of European banks with those in the US (see table A3), it can easily be seen that (with the notable exception of

[27] A description of the sample periods, the outlier detection methods and the exact specifications can be found in the appendix.
[28] For Italy, this is consistent with previous work analysing lending rates, e.g. Angeloni et al. (1995) and Cottarelli et al. (1995).
[29] The BIS ratio measure cannot be obtained from the available datasets for the four largest countries.

Germany where, as stated in section 2, the asset structure of banks is less risky), banks in Europe are much better capitalised.

Table 6a: Long-run coefficients estimated in model (7), national datasets: France

	Models estimated with the following bank characteristic variables									
France (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-1.564**** *0.765*		**-2.131***** *0.736*		**-1.823***** *0.701*		**-1.969***** *0.566*		**-2.221***** *0.697*	
Real GDP	**3.239***** *0.578*		**3.999***** *0.493*		**3.788***** *0.503*		**2.975***** *0.374*		**2.523***** *0.470*	
Prices	**-2.850***** *0.742*		**-4.173***** *0.692*		**-3.701***** *0.689*		**-3.678***** *0.512*		**-3.147***** *0.644*	
Char1*MP	**-0.458** *0.553*		**4.030** *4.734*		**3.547** *15.236*		**-0.063** *0.218*		**-0.184** *0.235*	
Char2*MP							**8.106***** *1.931*		**7.070***** *2.010*	
Char3*MP							**2.304** *7.007*			
Char1*Real GDP	**-0.262** *0.785*		**-1.255** *7.508*		**-16.48** *25.648*					
Char1*Prices	**-0.070** *0.714*		**-1.637** *6.143*		**5.303** *24.351*					
Char1*Char2*MP									**0.390** *1.228*	
p-val Sargan	0.142		0.233		0.111		0.231		0.075	
p-val MA1, MA2	0.014	0.451	0.006	0.326	0.017	0.542	0.000	0.387	0.000	0.450
No of banks, obs.	312	5327	312	5327	312	5327	312	5327	312	5327

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table 6b: Long-run coefficients estimated in model (7), national datasets: Germany

	Models estimated with the following bank characteristic variables									
Germany (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-1.662***** *0.737*		**-0.857***** *0.238*		**-0.695***** *0.239*		**-0.526***** *0.202*		**-0.679***** *0.205*	
Real GDP	**0.071** *0.296*		**0.119** *0.163*		**-0.034** *0.167*		**0.079** *0.135*		**0.008** *0.138*	
Prices	**3.120***** *0.803*		**2.039***** *0.347*		**1.965***** *0.350*		**1.662***** *0.280*		**1.842***** *0.286*	
Char1*MP	**-0.117** *0.127*		**3.547***** *1.100*		**1.935** *6.300*		**-0.044** *0.036*		**0.003** *0.045*	
Char2*MP							**3.936***** *0.883*		**4.689***** *0.885*	
Char3*MP							**-0.469** *5.340*			
Char1*Real GDP	**0.167** *0.167*		**-2.960*** *1.398*		**1.533** *10.293*					
Char1*Prices	**-0.561***** *0.252*		**2.872** *2.405*		**9.328** *14.320*					
Char1*Char2*MP									**-1.082*** *0.551*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.184	0.000	0.421	0.000	0.276	0.000	0.351	0.000	0.344
No of banks, obs.	2689	48402	2693	48474	2708	48744	2651	47718	2659	47862

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table 6c: Long-run coefficients estimated in model (7), national datasets: Italy

	Models estimated with the following bank characteristic variables									
Italy (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-0.703*** ***0.103***		**-0.529*** ***0.102***		**-0.695*** ***0.102***		**-0.825*** ***0.127***		**-0.675*** ***0.113***	
Real GDP	**1.363*** ***0.175***		**1.879*** ***0.162***		**1.419*** ***0.173***		**1.389*** ***0.213***		**1.084*** ***0.175***	
Prices	**0.230** ***0.302***		**-1.931*** ***0.307***		**0.101** ***0.308***		**-0.622** ***0.386***		**-0.264** ***0.338***	
Char1*MP	**-0.009** ***0.025***		**2.593**** ***1.284***		**4.226** ***1.499***		**0.079** ***0.054***		**-0.046** ***0.073***	
Char2*MP							**2.278*** ***0.831***		**2.058*** ***0.574***	
Char3*MP							**3.616** ***3.099***			
Char1*Char2*MP									**-1.238** ***0.845***	
p-val Sargan	0.196		0.079		0.186		0.077		0.062	
p-val MA1, MA2	0.000	0.110	0.000	0.246	0.000	0.116	0.000	0.128	0.000	0.156
No of banks, obs.	587	25241	587	25241	587	25241	587	25241	587	25241

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table 6d: Long-run coefficients estimated in model (7), national datasets: Spain

	Models estimated with the following bank characteristic variables									
Spain (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-0.993**** ***0.453***		**-1.862*** ***0.441***		**-1.314*** ***0.487***		**-1.510*** ***0.433***		**-1.593*** ***0.422***	
Real GDP	**2.022*** ***0.359***		**1.689*** ***0.347***		**1.878*** ***0.357***		**1.695*** ***0.326***		**1.818*** ***0.327***	
Prices	**-1.092*** ***0.315***		**-1.979*** ***0.465***		**-0.985*** ***0.368***		**-2.074*** ***0.387***		**-2.066*** ***0.414***	
Char1*MP	**-0.253**** ***0.114***		**6.061*** ***2.072***		**0.365** ***8.393***		**-0.214*** ***0.128***		**-0.153** ***0.109***	
Char2*MP							**3.986**** ***1.905***		**5.277*** ***1.879***	
Char3*MP							**-11.304** ***9.112***			
Char1*Char2*MP									**2.010*** ***1.161***	
p-val Sargan	0.852		0.838		0.888		1.000		1.000	
p-val MA1, MA2	0.374	0.952	0.264	0.770	0.130	0.967	0.458	0.913	0.499	0.880
No of banks, obs.	210	4012	210	4012	210	4012	210	4012	210	4012

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

The third bank characteristic, the degree of liquidity, turns out to be a highly significant indicator for distributional effects across banks in Germany, Italy and Spain. In the specifications with all three bank characteristics, it dominates the other characteristics for those countries, and now becomes the significant and dominant characteristic also for France.

