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Abstract

The dramatic increase in securitisation activity has modified the functioning of credit markets by reducing the fundamental role of liquidity transformation performed by financial intermediaries. We claim that the changing role of banks from "originate and hold" to "originate, repackage and sell" has also modified banks' abilities to grant credit and the effectiveness of the bank lending channel of monetary policy. Using a large sample of European banks, we find that the use of securitisation appears to shelter banks' loan supply from the effects of monetary policy. Securitisation activity has also strengthened the capacity of banks to supply new loans but this capacity depends upon business cycle conditions and, notably, upon banks' risk positions. In this respect, the recent experience of the sub-prime mortgage loans crisis is very instructive.

JEL classification: E44, E55.
Keywords: asset securitisation, bank lending channel, monetary policy.

Non-technical Summary

The aim of this paper is to evaluate whether securitization activity affects the transmission mechanism of monetary policy via the bank lending channel. In recent years, securitization activity has expanded in the euro area changing the monitoring role of banks, and reducing their fundamental role of liquidity transformation. In other words, even if a project is illiquid, the underlying loan may be sold on to the markets providing banks with additional sources of financing and the possibility to transfer the underlying credit risk. As a result, banks maintain a major role as originators of credit while progressively losing importance in their function as primary holders of illiquid assets. All these developments are likely to have contributed to a change in the way banks grant credit to borrowers and react to monetary policy shocks.

We argue that the development of securitisation has changed the bank lending channel transmission mechanism as well as the relevance of the standard liquidity-to-total asset ratio, used by the literature to identify a bank's ability to insulate its loan portfolio from monetary policy shocks. The effects of securitization on loan supply are analysed by means of an extensive database of asset-backed securities issued since 1999, matching them with individual bank balance-sheet information.

We find that asset securitization significantly reduces the relevance of the bank lending channel of monetary policy transmission. This effect seems to depend upon two main mechanisms. First, asset securitization increases banks' liquidity while reducing banks' funding needs in the event of monetary tightening. Second, securitization allows banks to swiftly transfer part of their credit risk to the markets (including institutional investors such as hedge funds, insurance companies and pension funds) thereby reducing their regulatory requirements on capital. Our results point out that the effectiveness of the bank lending channel strongly depends on banks' capacity to "originate, repackage and sell" their loans. Securitisation activity strengthens the capacity of banks to supply new loans to households and firms for a given amount of funding. However, we show that this capacity changes over time and is dependent on business cycle conditions as well as on banks' risk situation.

Overall, these results emphasise the importance of analysing developments in banks' situation and securitisation activity from a monetary policy perspective. In this light, the

recent tensions in credit risk markets, starting late in the summer of 2007, brought to the fore the role of financial innovation in connection to bank risk-taking.[1] While this is obviously a dynamic process, the recent crisis also vouches for the importance of considering developments in the banking sector when assessing the transmission mechanism of monetary policy.

[1] A possible consequence of the recent crisis could be that investors analyse more carefully certain forms of asset-backed securities that have had spectacular growth rates in recent years.

1. Introduction

European banks rarely used securitisation techniques before the introduction of the euro. In the last decade, however, there has been a spectacular increase in securitisation activity in the euro area. This is partly a global trend but the escalation in securitisation activity is also linked to other factors such as the closer integration in European financial markets as well as a move towards a more market-based financial system. This development has probably changed the monitoring function performed by banks (Diamond, 1984; Holmström and Tirole, 1997). Securitisation has also reduced the fundamental role traditionally performed by banks in liquidity transformation (Diamond and Dybvig, 1983). In other words, nowadays even if a project is illiquid, the underlying loan may, in principle, be sold on to the market providing originating banks with additional sources of financing. In this way, while the origination of bank loans remains to a large extent local, securitisation can make previously illiquid loans tradable and available to global investors. As a result, banks maintain a central role as originators and evaluators of credit risk, while progressively losing importance as primary holders of illiquid assets.

Loan securitization activity together with the emergence of credit derivative markets seems to have altered credit risk management by banks. Through these financial innovations, credit risk may be easily transferred away from banks' balance sheets to other economic agents. Protection sellers, in turn, may further combine and diversify their asset portfolio, reaching parts of the credit spectrum that, until recently, were mostly illiquid. All these developments are likely to have contributed to a change in the way banks grant loans and react to monetary policy shocks.

We add to the "bank lending channel" literature by considering the effects of securitisation on loan supply. To date, the "identification problem" of the transmission mechanism of monetary policy has been solved by claiming that only certain bank-specific characteristics (such as size, liquidity and capitalization) influence loan supply movements, while the demand for bank loans from borrowers is largely independent of them. After a tightening of monetary policy, the drop in the supply of bank loans is expected to be larger for: (1) small banks, which are financed almost exclusively from deposits and equity

(Kashyap and Stein, 1995); (2) less liquid banks, which cannot protect their loan portfolio against monetary tightening simply by drawing down cash and securities (Stein, 1998; Kashyap and Stein, 2000) and (3) poorly capitalised banks, which might be below their target capital and have less access to markets for uninsured funding (Peek and Rosengren, 1995; Kishan and Opiela, 2000; Van den Heuvel, 2002).[2]

This paper argues that the development of securitisation has changed the bank lending channel mechanism. Securitisation has also probably altered those bank characteristics usually emphasised in the literature to identify shifts in loan supply. The size indicator is less significant because securitisation activity can considerably reduce the amount of loans on banks' balance sheets (DeYoung and Rice, 2004). Liquidity is also affected by securitisation because of the short-term inflows caused by the sale of asset-backed securities that modify the standard liquidity ratio. Securitization activity may also reduce the regulatory requirements for capital and make the standard capital-to-asset ratio a poor approximation of the relevant capital constraints faced by banks in this regard. More broadly, securitisation provides banks with additional flexibility to face changes in market conditions associated with monetary policy movements.

An extensive database of asset-backed securities is used to analyse the impact of securitisation on loan supply, focusing not only on the securitisation of mortgage markets, but also on other forms of bank loans. We employ therefore a comprehensive dataset of asset-backed securities issued since 1999, when the market started in the euro area, matching them with individual bank's balance-sheet information. The estimation is performed using an approach similar to that used within the Monetary Transmission Network, a joint project conducted by a group of economists affiliated with the ECB and the National Central Banks of the Eurosystem (Angeloni, Mojon and Kashyap, 2003).

The main finding of the paper is that asset securitisation significantly reduces the importance of the bank lending channel of monetary policy transmission. This effect seems to depend upon two main mechanisms: first, asset securitisation increases banks' liquidity

[2] All these studies on cross-sectional differences in the effectiveness of the "bank lending channel" refer to the US. The literature on European countries is far from conclusive (see, amongst others, Ehrmann et al., 2003 and Altunbas, De Bondt and Marqués, 2004).

and reduces banks' funding needs in the event of monetary tightening; second, it allows banks to transfer a part of their credit risk to the markets (including institutional investors such as hedge funds, insurance companies and pension funds) and thereby reduce their regulatory requirements on capital. This capital relief seems to cause, *ceteris paribus*, a further increase in supplied lending.

Securitisation activity has also strengthened the capacity of banks to supply new loans to households and firms for a given amount of funding. However, we show that this capacity changes over time due to business cycle conditions: it is maximised during economic expansion when there is probably little uncertainty (in the terms of Frank Knight) among investors about the valuation of structured products.

The remainder of this paper is organised as follows. Section 2 outlines recent developments in securitisation activity in the euro area, compared with experiences in the United States. These institutional developments provide the basis for the subsequent econometric analysis in Section 3, which considers how securitisation activity may affect the monetary transmission mechanism. Section 4 describes the econometric model and the data, while Section 5 presents evidence on the response of bank lending to a monetary shock. Section 6 describes some robustness checks performed on the results. The final section summarises the main conclusions.

2. Developments in securitisation in the euro area

Securitisation can be defined, in a broad way, as the process whereby individual bank loans and other financial assets are bundled together into tradable securities that are sold to the secondary market. In the United States the market for asset-backed securities started to develop by means of government-sponsored agencies (such as the Federal National Mortgage Association, known as Fannie Mae, and the Federal Home Loan Mortgage Corporation or Freddie Mac)[3] that enhanced mortgage loan liquidity by issuing and guaranteeing, but not originating, asset-backed securities. These agencies contributed to the progressive growth in the outstanding volume of US agency mortgage-backed securities to

[3] Created in 1938 and 1968, respectively.

USD 4 trillion at the end of 2006. Including both agency and non-agency issues, the US market for mortgage-related securities nowadays accounts for over USD 6.5 trillion, representing the largest segment of the fixed income market in the world (to give an idea of the magnitude, the US corporate bond market accounts for USD 5.4 trillion, while the Treasury segment accounts for USD 4.3 trillion).

In contrast to the US experience, the development of the asset securitisation market in the euro area started much later - at the end of the 1990s - and was not triggered by the introduction of any specific government agencies.[4] As shown in Figure 1, the growth in euro-denominated securitisation started at the end of the 1990s and accelerated strongly from 2004 onwards. The annual net flow of asset-backed securities issuance in 2006 was around one fifth of total bank loans granted to households and non-financial corporations in the euro area.

The reasons for the spectacular growth in securitisation activity in the euro area since 1999 are linked to three main factors: the increased demand from investors; technological and financial innovation; and the introduction of euro. First, the demand for asset-backed securities has grown rapidly from institutional investors, who are more willing and able to invest in credit risk. Asset-backed securities cater for the increasing number of sophisticated institutional investors seeking to buy assets that typically have a good rating and provide an extra yield over government bonds (Rajan, 2006). Moreover, these securities can be constructed to offer specific, sometimes even tailor-made, risk-return trade-offs that can be segmented by rating, asset class, sector and country of origination thereby tapping into a broader investor base.

Second, technological advancements have been instrumental in the development of securitisation via dramatic improvements in the storage, processing and pricing of financial data. Technological progress has therefore changed the cost structure of issuing asset-backed securities and increased the spectrum of financial products.

[4] Unlike in the United States and United Kingdom, where a common law system is in place, most continental European countries possess a continental law framework under which a specific regulation is required to issue asset-backed securities. In this respect, Belgium, France, Germany, Greece, Italy, Portugal and Spain had to enact specific laws to remove obstacles to the development of securitisation.

Third, in addition to these global trends, the introduction of the euro has given a strong impulse to the corporate bond and securitisation markets (ECB, 2007). The disappearance of exchange rate risk among euro-area countries, the increase in financial integration (Baele et al., 2004) and a more market-based financial system have all contributed to enhancing the liquidity and size of the securitisation market. As a result, institutional investors increased their cross-country exposure while issuers gained access to a broader pool of potential investors. At the same time, increased bank competition also helped by lowering underwriters' and managers' fees.

The increase in the use of securitisation techniques in the euro area has been widespread but remains heterogeneous across countries (see Figure 2). In relative terms, asset securitisation has been strongest in countries which have undergone significant increases in real estate prices since the introduction of the euro such as Italy, Spain, Portugal and the Netherlands (Figure 3). In this respect, it is worth noting that residential as well as commercial mortgage-backed securities (RMBS and CMBS) accounted for 68% of all euro-denominated securities issued (Figure 4). This is mainly because of the strong degree of commoditisation of this type of loan, as well as the high standardisation of credit assessment techniques that makes the pooling and selling of a large number of mortgages easier to originate for borrowers and easier to assess for investors. Balance sheet cash-flow collateralised debt obligations (CDOs) accounted for around 18% while consumer and corporate asset-backed securities (ABS) represented around 14% of total issuance. In terms of originators, the securitisation market is overwhelmingly dominated by commercial banks, while the share of securitisation products issued directly by non-financial corporations remains relatively very small (ECB, 2007).

The location of the credit investors may be very far away from the residence of the household or the corporate borrower. In this respect, based on a survey conducted by the Bond Market Association, for the period 2005-2006, less than 50% of the risk connected to European ABS structured products was bought by euro-area investors (see Figure 5). More than one third was bought by UK investors, while the remainder was disseminated elsewhere, including Asia, the Middle East and Africa. Similar results are obtained when examining the investor location of CDOs. Given this increase in the distance between borrowers and credit investors, the role of the market in pricing such assets, together with

that of rating agencies, becomes pivotal as a signal of credit risk and as a disciplining mechanism.

In this paper, we focus on the traditional concept of securitisation which involves both full funding via the true sale of bank loans as well as credit risk transfer (these instruments account for 84% of total securitisation activity in Europe). Special care is taken to account for individual banks' characteristics, including market-derived measures of banks' risk.[5] The latter control is very important also in light of the more recent tensions in credit risk markets that started in the summer of 2007. The turmoil underlined the role of financial innovation in connection with bank risk-taking and the necessity of a more careful analysis from investors of certain forms of asset-backed securities.

3. How does securitisation affect the monetary transmission mechanism?

The changing role of banks from "originate and hold" to "originate, repackage and sell" is likely to have influenced the effectiveness of the bank lending channel of monetary policy. We claim that the standard set up of the bank lending channel to capture the effect of banks' conditions on loan supply changes if banks can grant mortgages and other loans, and are able to pass them on to markets.

In their seminal work, Bernanke and Blinder (1988) show that if some borrowers have limited access to the capital market and depend mostly on bank loans for external funding, bonds and loans are imperfect substitutes and changes in the composition of bank assets also influence investment financing. In response to monetary tightening, the credit channel works if the reduction in supplied loans is not counterbalanced by greater access by firms to the capital markets.

[5] By looking at the true sales of bank loans, we analyse the funding element of securitisation rather than its overall credit risk transfer effect, which could also be obtained through other instruments such as credit derivatives or the syndicated loan market. It is worth noting that we analyse the value of securitised assets that are removed from the bank's balance sheet so that the performance of these securities no longer depends on the institution originating the loans but on the situation of the financial assets pooled. In other words, credit risk is "bankruptcy remote" from the originator. This contrasts with the case of corporate bonds where the bond is essentially backed by a promise to pay by the issuer.

The literature on the bank lending channel claims that banks' conditions also affect how banks' supply of credit responds to monetary policy changes. After monetary tightening, the response of supplied lending will be less severe for big, liquid and well-capitalised banks (Kashyap and Stein, 1995, 2000; Kishan and Opiela, 2000; Peek and Rosengren, 1995; Stein, 1998; Van den Heuvel, 2002; Gambacorta and Mistrulli, 2004). For example, big and well-capitalised banks have more access to markets for uninsured funding, while liquid banks may simply draw down cash and securities to attenuate for the effects of a drop in deposits.

Securitisation provides an alternative way for banks to maintain the credit relationship with the client by simply bundling together some loans into tradable securities and selling them on to the secondary market. This has major consequences for the standard transmission mechanism. First, banks may obtain additional liquidity independently of their securities holdings and the standard liquidity indicator may be less informative than in the past. This mechanism reduces the effectiveness of the bank lending channel in a way similar to the critique advanced by Romer and Romer (1990). According to these authors, if banks had the possibility to raise, without limit, CDs or bonds, which are not subject to reserve requirements, the bank lending channel would be ineffective. In this respect, through securitisation, loans can be readily removed from banks' balance sheets and changed in cash; findings for the US jumbo mortgages market suggest that securitisation could make the bank lending channel less effective (Loutskina and Strahan, 2006).[6]

Second, by removing loans from their balance-sheet, banks can obtain regulatory capital relief on account of the transfer of credit risk, which allows for a positive net effect on the loan supply. This mechanism is expected to continue with the implementation of the Basel II Accord - provided banks also remove the underlying risk from their balance sheet -

[6] Existing evidence on the effects of securitisation on interest rates remains scarce and conclusions are mixed. Kolari, Fraser and Anari (1998) show that securitisation activity increases liquidity in the mortgage market and insulates mortgage interest rates from the effects produced by the monetary policy operations of the central bank. On the contrary, Estrella (2002) finds that the reaction of mortgage rates to changes in the federal funds rate is stronger with an increasing recourse to securitization. He concludes that the change in efficacy of monetary policy appears to derive from non-interest effects, such as the liquidity and credit volumes. In line with this finding, Fernald, Keane and Mosser (1994), examine the influence of securitisation on the monetary policy transmission mechanism using mortgage-backed securities as an example and conclude that the IT revolution is raising the effectiveness of interest rate channels.

which has a stronger focus on credit risk management and economic capital.[7] At the same time, the final effect on credit risk is very difficult to predict because banks may be induced to shift to riskier assets (Donahoo and Shaffer, 1991; Dionne and Harchaoui, 2003).[8]

Details of the effects of securitisation on bank lending behaviour can also be found in the existing literature. Loan sales provide a lower cost method of financing for banks facing a competitive deposit market (Pennacchi, 1988). This effect has probably become stronger in recent years. James (1988) examines the incentives for banks to engage in "off-balance sheet" activities, such as commercial loan sales and points out that these can mitigate the "under-investment" problem for banks which previously issued risky debt. In other words, loan sales permit banks to invest in more projects with positive net present value than would have been the case in the past.