Looking at the more detailed analysis in the national companion papers, results for Spain appear to be less robust than in the case of the other countries. Indeed, this result disappears when looking at the response of different types of loans and at the response of

loans to an exogenous shock to deposits (Hernando and Martínez-Pagés, 2001). Therefore, in the case of Spain, the distributional effects across banks with different degrees of liquidity do not appear to be related to loan supply effects.

On the other hand, the results for the other countries are very robust. For Germany, it turns out that the result is driven by the short-term interbank deposits that many small banks with a network affiliation hold with their head institutions (Worms, 2001). For Italy, the analysis is extended to the role of deposits and liquidity. It is shown that deposits drop sharpest for those banks that have fewer incentives to shield their deposits, like, e.g., small banks with a deposit to loan ratio larger than one. The analysis of liquidity supports the idea that banks use their liquidity to maintain their loan portfolio (Gambacorta, 2001b). For France too, this conclusion appears to be robust, both to different measures of the liquidity ratio and to the specific treatment of mutual and cooperative banks networks (Loupias et al., 2001).

The positive coefficient on the interaction of the monetary policy indicator with the degree of liquidity in France, Germany and Italy means that less liquid banks show a stronger reduction in lending after a monetary tightening than relatively more liquid banks do. The underlying reasoning is that banks with more liquid balance sheets can use their liquid assets to maintain their loan portfolio and as such are affected less heavily by a monetary policy tightening. The robustness of these results can be checked through the last column of table 6 that includes the double interaction between size and liquidity. The double interaction has the expected negative sign in Germany and Italy, but is insignificant in the case of Italy and only weakly significant for the case of Germany. Hence, there is no strong evidence that the effect of liquidity is stronger for smaller banks; the conclusion that size is not the dominant characteristic that distinguishes banks' responses to monetary policy does therefore obtain further support.

When comparing the BankScope regression results of section 4.3 with those based on the national datasets, the results generally do not agree. (The exception is Spain when liquidity is used as the bank characteristic.) The Eurosystem datasets, through their much larger variation both across banks and time, seem to be superior to the BankScope data, as evidenced by the improved explanatory power of the models and the better significance and robustness of results. This casts doubt on the usefulness of the BankScope dataset for studies of the micro effects across banks. Through the representation bias towards large banks, important heterogeneity in bank behaviour is lost.

Several companion papers provide an analysis along similar lines for several other countries of the euro area. De Haan (2001) finds for the Netherlands that interest rate

increases reduce unsecured bank lending, and provides evidence that size, degree of liquidity and capitalisation all matter for a bank's reaction in this market segment. Another split according to bank types shows that wholesale banks react more strongly to monetary policy than retail banks. Looking at table 3, these findings can be explained by the fact that the role of government is weak in the Netherlands, such that banks cannot rely on government guarantees to attract financing. There are also no important bank networks in the Netherlands. Thus, the Netherlands appears to be a case where the usual informational asymmetry problems might play a bigger role than in many other countries of the euro area. Interestingly, the split according to retail and wholesale banks can be reconciled with the fact that relationship lending is important in this country.

A paper on Portugal (Farinha and Marques, 2001) finds similarly that monetary policy tightenings reduce bank lending. Here, the capitalisation of banks plays an important role for the way banks respond to interest rate changes, whereas the other tested criteria size and liquidity do not. They report furthermore, that the models are subject to a structural break when Portuguese banks had the possibility to access funds from foreign EU banks. Interestingly, during this period the growth rate of loans increased relative to the growth of deposits, suggesting that this improved availability of funds matters for the growth rate of lending.

Brissimis et al. (2001) investigate the Greek case, and conclude that both the size and the liquidity of a bank determine distributional effects. Although there has been a strong involvement of the government, proxies for informational asymmetries seem to be important in Greece. This is consistent with the absence of bank networks, so that each bank's own creditworthiness is relevant. However, it has to be noted that, as is described in more detail in the paper, the Bank of Greece managed to tightly control the banking activities by applying a reserve requirement of 12% (and of effectively 100% for deposits in foreign currencies).

Kaufmann (2001) looks at Austrian data, and detects distributional effects across banks only for subperiods of the sample. When they are found, it is the degree of liquidity that matters rather than size. This is in line with our results for Germany, and consistent with the similarity of the two banking systems as evidenced in table 3. Interestingly, monetary policy is effective only in times of economic slowdowns, as opposed to times of high growth.

Looking at the case of Finland, Topi and Vilmunen (2001) find that bank lending contracts after interest rate increases. Monetary policy does seem to affect all banks alike, however. Only liquidity is marginally significant in its interaction with monetary policy.

This is in line with our conjecture of section 2, that the state guarantees in the aftermath of the banking crisis, which were maintained in parts of the sample period they study, change the lending behaviour of banks. Interestingly, the authors provide further evidence in this direction: a dummy variable for the state guarantees enters significantly in their regressions, indicating that the bank support measures themselves might have contributed to the increase in the growth rate of loans.

6. Macroeoconomic relevance

Since the results presented in the preceding section are based on panel data regressions, the long-run coefficient on the monetary policy indicator represents the reaction of the average bank in the sample. Given the heterogeneity of reactions across banks (as shown through the significant interaction term with liquidity), the reaction of the average bank need not be informative on the overall macroeconomic effect of monetary policy on bank loans. We had found that for three countries, less liquid banks react more strongly. If we want to interpret this finding on a macroeconomic level, it is important to weight the banks in the sample with their respective market share when calculating their response to monetary policy. The resulting, overall response of the loan market can be quite different from the response of the average banks, depending on the distribution of liquidity and market share across banks. Table A5 presents some evidence on this distribution in the single countries.

In table 7, we present how the equilibrium quantities in the loan market respond in each country. This response is calculated by first weighting the liquidity ratio of each bank with its loan market share.[30] Doing so yields the liquidity ratio of the loan market as a whole. Then, this ratio is used in the estimated models to explore overall loan market responses.