More recently, some papers have focused on how securitisation activity evolves through the business cycle, although the evidence produced to date is far from conclusive. On the one hand, Stanton (1998) finds that securitisation increases in periods of cyclical downturns or individual firm weakness. On the other hand, Estrella (2002) points out that securitisation of multi-family home mortgages, as a proportion of outstanding mortgages, tends to decline during recessions. The link between securitization and the business cycle is also very important as regards the implications for monetary policy. Kuttner (2000) examines this issue by comparing the relative growth of ABS and bank loans over the business cycle. If banks use securitisation to shield their supply of loans from the effects of monetary policy, the volume of ABS should move in opposite direction in response to monetary policy.

Overall, the increasing importance of loan securitisation together with the emergence of the credit derivative market, have improved credit risk management by banks. Through these innovations, credit risk can be commoditised and transferred away from banks' balance sheets to other economic agents who might, in turn, acquire credit risk to diversify their

[7] While asset-backed securities are expected to remain the dominant instrument being securitised, higher growth is expected on less granular securities such as small and medium enterprise CDOs and other corporate-backed deals owing to the greater scope for capital release (Hancock et al., 2005 and J. P. Morgan, 2006).
[8] For an analysis of the interactions between capital reserve requirements and securitisation see, among others, Nwogugu (2007).

overall risk position or to generate revenues. This probably also has some consequences for the bank lending channel.

In recent years, better credit risk management by banks may have partly contributed to the observed gradual easing of credit standards applied to loans and credit lines observed, as reported in the ECB's Bank Lending Survey (Figure 6). This diminishing pressure on banks' balance sheets is also reflected in the increase in the distance to default of banks in recent years (Figure 7). All these developments may have contributed, other things being equal, to a relaxation of constraints on banks' loan supply. This issue will be addressed in the econometric part of the paper by explicitly taking into account the link between banks' risk and lending supply.[9]

4. The econometric model and the data

The empirical specification, based on Kashyap and Stein (1995), Ehrmann et al. (2003) and Ashcraft (2006), is designed to test whether banks that securitise loans react differently to monetary policy shocks. This approach is in line with the research conducted within the Monetary Transmission Network (Angeloni, Mojon and Kashyap, 2003).

The model is given in the following equation:[10]

$$\begin{aligned}\Delta \ln(Loans)_{i,t} &= \alpha \Delta \ln(Loans)_{i,t-1} + \sum_{j=0}^{1} \delta_j \Delta \ln(GDPN)_{k\,t-j} + \sum_{j=0}^{1} \beta_j \Delta i_{M\,t-j} + \sum_{j=0}^{1} \phi_j \Delta i_{M\,t-j} * SEC_{i,t-1} + \\ &+ \sum_{j=0}^{1} \sigma_j \Delta i_{M\,t-j} * SIZE_{i,t-1} + \sum_{j=0}^{1} \lambda_j \Delta i_{M\,t-j} * LIQ_{i,t-1} + \sum_{j=0}^{1} \chi_j \Delta i_{M\,t-j} * CAP_{i,t-1} + \eta SEC_{i,t-1} + \\ &+ \kappa SIZE_{i,t-1} + \vartheta LIQ_{i,t-1} + \xi CAP_{i,t-1} + \tau LLP_{i,t-1} + \psi EDF_{i,t-1} + \varepsilon_{i,t}\end{aligned} \quad (1)$$

[9] A complete analysis of the impact of the use of credit derivatives on loan supply goes beyond the scope of this study. In general, new risk management techniques in the presence of friction should, ceteris paribus, increase the supply of bank credit. Existing empirical studies and practitioners assessments drawn from fact-finding exercises support this idea (ECB, 2007). In this respect, Hirtle (2007), using data on individual loans made by a sample of banks between 1997 and 2005, finds evidence suggesting that greater use of credit derivatives is associated with the greater supply of bank credit for large loans (i.e. to large corporate borrowers), although not for (previously negotiated) commitment lending. On-balance-sheet amounts of commercial and industrial loans also appear to increase as the protection afforded by credit derivatives rises. Goderis et al. (2006) find that banks adopting advanced credit risk management techniques experience a permanent increase in their target loan levels of around 50%.

[10] The model in levels implicitly allows for fixed effects and these are discarded in the first difference representation given in equation (1).

with i=1,…, N , k= 1, …,12 and t=1, …, T where N is the number of banks, k is the country and T is the final year.

In equation (1) the growth rate in bank lending to residents (excluding interbank positions), Δln(*Loans*), is regressed on nominal *GDP* growth rates, Δln(*GDPN*), to control for country-specific loan demand shifts. The introduction of this variable captures cyclical macroeconomic movements and serves to isolate the monetary policy component of interest rate changes (Δi_M). The econometric specification also includes four interactions between changes in the interest rate controlled by the monetary policy authority and bank-specific characteristics: *SEC*, the securitisation activity indicator, *SIZE*, the log of total assets, *LIQ*, securities and other liquid assets over total assets, *CAP*, the capital-to-asset ratio. Bank-specific characteristics refer to *t-1* in order to avoid an endogeneity bias.

The securitisation activity indicator has been constructed as $SEC_{i,t} = \frac{SL_{i,t}}{TA_{i,t-1}}$, where *SL* stands for the flow of securitised lending in year t and TA_{t-1} represents total assets at the end of the previous year. Following Ehrmann et al. (2003), all bank-specific characteristics have been normalised with respect to their average across all banks in the respective sample, in order to get indicators that amount to zero over all observations. This means that for model (1) the average of the interaction terms are also zero, and the parameters β_j may be broadly interpreted as the average monetary policy effect on lending for a theoretical average bank.

The sample used relates to the period from 1999 to 2005,[11] covering the growth in securitisation activity in the euro area and the single monetary policy whereby all banks are subject to one monetary regime. The interest rate taken as the monetary policy indicator is the three-month Euribor.

Securitisation may dramatically affect bank loans dynamics. Standard statistics do not take into account that even if a loan has been securitized (and it is therefore expelled from banks' balance sheets) it still continues to finance the economy.[12] We have tried to tackle

[11] Data for 1998 has also been included to calculate growth rates.
[12] See Jeffrey (2006) for an overview of the accounting consequences of securitization.

this statistical issue by simply re-adding the flows of securitised loans (*SL*) to the change in the stock of loans to calculate a corrected measure of the growth rate for lending that is independent of the volume of asset securitisation ($\Delta \ln L_t = \ln(L_t + SL_t) - \ln L_{t-1}$).

To give a rough idea of the bias that can be caused by asset securitisation activity to the computation of the lending growth rate, in Figure 8 the gross annual growth rate of lending in the euro area (solid line) is compared with that corrected for securitised loans outflows (dotted line). The bias tends to increase over time and reach a value of around 2 percentage points in 2005.

We use annual data obtained from Bankscope, a commercial database maintained by International Bank Credit Analysis Ltd. (IBCA) and the Brussels-based Bureau van Dijk. In particular, we consider balance sheet and income statement data for a sample of around 3,000 euro-area banks. Table 1 gives some basic information on the dataset.[13] The sample accounts for around three quarters of bank lending to euro-area residents. The average size of banks in the sample is the largest in the Netherlands, Finland and Spain and smallest in Italy, Austria and Germany. Averages for individual bank characteristics remain heterogeneous across countries in terms of capital, loan loss provisions and liquidity characteristics partly reflecting different stages of the business cycle as well as different competitive and institutional conditions.