The weighted average coefficient implies that the magnitude of the lending reaction is similar in France and Spain, and similar in Germany and Italy. France and Spain show a much stronger overall response than Germany and Italy. This finding could for example be explained by the dominance of relationship lending in the two latter countries – that some banks shield their customers from a monetary policy tightening seems to be reflected in a lower overall responsiveness of loans.

Interestingly, the same exercise with BankScope arrives at not too dissimilar conclusions. Table A11 reports the respective coefficients, which show that the response is significantly estimated for Spain and Germany. The response is somewhat stronger for

[30] However, in the case of France, one should keep in mind that only banks with a significant level of deposits have been kept in the sample, leaving aside many branches of foreign banks, as well as specialised credit institutions which, on the whole, account for about ¼ of total loans.

Spain, and for Germany is actually very close to the one obtained with the full sample. For Germany, therefore, the coverage of large banks is good enough to portray the relevant market reaction fairly well.[31]

Table 7: Percentage change of loans following a one percent change in interest rates

Eurosystem data	France	Germany	Italy	Spain
Overall loan response	**-2.637*** **	**-0.926*** **	**-0.944*** **	**-2.415*** **
	0.788	*0.236*	*0.271*	*0.459*

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

This observation leads us to believe that BankScope, although a poor instrument to investigate *micro* effects across banks, can actually give a fair description of the *macro* effects. This is easily understandable as macro effects mainly derive from large banks' responses to monetary policy shocks. It is therefore enlightening to calculate the overall response of the euro area loan market from the BankScope regressions. Looking at the euro area models, the preferred specification is the one with size as bank characteristic. Repeating the same kind of exercise, we find the market response to be -1.261 (significant at the 1% level).

The long-run effect of monetary policy on bank loans is in the range of a 1% decline after a 100 basis point increase in interest rates in Germany, Italy and the euro area as a whole.[32] However, there is considerable heterogeneity across countries, as shown in the much stronger reaction of French and Spanish loans.

7. Conclusions

This paper has investigated the role of banks in monetary policy transmission in the euro area. It has been shown that bank lending contracts significantly after a monetary tightening both on the euro area aggregate as well as on the country level.

Using micro data on banks, it is found that liquidity is important to characterise a bank's reaction to a monetary policy action: less liquid banks react more strongly than more liquid banks do, although not in all countries. On the other hand, factors like the size or the degree of capitalisation of a bank are generally not important for the way a bank adjusts its lending to interest rate changes. This is opposed to findings for the US, where

[31] Interestingly, the lower frequency of the BankScope data seems to be less problematic for analysing the distributional effects than the coverage bias. When the Eurosystem dataset on German banks is used to analyse the distributional effects amongst large banks only, then size turns out to be a significant determinant, just like in the BankScope regressions reported in this paper (see Worms, 2001). This indicates that the differences in frequency between the two datasets are less of a problem.

[32] These estimates are in the same range as those found at the macro level in VAR analyses, e.g., by Peersman and Smets (2001).

small and lowly capitalised banks show a disproportionately strong response to monetary policy. We explain the absence of size and capitalisation effects with a lower degree of informational asymmetries: the role of the government, banking networks, as well as the low number of bank failures in the countries of the euro area contribute to a reduction in informational frictions. Proxies for informational asymmetry are therefore less informative in the European case than they are in the US.

The way banks respond to monetary policy can be explained by the structure of banking markets. This finding emerges when comparing the banking systems between Europe and the US, and matching the empirical findings with differences in the banking structures, as well as in the same comparison across euro area countries.

We have worked with two different types of datasets in this paper. The publicly available database BankScope, used in similar studies to date, suffers from a representation bias. Since small banks are not covered adequately, the *microeconomic* distributional effects are estimated on a biased sample of banks. This might explain the contradictory findings in the previous literature as well as the few cases of coinciding evidence in this and earlier studies. When estimating the *macroeconomic* importance of the bank loan response, this bias is less important, however: since the coverage of large banks is relatively good, both the estimates with BankScope and those with the complete population of banks arrive at quantitatively similar conclusions. This holds especially for Germany, which is covered particularly well in BankScope.

The Eurosystem datasets used in this paper have been able to produce a set of stable and robust results that improves markedly on the existing evidence on the role of banks in monetary policy transmission in the euro area to date.

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APPENDIX 1: Databases and estimation methods

A) The samples

1) Data sources

Eurosystem datasets for France, Italy and Spain: respective national banks supervisory reports. Eurosystem dataset for Germany: Bundesbank banks' balance sheets statistics. BankScope: Fitch Ibca, a publicly accessible source. The Eurosystem datasets are on a quarterly basis while BankScope provides annual data. BankScope data are consolidated balance sheets when available, and unconsolidated balance sheets otherwise.

2) Merger treatment

For all countries, mergers have been treated by a backward aggregation of the entities involved in the merger. Other kinds of treatments have shown to have little impact on the econometric results. No merger treatment with the BankScope data.

3) Criteria defining banks and sample initial coverage

Credit specialised financial institutions are excluded from the sample in France, Italy and Spain. For Spain, also branches of foreign banks are excluded from the sample. For France, each mutual bank network (except for one of them) is considered as an aggregate bank. Banks with less than 10 % deposits (which are mostly foreign banks are discarded from the sample). Banks with less than 1 % loans are also discarded. Before the necessary trimming of the samples, but after the merger treatment, the coverage is as follows:

Table A1: Initial sample coverage

	Period	Number of banks
BankScope	1992 – 1999	4425
France	1993:Q1 to 2000:Q3	496
Germany	1993:Q1 to 1998:Q4	3281
Italy	1986:Q4to 1998:Q4	785
Spain	1991:Q1 to 1998:Q4	264

4) Trimming of the sample/outlier elimination.

For France, Italy and Spain, only banks with both non-null loans and deposits are kept in the sample. For Germany and BankScope, this positivity condition only applies to loans.