In order to proxy for banks' risk we have also inserted two control variables. The first variable represents loan loss provisions as a percentage of loans. This variable is quite standard in the literature and represents an ex-post accounting measure of credit risk. The second is given by the one-year expected default frequency (EDF) which is a widely-used measure of credit risk by financial institutions, including central banks and regulators (see, for instance, ECB, 2006, and IMF, 2006).[14] EDF is a forward-looking indicator of credit risk computed by Moody's KMV using financial markets data, balance sheet information and Moody's

[13] Only euro-area banks that have at least four years of consecutive data are included in the sample. Banks which do not report positive figures for total assets, total loans and total capital for any given year are excluded. Investment banks, government financial agencies, special purpose financial institutions and foreign subsidiaries are excluded. Anomalies in loan growth rates are controlled for by checking for possible merger and acquisition activity related to full mergers from 1998 to 2005 in the Thomson SDC Platinum database.
[14] Furfine (2006) uses EDF to assess the effect of mergers on banks' risk in American banks.

proprietary bankruptcy database.[15] This measure is very important because it allows us to capture transfer of credit risk to the markets not only via true sale securitisation but also by means of credit derivatives or synthetic CDOs. EDF information is not available for all banks. From 1999 to 2005, the sum of total assets of banks for which Moody's KMV constructs EDF figures accounts for around 52% of the total assets of banks in our sample. For banks that do not have EDF we have approximated their default probability by means of a cluster analysis.

Securitisation data are obtained from Bondware which is a database compiled by Dealogic, an independent data distributor and completed with data from Standard and Poor's (S&P), a large private rating agency. Securitisation data start in 1999 and cover an extensive range of around 4,500 deals (Table 2). We look at individual deal-by-deal issuance patterns from euro-area originators.[16] The advantage of using data on securitisation activity from Bondware and S&P is that the name of the originator, date of issuance and deal proceeds are registered.[17] We cover all ABS securities as well as cash flow (balance-sheet) CDOs issued by euro-area originators that accomplish two main criteria. First, that the bank originating the loan passes them from their balance-sheet to the markets via asset-backed securities and, second, that it receives funding from investors from the sale of those securities.

Data on individual securitisation deals have been matched with financial statements of each bank originating the deal. Banks active on the securitisation market are characterized on average by their large scale (EUR 73 billion of total assets), a lower level of the capital-to-asset ratio (6.4%) than other banks, as well as a lower liquidity ratio (15.2%). These bank characteristics are consistent with the idea that there are some economies of scale in securitisation activity. Moreover, banks active in the securitisation market (*SEC* banks) maintain a lower level of liquidity or capital, because the selling of bank loans on the market allows them to be less constrained by liquidity management and minimum capital

[15] The calculation of EDF builds on Vasicek and Kealhofer's extension of the Black-Scholes-Merton option-pricing framework to make it suitable for practical analysis as well as on the proprietary default database owned by KMV (see Kealhofer, 2003, Crosbie and Bohn, 2003 and Garlappi, Shu and Yan, 2007 for further details on the construction of EDFs and an example of a recent application).
[16] It includes twelve euro-area countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.
[17] We compare Bondware's and S&P's coverage of securitization activity data with individual deal by deal data on securitization activity provided by Moody's, Eurostat and the European Securitisation Forum to obtain a comprehensive view of the size of the securitization market.

requirements. The growth rate of lending of *SEC* banks is more than triple that of the average bank in the sample (16% compared with 5% respectively).

5. Results

The results of the study are summarized in Table 3. The models have been estimated using the GMM estimator suggested by Arellano and Bond (1991) which ensures efficiency and consistency provided that the models are not subject to serial correlation of order two and the instruments used are valid (which is tested for with the Sargan test).

The first column presents the results for our benchmark equation (1). Changes in economic activity have a positive and significant effect on lending: better economic conditions increase the number of projects that become profitable in terms of expected net present value and hence increase the demand for bank credit from borrowers (Kashyap, Stein and Wilcox, 1993). A 1% increase in GDPN (which produces a bank loan demand shift) causes a loan increase of around 0.5%. In contrast the response of bank lending to a monetary policy shock has the expected negative sign, suggesting a reduction in loan growth as a result of increases in the monetary policy rates (see coefficients for $\Delta i_{M\,t}$ and $\Delta\, i_{M\,t-1}$).

Securitisation activity is positively related to bank lending. That is, banks that securitize their assets to a larger extent have, on average, a higher growth rate of lending. This result is consistent with the view of securitisation as a source of capital relief and additional funding that can be used by banks to grant additional loans.

The effect of liquidity and capital on lending (*LIQ* and *CAP*) indicates that liquid and well-capitalised banks have more opportunities to expand their loan portfolio. On the contrary, consistent with Ehrmann et al. (2003), the effect for size is negative, and the role of size as an indicator of informational asymmetries appears to be quite poor. Several features of banking markets in the euro area (low number of banking failures, decreasing role of the government, presence of comprehensive deposit insurance schemes, network arrangements in groups, strong relationship lending between small banks and small firms) seem to diminish the usefulness of size as an indicator of (lower) informational friction.

The riskiness of the credit portfolio has a negative effect on banks' capacity to increase lending. Other things being equal, higher loan loss provisions (LLP) reduce profits, bank market capital and, therefore, have negative consequences on supplied lending. A similar effect is detected for the expected default frequency (EDF).[18] The mechanism suggests that banks' risk conditions matter for the supply of loans and it probably works by means of "market discipline" including the capacity of banks to issue riskier uninsured debt (i.e. bonds or CDs) which might be easier for less risky banks because they have more capacity to absorb future losses.[19]

As expected, the interaction terms between size, liquidity, capitalisation and monetary policy have the positive sign. In line with the bank lending channel literature, big, liquid and well-capitalized banks are better able to buffer their lending activity against shocks affecting the availability of external finance. It is worth noting that the coefficient of LIQ*Δi_M is however only marginally different from zero. From a monetary policy perspective, the implication of this result is that the liquidity indicator reduces its significance if considered jointly with the ability of banks to sell loans on to the market. In other words, a bank may be less liquid than others but more insulated than more liquid banks because of its greater capacity to securitize loans. Bank liquidity in itself, is not sufficiently informative, meaning that this indicator has to be considered together with the full range of securitisation issues.

The effects on lending of a 1% increase in the short-term monetary rate are summarised in Figure 9 that shows the effects for banks that make a different use of securitization techniques. In particular it compares the effect on the average bank (that securitises only 2% of its assets, *SEC*=0.02) with banks that use securitization in a more prominent way: the median *SEC* bank that securitises 10% of total assets, and the average *SEC* bank that sells one quarter of its assets. The aim is to verify not only whether securitisation generates some insulation effects on banks' loan supply but also to have an

[18] The model includes both a backward (LLP) and a forward-looking (EDF) proxy for credit risk. Strong collinearity among the variables was not detected. Results remain the same when only a single proxy for credit risk is included.
[19] Empirical evidence shows that lower capital levels are associated with higher prices for uninsured liabilities. See, for example, Ellis and Flannery (1992) and Flannery and Sorescu (1996).

assessment of the magnitude in relation to securitisation activity. For each bank we consider the immediate pass-through (over the first year) and the long-term effects.

Results indicate that a 1% increase in the monetary policy indicator leads to a decline in lending for the average bank of 0.6% in the short term and of 0.7% in the long run. *SEC* banks are on average more insulated from the effects of a monetary policy shock. The insulation, however, is not complete for the median *SEC* bank, for which the long-term effect of monetary policy on supplied lending remains significant. The supply of loans becomes insulated from monetary policy changes only when a bank is particularly active on the securitisation market, with a volume of ABS that accounts for at least a quarter of its assets (this corresponds to the average value of *SEC* banks in our sample): in this case the long-term effect is equal to 0.3% with an associated standard error of 0.2.[20]

Since the results presented so far are based on panel data regressions, the long-term coefficient on the monetary policy indicator represents the reaction of the average bank in the sample or specific categories of *SEC* banks. Given the heterogeneity of reaction across banks (as shown by the significant interaction terms in Table 3), the response of the average bank may be not informative as to the overall macroeconomic effect of monetary policy on supplied lending. In order to obtain some macroeconomic insights from these results it is important to weight the banks in the sample according to their respective market share when calculating their response to monetary policy. The resulting overall response of the loan market can, in principle, be quite different from the response of the average bank, depending on the distribution of the specific characteristics (size, liquidity, capitalisation and securitisation) and market shares across banks. Using the coefficients in the baseline model and weighting bank-specific characteristics, we found that the overall market response to a 1% increase in the monetary market rate in the long term is equal to -0.7. This is lower than the effect detected in the literature for the period before the introduction of the euro. For example, the same macroeconomic relevance exercise performed using the model in Ehrmann et al. (2003), which has a very similar set up but is estimated for the period 1992-1999, gives a long-term coefficient of -1.3. Overall, these results call for two observations.