Criteria defining outliers are as follows:

	1st difference in logs is, for each period, below (above)	1st difference in the ratio of liquidity and capitalisation over total assets is, for each period, below (above)
BankScope	4th (96th) percentile for loans, deposits and total assets	4th (96th) percentile
France	2nd (98th) percentile for loans, deposits and total assets	1st (99th) percentile
Germany	2nd (98th) percentile for loans and 1st (99th) percentile for total assets	1st (99th) percentile of the ratios level
Italy	1st (99th) percentile for loans	
Spain	2nd (98th) percentile for total assets and 3rd (99th) percentile for loans	2nd (98th) percentile or 3rd (99th) percentile of the ratios level

NB: For Germany and Italy, banks with one outlier or more are fully discarded from the sample. Moreover, for Germany and BankScope, different samples have been built for size, liquidity and capitalisation.

5) Number of consecutive lags required:
Due to the model specification as well as the estimation methods requiring numerous lags, we required a minimal number of consecutive observations of the first difference of the log of loans (and correspondingly for the other variables in the model): 2 lags for BankScope, 5 for France, 4 for Germany, 12 for Italy, and 9 for Spain.

The final composition of the samples used for econometric estimations is thus:

Table A2: Econometric samples coverage

	Estimation period	Number of banks	Number of observations
BankScope	1993 – 1999	Around 3000	Around 9700
France	1994:Q3 to 2000:Q3	312	5327
Germany	1994:Q1 to 1998:Q4	Around 2700	Around 48000
Italy	1988:Q1 to 1998:Q4	587	28763
Spain	1991:Q1 to 1998:Q4	210	4012

B) Variable definitions

1) Loans
For all countries, loans are those to the non-financial private sector. For Italy and France, bad loans are excluded.

2) Liquidity
The liquidity ratio is computed by dividing liquid by total assets. The precise definition of liquidity changes a bit from country to country, due to differences in the available information: In France, it is constructed as cash and interbank deposits. In Germany, it includes cash, short-term interbank deposits and government securities. In Italy, it comprises cash, interbank deposits and securities and repurchase agreements at book value. In Spain, liquid assets include cash, interbank lending and government securities. For BankScope, this variable is pre-defined in the database. For all countries, the ratio liquidity/total assets is centred with respect to its overall sample mean.

3) Capitalisation
For all countries, capitalisation is defined as the sum of capital and reserves divided by total assets. For BankScope, this variable is pre-defined in the database. Also capitalisation has been centred with respect to its overall sample mean.

4) Size
For all countries and BankScope, size is defined as the log of total assets. This variable is centred with respect to each period's mean.

5) Monetary policy indicator
In each country but Italy, the monetary policy indicator is the first difference of the 3 months interest rate. In Italy, it is the first difference in the interest rate on repurchase agreements between the central bank and credit institutions.

C) Model specification and estimation methods

For France, model (7) is directly estimated with four lags and contemporaneous macro variables. Instruments are second and third lags of the 1st difference of log of loans, second lags of the characteristics included in the equation: size and/or liquidity and/or capitalisation, and the monetary policy indicator which is assumed exogenous. All these instruments are multiplied by time dummies "à la Arellano-Bond".

For Germany, all bank specific variables have been seasonally adjusted on a bank individual basis, using a MA procedure. The first difference operator has been applied to model (7) before estimation. The model has 4 lags. Instruments are the macro variables themselves, lags t-2 to t-5 of the 1st difference of the log of loans, and lags 2 to 5 of all other (interaction) variables in the model. No contemporaneous variables enter the models. Seasonal dummies and trend enter model (1).

For Italy, model (7) is directly estimated. Instruments are lags of the 1st difference of log of loans and of the characteristics included in the equation. Inflation, GDP growth and the monetary policy indicator are considered as exogenous variables. The model has 4 lags, and no contemporaneous variables.

For Spain, the model is estimated in 4th differences of the 1st differences. This eliminates the seasonal individual effects existing in the model in 1st differences. Estimation is done in a model with contemporaneous values and 4 lags, with the GMM method proposed by Arellano and Bond, using as instruments lags 5 through 8 of the 1st difference of loans and bank characteristics. Macroeconomic variables are instrumented by themselves and their interactions with bank characteristics are instrumented by the same macro variable interacted with the characteristic at time t-5.

For BankScope, model (7) is estimated with one lag of the endogenous variable, and either the contemporaneous values or one lag (if contemporaneous values are not significant) for the other explanatory variables. Estimation is performed in first differences. Instruments are the second and consecutive lags of the 1st difference of log of loans, the bank characteristics and the interaction terms.

Table A3: Data description with respect to relative size* – December 1998

	France			Germany			Italy			Spain			US		
	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large	Total
Number of banks	249	16	332	2405	160	3207	578	36	759	182	12	243	8404	561	11206
Mean assets (billion of euros)	0.770	92.33	6.398	0.161	24.49	1.591	0.138	28.90	1.863	0.498	43.67	3.612	0.045	4.82	0.32
Share of total assets	0.090	0.695	1	0.076	0.768	1	0.057	0.736	1	0.103	0.597	1	0.105	0.755	1
Mean deposits	0.492	44.89	3.393	0.123	7.311	0.628	0.070	9.705	0.646	0.292	18.70	1.773	0.039	3.44	0.24
Market share of total deposits	0.109	0.638	1	0.147	0.581	1	0.083	0.713	1	0.123	0.521	1	0.12	0.72	1
Mean loans	0.343	37.91	2.576	0.095	7.673	0.588	0.055	12.31	0.762	0.246	17.65	1560	0.024	2.84	0.19
Market share of total loans	0.100	0.709	1	0.121	0.651	1	0.055	0.766	1	0.118	0.559	1	0.10	0.77	1
Liquid assets/total assets	0.416	0.294	0.401	0.344	0.342	0.338	0.421	0.257	0.399	0.424	0.337	0.407	0.44	0.36	0.37
Loans/total assets	0.411	0.358	0.403	0.580	0.394	0.563	0.387	0.405	0.388	0.450	0.466	0.459	0.53	0.59	0.58
Deposits/total assets	0.581	0.438	0.585	0.781	0.423	0.747	0.550	0.346	0.508	0.625	0.490	0.614	0.88	0.71	0.75
Capital and reserves/total assets	0.106	0.037	0.089	0.059	0.041	0.055	0.122	0.068	0.112	0.154	0.049	0.132	0.10	0.07	0.08

* Source: Eurosystem data, Kashyap and Stein (2000). The datasets are corrected for "nonsense" observations, like banks with total assets smaller or equal to zero. A "small" bank is situated below the third quartile of the distribution of total assets, while a "large" bank is situated above the 95th percentile. Data for the US refer to 1993 and are expressed in billion US dollars. Liquid assets for the US are calculated as cash, securities and federal funds lent.