[20] Standard errors for the long-run effect have been approximated with the "delta method" which expands a function of a random variable with a one-step Taylor expansion (Rao, 1973).

First, the effectiveness of the bank lending channel has decreased since the introduction of the euro; second, the effects of securitisation are far from completely insulating the supply of bank loans from monetary policy changes.

6. Robustness checks

The robustness of the results has been checked in several ways. First, a test was run to introduce an additional interaction term by combining the securitisation measure with the growth rate in nominal GDP, giving the basic equation (1):

$$\begin{aligned}\Delta \ln(Loans)_{i,t} &= \alpha \Delta \ln(Loans)_{i,t-1} + \sum_{j=0}^{1} \delta_j \Delta \ln(GDPN)_{t-j} + \sum_{j=0}^{1} \beta_j \Delta i_{M\,t-j} + \sum_{j=0}^{1} \phi_j \Delta i_{M\,t-j} * SEC_{i,t-1} + \\ &+ \sum_{j=0}^{1} \sigma_j \Delta i_{M\,t-j} * SIZE_{i,t-1} + \sum_{j=0}^{1} \lambda_j \Delta i_{M\,t-j} * LIQ_{t-1} + \sum_{j=0}^{1} \chi_j \Delta i_{M\,t-j} * CAP_{i,t-1} + \eta SEC_{t-1} + \\ &+ \kappa SIZE_{i,t-1} + \vartheta LIQ_{i,t-1} + \xi CAP_{i,t-1} + \tau LLP_{i,t-1} + \psi EDF_{i,t-1} + \sum_{j=0}^{1} \varpi_j \Delta \ln(GDPN)_{t-j} * SEC_{i,t-1} + \varepsilon_{i,t}\end{aligned} \tag{2}$$

The reason for this test is the possible presence of endogeneity between the business cycle and securitisation. For example, Stanton (1998) show that securitisation of lending increases in periods of cyclical downturns or individual firm weakness. On the contrary, Estrella (2002) finds that securitisation of multi-family home mortgages as a proportion of outstanding mortgages tends to decline during recessions. The test, reported in column II of Table 3, indicates that the interaction term ϖ is positive and statistically significant while other coefficients remain broadly unchanged. Hence the positive effects of securitization on bank loan supply is dependent on the level of economic activity. In other words, banks that are more active in securitising their assets also experience a significant increase in bank lending but this effect diminishes in period of cyclical downturns.

On the base of these results, if an increase of 1% in the short-term interest rate is associated with a reduction in the nominal growth rate of GDP of 0.5% we can easily observe that the insulation effect of securitization activity on lending vanishes and banks have the same drop in lending independently of their activism on the securitization market.

Another robustness check, reported in the third column of Table 3, compares equation (1) with the following model:

$$\Delta \ln(Loans)_{i,t} = \alpha \Delta \ln(Loans)_{i,t-1} + \theta_t + \sum_{j=0}^{1} \phi_j \Delta i_{M\,i,t-j} * SEC_{i,t-1} + \sum_{j=0}^{1} \sigma_j \Delta i_{M\,t-j} * SIZE_{i,t-1} +$$
$$\sum_{j=0}^{1} \lambda_j \Delta i_{M\,t-j} * LIQ_{i,t-1} + \sum_{j=0}^{1} \chi_j \Delta i_{M\,t-j} * CAP_{i,t-1} + \eta SEC_{i,t-1} + \kappa SIZE_{i,t-1} + \vartheta LIQ_{i,t-1} + \qquad (3)$$
$$\xi CAP_{i,t-1} + \tau LLP_{i,t-1} + \psi EDF_{i,t-1} + \varepsilon_{i,t}$$

All variables are defined as before, and θ_t describes a complete set of time dummies. This model completely eliminates time variation and tests whether the macro variables used in the baseline equation (nominal income and the monetary policy indicator) capture all the relevant time effects. Again, the estimated coefficients on the interaction terms do not vary very much between the two kinds of model, which testifies to the reliability of the cross-sectional evidence obtained.

Finally, we also introduced a geographical control dummy for each model and assigned the value of one if the head office of the bank is in a given country and zero if elsewhere. In this way we test for the presence, if any, of country-specific institutional factors that could alter the results. Also in this case, the interactions between monetary policy and bank-specific characteristics remained basically unchanged (see the last column of Table 3).

7. Conclusions

European banks rarely used securitisation techniques before the introduction of the euro. In the last decade, however, there has been a spectacular increase in securitisation activity in the euro area. This is partly a global trend but it is also linked to other factors such as the increase in financial integration and moves towards a more market-based financial system. Therefore the European case provides an interesting framework to check whether or not securitisation activity has a significant effect on the transmission mechanism of monetary policy. To do so, we build on existing transmission mechanism literature and use an extensive database of banks' financial statements and securitisation activity.

We find that the changing role of banks from "originate and hold" to "originate, repackage and sell" reduces the effectiveness of the bank lending channel of monetary policy. Thus, banks making more use of securitisation activity are also more sheltered from the effects of monetary policy changes. Moreover, banks making a massive use of securitisation, grant more loans and this effect is stronger when the economy is in good shape.

Our results complement the conclusions of earlier studies, which suggest that belonging to a larger conglomerate or bank dimension have a dampening effect on monetary policy (Campello, 2002; Gambacorta, 2005; Ashcraft, 2006). Taken together the results suggest that, nowadays, the role of the bank lending channel has decreased compared with the past when banks were smaller, less integrated in groups and less able to liquidate loans into secondary markets. At the same time, our macro-relevance exercise highlights that the effects of securitisation are far from a complete insulation of loan supply from monetary policy changes. Significantly, banks' risk profile has a significant impact on loan supply, highlighting the importance of financial stability from a monetary policy perspective.

Two issues merit further research. First, this analysis is limited to studying the effects of securitisation on bank loan supply, without considering the possible impact on other forms of credit supplied to the economy: the positive effect of securitisation on bank lending may limit borrowers' demand for other forms of credit. For instance, with the advent of securitisation borrowers might find financing from banks at more favourable terms than raising direct funding through the corporate bond market. Likewise, it is also worth exploring how monetary policy conduct could or should be suitably adjusted to account for the greater liquidity resulting from asset securitisation. For example, securitisation entails a stronger role for institutional investors as ultimate buyers of credit. As a result the aggregate lending supply is now strongly influenced by financial intermediaries that do not collect deposits and which are significantly less affected by changes in the money supply. At the same time the effect of the growing influence of institutional investors on credit markets and the more prevalent role of banks as credit originators on the transmission mechanism is far from being completely understood.

Table 1

DESCRIPTIVE STATISTICS BY COUNTRY [1]

(percentages, millions of euros, expected default frequencies and number of banks)

	Lending	Size	Capital	Loan provisions	Liquidity	Securitisation	EDF (1)	Number of banks
	(mean annual growth rate)	(EUR mill.)	(% total assets)	(% total loans)	(% total loans)	(% total assets)		
Austria	4.5	3,425	8.7	3.2	23.7	0.72	0.4	175
Belgium	3.9	23,981	7.6	1.4	10.8	0.02	0.1	57
Finland	7.4	18,723	9.4	0.2	11.6	0.01	0.2	4
France	5.2	10,460	10.0	1.5	13.9	1.80	0.7	250
Germany	2.1	4,699	5.7	1.0	24.8	1.66	1.0	1,665
Greece	38.4	7,345	14.2	1.2	13.5	0.24	1.4	8
Ireland	9.3	9,874	10.4	1.4	17.0	0.70	0.3	24
Italy	12.6	2,058	13.0	1.0	31.1	1.22	0.3	579
Luxembourg	5.8	6,110	6.8	4.5	45.2	5.69	1.2	91
Netherlands	6.8	18,803	9.3	2.7	24.1	19.36	0.8	31
Portugal	11.9	7,362	12.9	1.9	6.5	10.18	0.2	22
Spain	8.1	15,615	9.9	1.4	7.5	1.51	0.1	41
Euro area	5.0	5,400	7.9	1.3	24.9	1.93	0.5	2,948

Sources: Bankscope, Eurostat, KMV-Moody's.
Note: (1) Expected default frequency (EDF) figures are available for 134 banks representing 52% of the total sample total assets.

Table 2

STATISTICS ON SECURITISATION DEALS 1999-2005

(millions of euros and number of observations)

Country	Mean	Median	St Dev	1st Quart.	3rd Quart.	Total	Obs.
Austria	145	24	410	12	100	6,086	42
Belgium	158	53	350	20	139	18,958	120
Finland	141	83	154	16	240	2,969	21
France	168	49	310	16	150	75,121	446
Germany	137	35	367	15	76	132,415	966
Greece	327	83	404	28	593	13,395	41
Ireland	199	40	359	16	255	27,451	138
Italy	237	56	397	18	294	211,964	896
Luxembourg	295	46	540	13	353	2,948	10
Netherlands	243	32	562	14	200	153,509	632
Portugal	195	27	444	12	145	45,318	232
Spain	293	52	481	18	326	271,156	925
Euro Area	215	40	433	16	200	961,289	4,469

Source: Bondware and Standard and Poor's.

Table 3

REGRESSION RESULTS

Dependent variable: annual growth rate of lending (ΔL_{t})	(I) Baseline Model		(II) Securitisation and the business cycle		(III) Time dummies		(IV) Time and geographical control dummies	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
ΔL_{t-1}	-0.151 ***	0.002	-0.147 ***	0.001	-0.020 ***	0.002	-0.090 ***	0.003
$\Delta GDPN_{t-1}$	0.461 ***	0.093	0.589 ***	0.100				
SEC_{t-1}	0.048 ***	0.000	0.037 ***	0.001	0.036 ***	0.000	0.033 ***	0.000
$SIZE_{t-1}$	-0.009 ***	0.001	-0.010 ***	0.001	-0.006 ***	0.001	-0.006 ***	0.001
LIQ_{t-1}	0.191 ***	0.007	0.187 ***	0.005	0.133 ***	0.005	0.368 ***	0.013
CAP_{t-1}	0.005 ***	0.000	0.005 ***	0.000	0.004 ***	0.000	0.020 ***	0.000
EDF_{t-1}	-0.049 ***	0.001	-0.054 ***	0.001	-0.055 ***	0.001	-0.103 ***	0.004
LLP_{t-1}	-0.112 ***	0.002	-0.129 ***	0.002	-0.072 ***	0.001	-0.100 ***	0.001
$\Delta i_{M\,t}$	-0.622 ***	0.120	-0.680 ***	0.122				
$\Delta i_{M\,t-1}$	-0.199 **	0.089	-0.281 ***	0.099				
$\Delta i_{M\,t}$*SEC_{t-1}	1.922 ***	0.010	1.233 ***	0.032	1.175 ***	0.006	1.465 ***	0.010
$\Delta i_{M\,t}$*$SIZE_{t-1}$	0.544 ***	0.063	0.498 ***	0.060	0.633 ***	0.060	0.590 ***	0.060
$\Delta i_{M\,t}$*LIQ_{t-1}	1.078 *	0.586	0.845	0.555	0.737	0.470	0.663	1.032
$\Delta i_{M\,t}$*CAP_{t-1}	0.153 ***	0.008	0.143 ***	0.007	0.136 ***	0.001	0.090 **	0.036
ΔGDP_{t}*SEC_{t-1}			2.490 ***	0.021				
Constant	0.059 ***	0.002	0.058 ***	0.002	0.057 ***	0.002		
Time dummies	NO		NO		YES		YES	
Country dummies	NO		NO		NO		YES	
Sample period	1998-2005		1998-2005		1998-2005		1998-2005	
No. of banks, no. of observations	3,312	15,403	3,312	15,403	3,312	15,403	3,312	15,403
Sargan test (2nd step; pvalue)		0.312		0.126		0.110		0.152
MA(1), MA(2) (p-value)	0.000	0.103	0.000	0.140	0.000	0.201	0.000	0.062

The model is given by the following equation, which includes interaction terms that are the product of the monetary policy indicator and a bank specific characteristic:

$$\Delta \ln(L)_{it} = \Delta \ln(L)_{it-1} + \sum_{j=0}^{1} \delta_j \Delta \ln(GDPN)_{t-j} + \sum_{j=0}^{1} \beta_j \Delta i_{Mt-j} + \sum_{j=0}^{1} \phi_j \Delta i_{M\,t-j} * SEC_{t-1} + \sum_{j=0}^{1} \sigma_j \Delta i_{Mt-j} * SIZE_{t-1} +$$

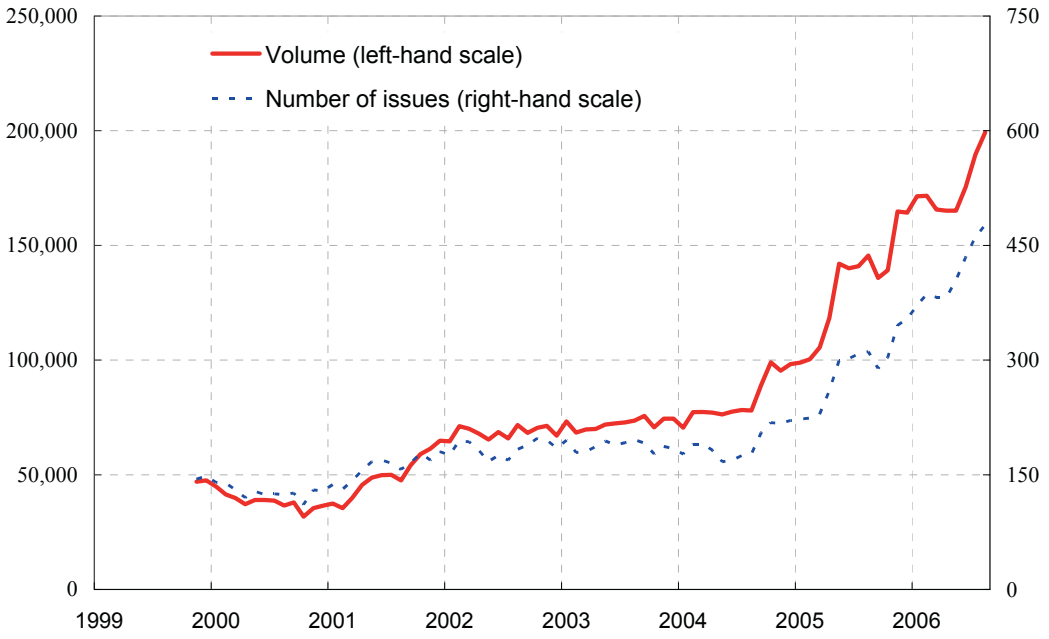
$$+ \sum_{j=0}^{1} \lambda_j \Delta i_{Mt-j} * LIQ_{t-1} + \sum_{j=0}^{1} \chi_j \Delta i_{Mt-j} * CAP_{t-1} + \eta SEC_{t-1} + \kappa SIZE_{t-1} + \vartheta LIQ_{t-1} + \xi CAP_{t-1} + \tau LLP_{it-1} + \psi EDF_{it-1} + \varepsilon_{it}$$

with i=1,…, N and t=1, …, T and where: N = number of banks; L_{it}= loans in the balance sheet of bank i in quarter t; i_{Mt} = monetary policy indicator; $GDPN_{it}$ = nominal GDP; SEC_{it} = securitization ratio; $SIZE_{it}$=log of total assets; LIQ_{it}=liquidity ratio; CAP_{it}=capital to asset ratio; LLP_{it}=loan loss provision over total assets; EDF_{it} =Expected default frequency. One lag has been introduced in order to obtain white noise residuals. The models have been estimated using the GMM estimator suggested by Arellano and Bond (1991). In the GMM estimation, instruments are the second and further lags of the growth rate of the dependent variable and of the bank-specific characteristics included in each equation. Inflation, GDP growth rate and the monetary policy indicator are considered as exogenous variables. The interactions terms and control variables that turned out not to be statistically significant in all the models have been removed from the table. The symbols *, **, and *** represent significance levels of 10 per cent, 5 per cent, and 1 per cent respectively.