Table A4: Data description with respect to absolute size* – December 1998

	France			Germany			Italy			Spain		
	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large	Total
Number of banks	182	24	332	2710	64	3207	629	32	759	150	17	243
Mean assets (billion of euros)	0.313	66.741	6.398	0.228	53.250	1.591	0.187	31.557	1.863	0.255	34.154	3.612
Share of total assets	0.027	0.754	1	0.121	0.668	1	0.100	0.714	1	0.044	0.661	1
Mean deposits	0.182	33.000	3.393	0.169	14.361	0.628	0.089	10.444	0.646	0.164	15.095	1.773
Market share of total deposits	0.029	0.703	1	0.227	0.456	1	0.168	0.682	1	0.057	0.595	1
Mean loans	0.124	26.788	2.576	0.130	15.735	0.588	0.076	13.351	0.762	0.128	13.945	1560
Market share of total loans	0.026	0.752	1	0.186	0.534	1	0.112	0.739	1	0.051	0.625	1
Liquid assets/total assets	0.455	0.317	0.401	0.342	0.291	0.338	0.413	0.258	0.399	0.438	0.362	0.407
Loans/total assets	0.379	0.335	0.403	0.576	0.327	0.563	0.390	0.398	0.388	0.439	0.461	0.459
Deposits/total assets	0.549	0.491	0.585	0.773	0.287	0.747	0.538	0.334	0.508	0.639	0.514	0.614
Capital and reserves/total assets	0.123	0.034	0.089	0.057	0.036	0.055	0.120	0.065	0.112	0.172	0.054	0.132

* Source: Eurosystem data. The datasets are corrected for "nonsense" observations, like banks with total assets smaller or equal to zero. "Small" banks have assets less than 1 billion euros, while "large" banks have assets more than 10 billion euros.

Table A5: Data description with respect to liquidity* – December 1998

	France			Germany			Italy			Spain		
	High	Low	Total	High	Low	Total	High	Low	Total	High	Low	Total
Number of banks	33	33	332	331	320	3207	91	72	759	24	24	243
Mean assets (billion of euros)	0.877	5.252	6.398	2.284	2.910	1.591	0.431	12.535	1.863	0.776	1.196	3.612
Share of total assets	0.014	0.082	1	0.148	0.183	1	0.028	0.638	1	0.022	0.034	1.000
Mean deposits	0.526	3.035	3.393	0.900	1.053	0.628	0.080	4.180	0.646	0.223	0.389	1.773
Market share of total deposits	0.015	0.089	1	0.148	0.167	1	0.015	0.614	1	0.013	0.023	1.000
Mean loans	0.062	3.086	2.576	0.643	1.104	0.588	0.062	5.556	0.762	0.053	0.645	1.560
Market share of total loans	0.002	0.119	1	0.113	0.187	1	0.010	0.692	1	0.004	0.043	1.000
Liquid assets/total assets	0.900	0.043	0.401	0.855	0.102	0.338	0.580	0.221	0.399	0.880	0.090	0.407
Loans/total assets	0.063	0.691	0.403	0.334	0.632	0.563	0.257	0.443	0.388	0.063	0.653	0.459
Deposits/total assets	0.630	0.522	0.585	0.616	0.63	0.747	0.555	0.322	0.508	0.387	0.367	0.614
Capital and reserves/total assets	0.092	0.072	0.089	0.081	0.061	0.055	0.155	0.086	0.112	0.337	0.164	0.132

* Source: Eurosystem data. The datasets are corrected for "nonsense" observations, like banks with total assets smaller or equal to zero. A bank with a low degree of liquidity is situated below the 10^{th} percentile of the distribution of liquidity ratios, while a bank with a high degree is situated above the 90th percentile.

Table A6: Comparing the coverage of BankScope with the actual population in the Eurosystem datasets (1998)