Figure 1

TOTAL EURO-DENOMINATED ASSET-BACKED SECURITIES ISSUANCE

(monthly data; millions of euros, annual gross flows and numbers)

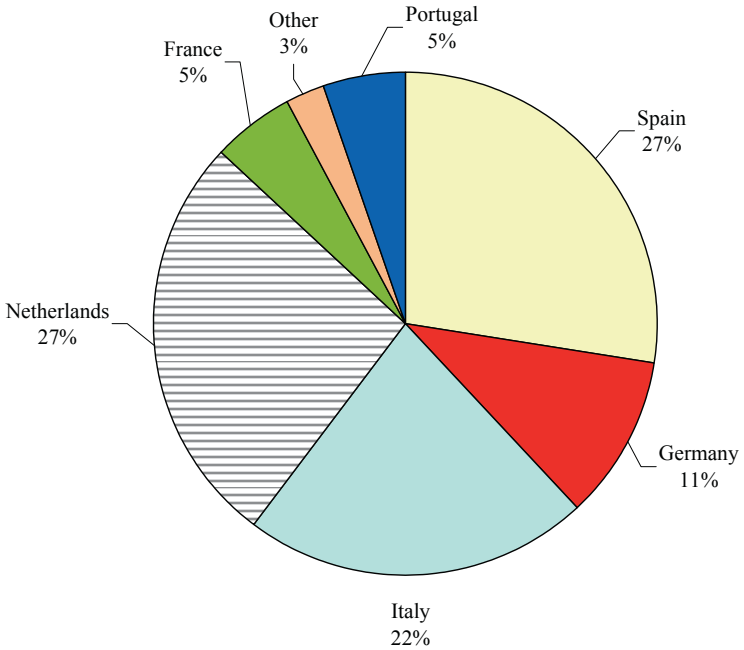


Source: European Commission.
Note: Broad sample including euro-denominated activity from non-euro area European originators such as the UK.

Figure 2

SECURITISATION BY COUNTRY OF ISSUANCE IN 2005

(volumes, CDOs are excluded)

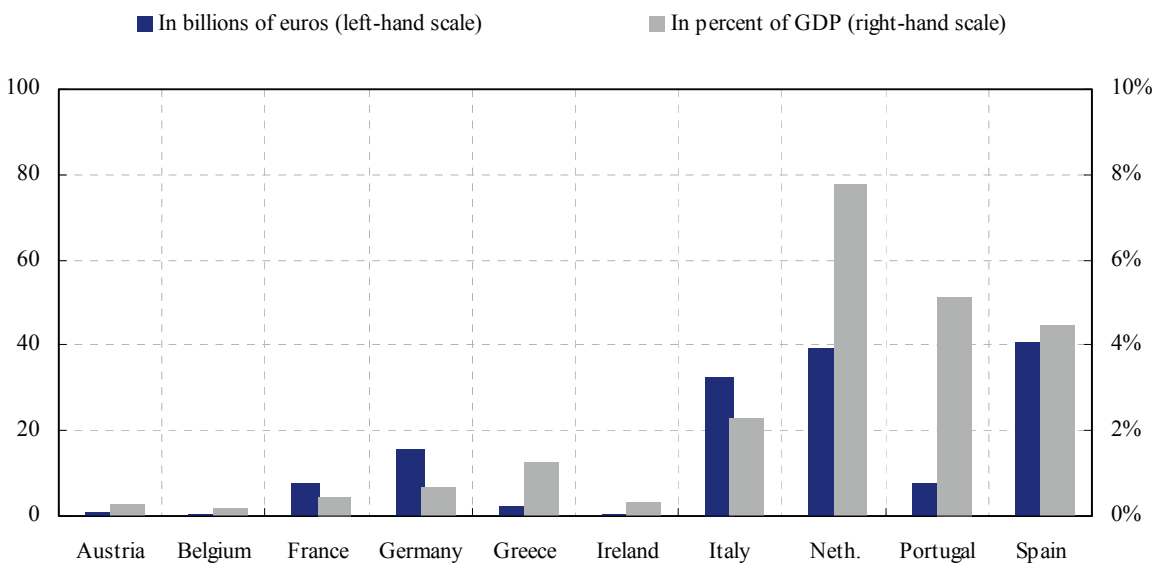


Sources: European Securitisation Forum, Thomson Financial, Dealogic, JP Morgan, Merrill Lynch, Structured Finance International, Bloomberg.

Figure 3

SECURITISATION BY COUNTRY OF COLLATERAL

(volumes in 2005, CDOs are excluded)

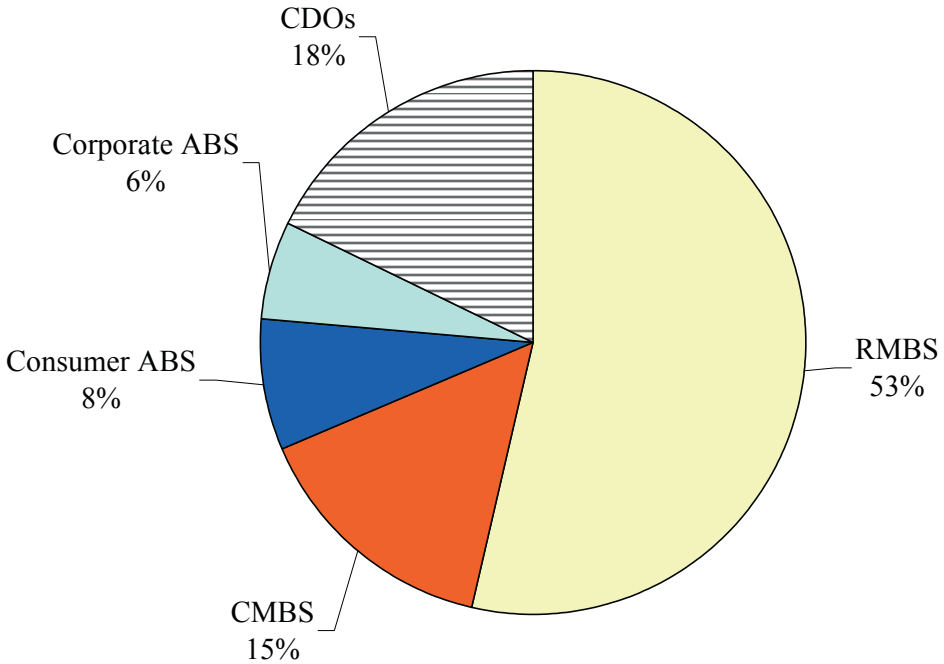


Sources: Eurostat, European Securitisation Forum, Thomson Financial, Dealogic, JP Morgan, Merrill Lynch, Structured Finance International, Bloomberg.

Figure 4

SECURITISATION BY TYPE OF INSTRUMENT IN 2005

(euro-denominated, volumes, cash funded instruments only)

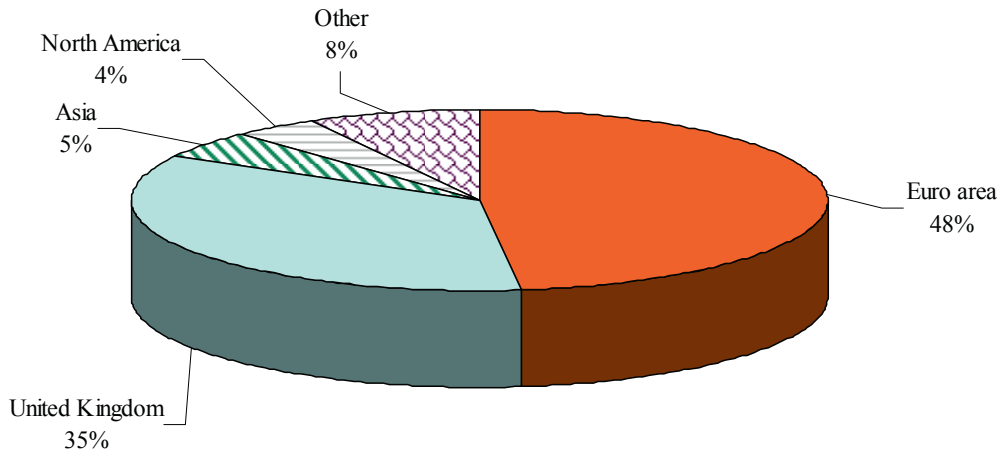


Sources: European Securitisation Forum, Thomson Financial, Dealogic, JP Morgan, Merrill Lynch, Structured Finance International, Bloomberg.

Figure 5

EUROPEAN ASSET-BACKED SECURITIES INVESTOR LOCATION

(flows in 2005-06)

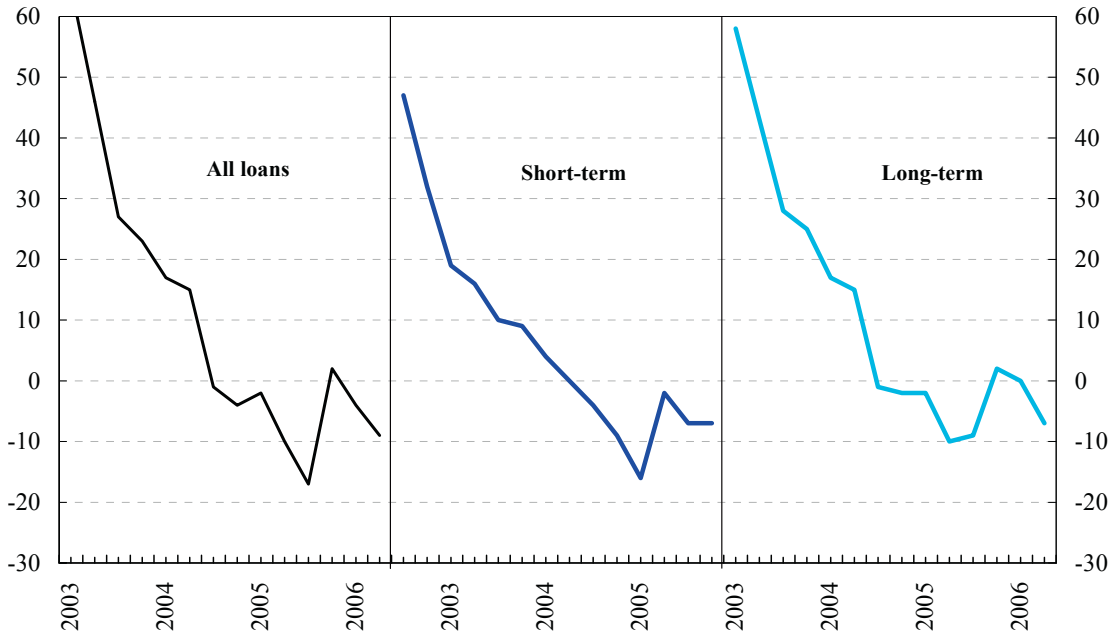


Source: The Bond Market Association Primary Distribution Survey.

Figure 6

CHANGES IN CREDIT STANDARDS ON LOANS TO CORPORATIONS

(net percentages of banks reporting tightening standards)



Source: European Central Bank.
Note: The net percentage refers to the difference between the sum of the percentages for "tightened considerably" and "tightened somewhat" and the sum of the percentages for "eased considerably" and "eased somewhat". See http://www.ecb.int/stats/money/lend/html/index.en.html for further information.

Figure 7

DISTANCE TO DEFAULT

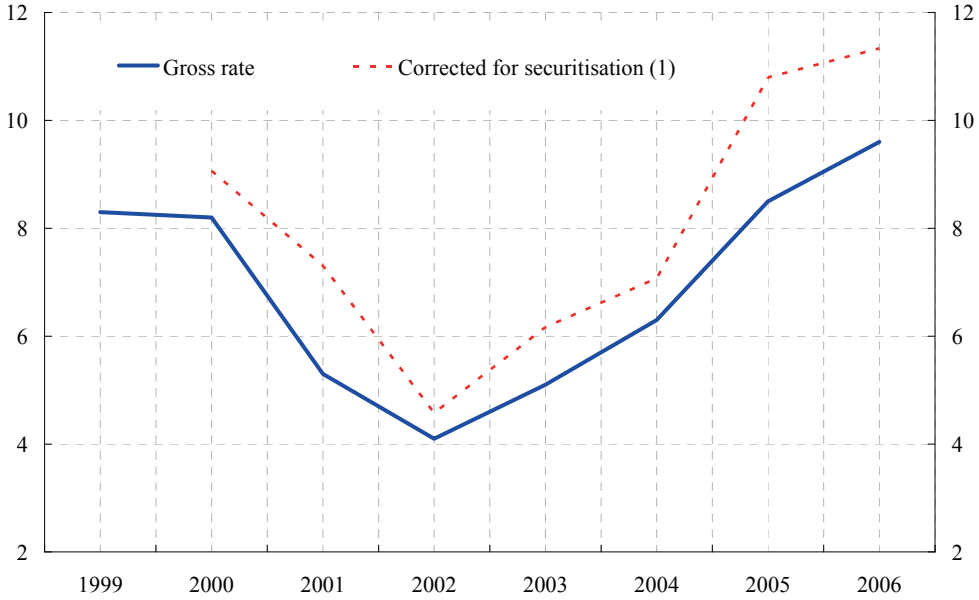
(higher distances suggest lower credit risk)

Source: Moody's KMV.

Figure 8

TOTAL BANK LENDING IN THE EURO AREA

(annual growth rate; percentage points)

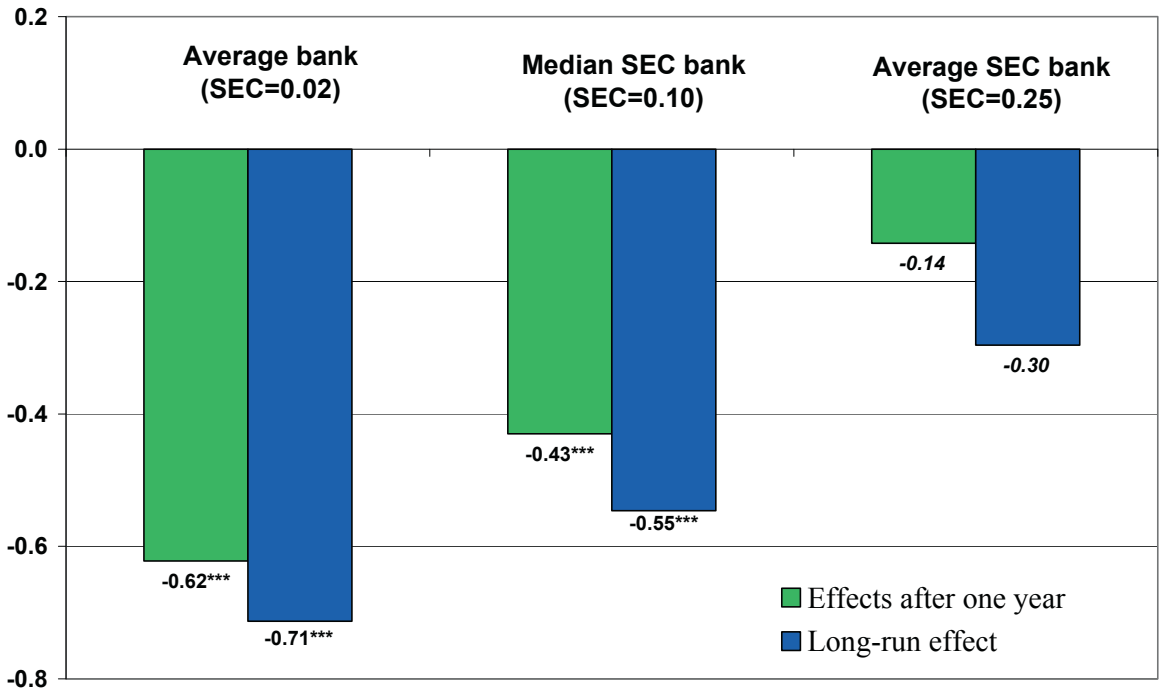


Sources: Thomson Financial, Dealogic, JP Morgan, Merrill Lynch, Structured Finance International, Bloomberg.
Note: (1) The growth rate is corrected to take into account securitised loans from banks resident in the euro area.

Figure 9

EFFECT OF A ONE PER CENT INCREASE OF THE MONETARY POLICY RATE ON BANK LENDING

(percentage points)



Note: We evaluate the effect of a one per cent increase of the short-term interest rate on bank lending considering banks with a different activism in the securitization market. *SEC* is the ratio of annual securitized lending and the total assets at the beginning of the year. The coefficients are calculated on the base of the benchmark model in Table 3. The symbols *, **, and *** represent significance levels of 10 per cent, 5 per cent, and 1 per cent respectively.

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