		All	Type				All	Type			
			Commercial	Savings	Cooperat./ mutual	Other		Commercial	Savings	Cooperat./ mutual	Other
		Austria					**Belgium**				
number of banks	BSc	146	40	72	22	12	96	39	15	7	35
	Eurosystem	*370*	*54*	*63*	*227*	*26*	*73*	*38*	*15*	*5*	*15*
	share (%)	39	74	114	10	46	132	103	100	140	233
average of total assets	BSc	3013	5563	1582	3235	2689	22499	23119	7675	7120	31236
(in mio euros)	*Eurosystem*	*1163*	*2081*	*2405*	*417*	*2760*	*8079*	*13010*	*2347*	*9535*	*830*
	ratio	2.6	2.7	0.7	7.8	1.0	2.8	1.8	3.3	0.7	37.6
median of total assets	BSc	371	377	258	966	2943	663	858	517	829	410
(in mio euros)	*Eurosystem*	*174*	*296*	*290*	*148*	*2079*	*614*	*883*	*539*	*491*	*303*
	ratio	2.1	1.3	0.9	6.5	1.4	1.1	1.0	1.0	1.7	1.4
		Finland					**France**				
number of banks	BSc	16	8	1	1	6	456	223	24	94	115
	Eurosystem	*346*	*14*	*40*	*292*	--	*1191*	*1053*	*32*	*101*	*4*
	share (%)	5	57	3	0	--	38	21	75	93	2875
average of total assets	BSc	14937	25955	2387	23332	939	9997	8487	6666	16359	8419
(in mio euros)	*Eurosystem*	*311*	*5884*	*130*	*69*	--	*2365*	*1565*	*7656*	*4962*	*79684*
	ratio	48.0	4.4	18.4	338.1	--	4.2	5.4	0.9	3.3	0.1
median of total assets	BSc	2199	13740	2387	23332	841	1180	700	5790	3301	573
(in mio euros)	*Eurosystem*	*38*	*1187*	*50*	*35*	--	*164*	*130*	*5663*	*2922*	*69372*
	ratio	57.9	11.6	47.7	666.6	--	7.2	5.4	1.0	1.1	0.0
		Germany					**Greece**				
number of banks	BSc	2021	211	581	1124	105	21	17	--	--	4
	Eurosystem	*3246*	*331*	*594*	*2256*	*65*	*60*	*43*	--	*12*	*5*
	share (%)	62	64	98	50	162	35	40	--	--	80
average of total assets	BSc	3413	10893	1860	644	26630	5468	6555	--	--	653
(in mio euros)	*Eurosystem*	*1583*	*4142*	*1533*	*230*	*35961*	*2198*	*2704*	--	*29*	*3052*
	ratio	2.2	2.6	1.2	2.8	0.7	2.5	2.4	--	--	0.2
median of total assets	BSc	364	527	941	230	6237	1588	1945	--	--	653
(in mio euros)	*Eurosystem*	*182*	*395*	*951*	*114*	*20926*	*594*	*795*	--	*12*	*1852*
	ratio	2.0	1.3	1.0	2.0	0.3	2.7	2.4	--	--	0.4
		Ireland					**Italy**				
number of banks	BSc	47	27	3	1	16	576	93	63	377	43
	Eurosystem	*77*	*74*	--	*3*	--	*918*	*357*	--	*561*	--
	share (%)	61	36	--	33	--	63	26	--	67	--
average of total assets	BSc	5421	7577	2946	847	2533	3657	11032	4111	677	13159
(in mio euros)	*Eurosystem*	*3047*	*3041*	--	*3202*	--	*1671*	*4101*	--	*124*	--
	ratio	1.8	2.5	--	0.3	--	2.2	2.7	--	5.5	--
median of total assets	BSc	2214	2146	2247	847	2084	216	1194	1376	117	1977
(in mio euros)	*Eurosystem*	*1657*	*1575*	--	*2258*	--	*141*	*859*	--	*76*	--
	ratio	1.3	1.4	--	0.4	--	1.5	1.4	--	1.5	--
		Luxembourg					**Netherlands (1997)**				
number of banks	BSc	134	110	2	4	18	67	42	5	2	18
	Eurosystem	*209*	--	--	--	--	*88*	*72*	*5*	*1*	*10*
	share (%)	64	--	--	--	--	76	58	100	200	180
average of total assets	BSc	3688	3592	13640	1852	3577	19568	17403	4246	97193	20249
(in mio euros)	*Eurosystem*	*2588*	--	--	--	--	*8140*	*7682*	*263*	*151915*	*999*
	ratio	1.4	--	--	--	--	2.4	2.3	16.1	0.6	20.3
median of total assets	BSc	782	825	13640	1472	602	2076	1374	741	97192	3366
(in mio euros)	*Eurosystem*	--	--	--	--	--	*363*	*498*	*211*	*151915*	*174*
	ratio	--	--	--	--	--	5.7	2.8	3.5	0.6	19.3
		Portugal					**Spain**				
number of banks	BSc	43	29	3	1	10	159	85	50	12	12
	Eurosystem	*55*	*26*	*7*	*4*	*18*	*396*	*148*	*51*	*95*	*102*
	share (%)	78	112	43	25	56	40	57	98	13	12
average of total assets	BSc	6669	6182	18719	2496	4883	8422	10324	6601	1775	9186
(in mio euros)	*Eurosystem*	*5203*	*9986*	*861*	*2236*	*643*	*2283*	*3464*	*6217*	*332*	*419*
	ratio	1.3	0.6	21.7	1.1	7.6	3.7	3.0	1.1	5.3	21.9
median of total assets	BSc	1670	1201	5470	2496	2559	1599	798	3488	1146	758
(in mio euros)	*Eurosystem*	*385*	*2049*	*6*	*51*	*113*	*302*	--	*3459*	*88*	--
	ratio	4.3	0.6	911.7	48.9	22.6	5.3	--	1.0	13.0	--

Table A7a: Long-run coefficients estimated in model (7a), BankScope data: France

	Models estimated with the following bank characteristic variables									
France (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-0.335** *0.217*		**-0.390** *0.116*		**-0.198** *0.486*		**-0.115** *0.620*		**-0.315** *0.148*	
Real GDP	**-0.430** *0.591*		**0.459** *0.349*		**-0.138** *0.791*		**0.159** *0.759*		**-0.007** *0.990*	
Prices	**-0.637** *0.728*		**-0.092** *0.943*		**0.915** *0.529*		**0.250** *0.886*		**-1.930** *0.209*	
Char1*MP	**0.174** *0.266*		**-0.877** *0.606*		**-2.542** *0.378*		**0.011** *0.949*		**0.060** *0.725*	
Char2*MP							**0.530** *0.752*		**1.465** *0.381*	
Char3*MP							**-2.117** *0.400*			
Char1*Char2*MP									**0.141** *0.814*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.741	0.001	0.316	0.000	0.658	0.001	0.741	0.001	0.768
No of banks, obs.	438	1554	419	1395	417	1482	379	1230	403	1323

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A7b: Long-run coefficients estimated in model (7a), BankScope data: Germany

	Models estimated with the following bank characteristic variables									
Germany (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-2.008***** *0.000*		**-1.063***** *0.000*		**-0.806***** *0.000*		**-1.412***** *0.000*		**-1.615***** *0.000*	
Real GDP	**1.879***** *0.000*		**1.149***** *0.000*		**1.150***** *0.000*		**1.251***** *0.000*		**1.599***** *0.000*	
Prices	**0.880**** *0.038*		**-0.659***** *0.010*		**-0.428** *0.133*		**0.195** *0.632*		**0.549** *0.175*	
Char1*MP	**0.239**** *0.040*		**-7.254***** *0.000*		**2.312** *0.419*		**0.027** *0.853*		**-0.078** *0.637*	
Char2*MP							**-4.122*** *0.075*		**-1.975** *0.406*	
Char3*MP							**-2.707** *0.167*			
Char1*Real GDP	**-0.469**** *0.030*		**2.236** *0.337*		**2.778** *0.576*					
Char1*Prices	**-0.417***** *0.002*		**2.138** *0.363*		**2.214** *0.310*					
Char1*Char2*MP									**-4.001***** *0.005*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.231	0.000	0.804	0.000	0.372	0.000	0.580	0.000	0.504
No of banks, obs.	1578	5123	1509	4676	1555	5050	1421	4297	1472	4483

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A7c: Long-run coefficients estimated in model (7a), BankScope data: Italy

	Models estimated with the following bank characteristic variables									
Italy (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**1.259*** ** *0.008*		**-0.720** *0.692*		**-0.205** *0.567*		**0.064** *0.951*		*0.909*	
Real GDP	**-0.366** *0.487*		**.** .		**0.636** *0.202*		**.** .		**.** .	
Prices	**-2.026*** ** *0.000*		**1.007** *0.279*		**-2.310*** ** *0.000*		**1.813** *0.106*		**3.662*** *0.055*	
Char1*MP	**0.133** ** *0.032*		**-0.073** *0.996*		**-8.954*** *0.061*		**0.463*** *0.097*		**-0.660** *0.330*	
Char2*MP							**-2.784** *0.750*		**13.278** *0.528*	
Char3*MP							**20.829** *0.140*			
Char1*Char2*MP									**-12.850** *0.196*	
p-val Sargan	0.537		1.000		0.995		1.000		1.000	
p-val MA1, MA2	0.000	0.093	0.001	0.869	0.035	0.134	0.105	0.321	0.016	1.000
No of banks, obs.	463	1206	222	404	458	1178	200	347	215	381

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A7d: Long-run coefficients estimated in model (7a), BankScope data: Spain

	Models estimated with the following bank characteristic variables									
Spain (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Monetary policy	**-0.430** *0.237*		**-0.914*** ** *0.005*		**-0.891** *0.112*		**0.301** *0.607*		**-0.253** *0.463*	
Real GDP	**-0.695** *0.321*		**-0.732** *0.284*		**-0.400** *0.618*		**-1.035** *0.139*		**-1.146*** *0.058*	
Prices	**1.315** *0.258*		**0.991** *0.487*		**1.478** *0.232*		**0.992** *0.424*		**0.698** *0.552*	
Char1*MP	**-0.037** *0.803*		**9.198*** ** *0.004*		**-12.345** *0.106*		**-0.165** *0.361*		**-0.254*** *0.099*	
Char2*MP							**5.619*** *0.088*		**5.304** ** *0.038*	
Char3*MP							**15.414*** *0.078*			
Char1*Char2*MP									**0.013** *0.992*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.812	0.000	0.434	0.003	0.554	0.000	0.423	0.000	0.333
No of banks, obs.	111	411	108	357	113	409	97	332	99	343

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A8a: Long-run coefficients estimated in models (2a), BankScope data

	Models estimated with the following bank characteristic variables									
Euro area (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**0.210** *0.102*		**-1.806** *0.218*		**4.251** *0.176*		**0.316**** *0.041*		**0.320**** *0.026*	
Char2*MP							**0.229** *0.904*		**-0.025** *0.990*	
Char3*MP							**3.165** *0.404*			
Char1*Char2*MP									**-0.030** *0.973*	
p-val Sargan	0.013		0.643		0.729		0.517		0.086	
p-val MA1, MA2	0.000	0.219	0.000	0.339	0.000	0.967	0.000	0.811	0.000	0.644
No of banks, obs.	3029	9662	2637	7963	2990	9507	2474	7370	2579	7766

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

Table A8b: Long-run coefficients estimated in models (2a), BankScope data

	Models estimated with the following bank characteristic variables									
France (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**0.162** *0.322*		**-0.158** *0.919*		**-2.584** *0.397*		**0.011** *0.944*		**0.058** *0.722*	
Char2*MP							**0.474** *0.778*		**1.460** *0.366*	
Char3*MP							**-1.960** *0.439*			
Char1*Char2*MP									**0.137** *0.811*	
p-val Sargan	1.000		0.999		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.585	0.000	0.646	0.000	0.765	0.001	0.879	0.002	0.810
No of banks, obs.	438	1554	419	1395	417	1482	379	1230	403	1323

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

Table A8c: Long-run coefficients estimated in models (2a), BankScope data

	Models estimated with the following bank characteristic variables									
Germany (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**0.231*** *0.060*		**-8.067***** *0.000*		**2.292** *0.420*		**0.018** *0.904*		**-0.078** *0.637*	
Char2*MP							**-3.887*** *0.093*		**-1.991** *0.408*	
Char3*MP							**-3.351** *0.135*			
Char1*Real GDP	**-0.478***** *0.003*		**4.201** *0.109*		**2.762** *0.585*					
Char1*Prices	**-0.393**** *0.020*		**2.407** *0.400*		**2.056** *0.346*					
Char1*Char2*MP									**-3.970***** *0.009*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.207	0.000	0.704	0.000	0.394	0.000	0.597	0.000	0.486
No of banks, obs.	1578	5123	1509	4676	1555	5050	1421	4297	1472	4483

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

Table A8d: Long-run coefficients estimated in models (2a), BankScope data

	Models estimated with the following bank characteristic variables									
Italy (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**0.138*** *0.053*		**-0.073** *0.996*		**-12.018*** *0.069*		**0.463*** *0.097*		**-0.660** *0.330*	
Char2*MP							**-2.784** *0.750*		**13.278** *0.528*	
Char3*MP							**20.829** *0.140*			
Char1*Char2*MP									**-12.850** *0.196*	
p-val Sargan	0.268		1.000		0.768		1.000		1.000	
p-val MA1, MA2	0.060	0.819	0.001	0.869	0.890	0.999	0.105	0.321	0.016	1.000
No of banks, obs.	463	1206	222	404	458	1178	200	347	215	381

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

Table A8e: Long-run coefficients estimated in models (2a), BankScope data

	Models estimated with the following bank characteristic variables									
Spain (BankScope data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**-0.080** *0.430*		**9.020***** *0.004*		**-12.209** *0.113*		**-0.135** *0.372*		**-0.176** *0.214*	
Char2*MP							**3.538** *0.176*		**4.378*** *0.068*	
Char3*MP							**10.904** *0.160*			
Char1*Char2*MP									**-0.559** *0.604*	
p-val Sargan	0.999		0.999		0.999		1.000		1.000	
p-val MA1, MA2	0.014	0.354	0.000	0.393	0.003	0.565	0.000	0.318	0.000	0.238
No of banks, obs.	111	411	108	357	113	409	97	332	99	343

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-values.

Table A9: Long-run coefficients estimated in models (7b), BankScope data

	Size		Liquidity		Capitalisation	
Monetary policy indicator						
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Germany	-2.485***	0.000	-0.418	0.524	-1.924***	0.000
Belgium	-1.810	0.542	-1.813	0.450	-2.231	0.338
Spain	1.087	0.257	-1.922**	0.031	-0.582	0.508
Greece	-2.873	0.240	-0.632	0.637	0.056	0.960
France	-1.384	0.136	-6.330***	0.000	-5.508***	0.000
Ireland	5.712*	0.068	6.252*	0.053	4.047	0.131
Italy	2.440**	0.014	-49.602***	0.004	-2.224***	0.005
Luxembourg	-10.477***	0.003	-6.007	0.158	-7.623**	0.028
Netherlands	1.799	0.662	-2.064	0.497	-1.309	0.703
Austria	0.293	0.880	-0.299	0.910	-1.907	0.503
Portugal	-1.874	0.809	.	.	-12.761**	0.026
Finland	-8.436*	0.090	-11.279	0.163	2.116	0.788
Interaction term						
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Germany	0.425***	0.003	-1.918	0.355	6.202*	0.050
Belgium	0.895	0.293	-20.120	0.169	4.330	0.640
Spain	-0.388	0.105	6.012	0.383	-8.747	0.612
Greece	0.211	0.793	2.086	0.743	122.465**	0.012
France	0.329	0.263	-17.696**	0.016	3.350	0.570
Ireland	1.793*	0.080	34.196	0.309	-13.329	0.594
Italy	0.443***	0.008	38.711	0.522	-19.571**	0.011
Luxembourg	2.573	0.115	-12.442	0.411	24.682	0.544
Netherlands	-0.109	0.932	37.199***	0.007	3.400	0.976
Austria	-2.072	0.159	-9.895	0.663	-42.923	0.568
Portugal	5.436	0.124	.	.	-141.506	0.278
Finland	3.872	0.143	-118.817**	0.047	86.156	0.459

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

Table A10a: Long-run coefficients estimated in models (8), national datasets

	Models estimated with the following bank characteristic variables									
France (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**-0.394** *0.556*		**5.247** *5.348*		**7.768** *16.517*		**-0.132** *0.233*		**-0.408** *0.262*	
Char2*MP							**8.211***** *2.102*		**7.303***** *2.333*	
Char3*MP							**2.210** *7.537*			
Char1*Real GDP	**-0.304** *0.810*		**-7.827** *8.375*		**-19.96** *27.395*					
Char1*Prices	**-0.055** *0.719*		**-5.443** *7.196*		**6.431** *24.818*					
Char1*Char2*MP									**0.121** *1.445*	
p-val Sargan	0.107		0.214		0.124		0.376		0.082	
p-val MA1, MA2	0.024	0.340	0.021	0.236	0.026	0.554	0.000	0.290	0.000	0.416
No of banks, obs.	312	5327	312	5327	312	5327	312	5327	312	5327

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A10b: Long-run coefficients estimated in models (8), national datasets

	Models estimated with the following bank characteristic variables									
Germany (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**-0.135** *0.107*		**3.576***** *1.099*		**5.543** *6.406*		**-0.048** *0.036*		**-0.024** *0.045*	
Char2*MP							**3.670***** *0.878*		**4.254***** *0.876*	
Char3*MP							**3.305** *5.258*			
Char1*Real GDP	**0.183** *0.153*		**-2.892**** *1.416*		**-0.410** *9.907*					
Char1*Prices	**-0.451*** *0.237*		**3.014** *2.440*		**6.695** *14.270*					
Char1*Char2*MP									**-1.228**** *0.548*	
p-val Sargan	1.000		1.000		1.000		1.000		1.000	
p-val MA1, MA2	0.000	0.454	0.000	0.522	0.000	0.474	0.000	0.451	0.000	0.436
No of banks, obs.	2689	48402	2693	48474	2708	48744	2651	47718	2659	47862

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A10c: Long-run coefficients estimated in models (8), national datasets

	Models estimated with the following bank characteristic variables									
Italy (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**-0.034** *0.035*		**1.320**** *0.646*		**5.401**** *2.530*		**0.014** *0.033*		**-0.082** *0.066*	
Char2*MP							**0.727*** *0.423*		**0.732**** *0.302*	
Char3*MP							**5.466** *3.416*			
Char1*Char2*MP									**-0.873** *0.661*	
p-val Sargan	0.091		0.079		0.171		0.179		0.086	
p-val MA1, MA2	0.000	0.237	0.000		0.000	0.172	0.000	0.073	0.000	0.491
No of banks, obs.	587	25241	587	25241	587	25241	587	25241	587	25241

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A10d: Long-run coefficients estimated in models (8), national datasets

	Models estimated with the following bank characteristic variables									
Spain (Eurosystem data)	Size		Liquidity		Capitalisation		Size, Liq. Capitalisation		Size Liquidity	
Char1*MP	**-0.255**** *0.114*		**5.742***** *2.038*		**1.405** *8.562*		**-0.203** *0.129*		**-0.148** *0.111*	
Char2*MP							**4.083**** *1.954*		**5.342***** *1.929*	
Char3*MP							**-10.904** *9.057*			
Char1*Char2*MP									**1.932** *1.181*	
p-val Sargan	0.966		0.969		0.991		1.000		1.000	
p-val MA1, MA2	0.464	0.981	0.355	0.613	0.165	0.800	0.594	0.737	0.611	0.680
No of banks, obs.	210	4012	210	4012	210	4012	210	4012	210	4012

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are standard errors.

Table A11: Percentage change of loans following a one percent change in interest rates, obtained from BankScope data

BankScope data	France	Germany	Italy	Spain
Overall loan response	**-0.391** *0.116*	**-0.948***** *0.001*	**-0.719** *0.686*	**-1.157***** *0.001*

*/**/*** denotes significance at the 10%/5%/1% level. Numbers in italics are p-vlaues.

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