



*DEPARTMENT OF BANKING AND FINANCIAL MANAGEMENT*

*M.Sc. IN FINANCIAL ANALYSIS FOR EXECUTIVES*

***IS THERE  
A BANK CREDIT CHANNEL  
IN THE TRANSMISSION  
OF MONETARY POLICY  
TO THE REAL ECONOMY?***

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## ABSTRACT

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*The bank credit channel assigns banks a pivotal role in the transmission of monetary policy, which stems from imperfect information and other frictions prevailing in financial markets. Banks are deemed special in the extension of credit to borrowers that cannot access other types of credit, owing to their expertise in attenuating financial frictions. If banks adjust their loan supply following a change in the stance of monetary policy, this poses implications on real activity, since some borrowers are forced to cut back on their expenditure and investment decisions. This paper offers a comprehensive review of the existing literature and empirical research on the existence of a bank lending channel across the US and the euro area, as well as its relevant macroeconomic significance. The empirical results though have not yet reached a consensus. Moreover, it offers an insight into the reformulation of the traditional mechanism in light of financial innovation and the new operational framework of the banking sector. The reformulated bank lending channel operates primarily through the impact of monetary policy on banks' external finance premium as determined by their perceived balance sheet strength, in terms of leverage, asset quality and risk attitude, which is likely to have altered its fundamentals, as initially conceived.*

*Key words: bank lending channel, monetary policy transmission*

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## ΠΕΡΙΛΗΨΗ

Ο δίαυλος των τραπεζικών χορηγήσεων (*bank lending channel*) υπογραμμίζει την σημαντικότητα των τραπεζών στη μετάδοση της νομισματικής πολιτικής, η οποία απορρέει από την ασύμμετρη πληροφόρηση και τις λοιπές ατέλειες του χρηματοπιστωτικού συστήματος. Οι Τράπεζες, χάρη στην τεχνογνωσία και τα προηγμένα συστήματα αξιολόγησης, ελέγχου του αξιόχρεου και παρακολούθησης των δανειοληπτών που διαθέτουν, είναι σε θέση να μετριάσουν τους εν λόγω φραγμούς, υπερικχύοντας έτσι έναντι των λοιπών χρηματοπιστωτικών διαμεσολαβητών στη χορήγηση πιστώσεων, και δη σε δανειολήπτες που δεν μπορούν με ευκολία να αντλήσουν κεφάλαια από εναλλακτικές πηγές χρηματοδότησης. Η μεταβολή από τις Τράπεζες του όγκου και/ή των συνθηκών των χορηγούμενων δανείων, συνεπεία μίας μεταβολής στη νομισματική πολιτική, αναμένεται να έχει αντίκτυπο στην πραγματική οικονομία, δεδομένου ότι ένα μέρος των δανειοληπτών αναγκάζεται, λόγω ανεπάρκειας χρηματοδοτικών πόρων, να αναβάλλει την καταναλωτική και/ή επενδυτική του δαπάνη. Η παρούσα εργασία διαπραγματεύεται τον άνω μηχανισμό διάδοσης της νομισματικής πολιτικής μέσω του τραπεζικού δανεισμού, παρέχοντας μία εμπειριστωμένη ανασκόπηση της υπάρχουσας βιβλιογραφίας και εμπειρικής μελέτης όσον αφορά την ύπαρξη ή μη του “*bank lending channel*” στις ΗΠΑ και την Ε.Ε., καθώς και της σχετικής σημασίας του στην πραγματική οικονομία. Όπως γίνεται αντιληπτό, δεν υπάρχει ομοφωνία ως προς τα αποτελέσματα των εμπειρικών μελετών. Ακόμη, βοηθά στην βαθύτερη κατανόηση του νέου μηχανισμού μετάδοσης, όπως έχει διαμορφωθεί υπό το πρίσμα των καινοτομιών στο χρηματοπιστωτικό σύστημα και του εκσυγχρονισμού στο λειτουργικό πλαίσιο των Τραπεζών. Η λειτουργία του αναμορφωμένου “*bank lending channel*” βασίζεται κυρίως στην επίδραση που ασκεί η νομισματική πολιτική στο “ασφάλιστρο εξωτερικής χρηματοδότησης” των Τραπεζών, το οποίο είναι συνάρτηση της χρηματοοικονομικής ευρωστίας τους - σε όρους κεφαλαιακής επάρκειας, μίγματος χρηματοδότησης, ποιότητας των στοιχείων του ενεργητικού - και του προφίλ κινδύνου της κάθε Τράπεζας, στοιχεία τα οποία φαίνεται ότι έχουν επηρεάσει την αρχική δομή και δραστικότητα του.

Λέξεις κλειδιά: δίαυλος τραπεζικών δανείων, μετάδοση της νομισματικής πολιτικής

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## INTRODUCTION

In most developed economies bank lending constitutes one of the main sources of external finance for households and non-financial corporations. This is quite evident in the euro area, where in recent years bank loans have accounted for approximately 85% of the total external financing mix of the private sector. Accordingly, the undisrupted provision of funds from the banking system to bank dependent borrowers turns out to be crucial for the sustainability of economic activity and the effectiveness of the transmission mechanism of monetary policy to the real economy. In many occasions across countries and over time, sharp declines in the growth rate of loans have coincided with a considerable downturn in economic activity. Indeed this has been the case in the Great Depression of 1929-1933, the credit crunch of 1966 and the more recent economic slowdowns in the US, the UK and Japan up to the ongoing widespread financial crisis. This fact underlines the special role of bank credit and suggests that credit cycles may interfere with real business cycles and/ or vice versa.

Under this spectrum, issues of credit availability, imperfect information and other financial frictions in credit markets, although largely ignored in the conventional macroeconomic textbook, have emerged as crucial elements of contemporary macroeconomic analysis and monetary policy setting. Traditionally, monetary policy is assumed to exert its impact on real economic activity primarily through the “interest rate channel” of transmission. Yet, in recent years the observed ambiguities in standard theory have drawn the attention of academics and policy makers in the so called “credit channel” of monetary policy transmission. This new approach briefly states that the direct effects of monetary policy on interest rates are amplified by endogenous shifts in the *external finance premium* of banks, thereby determining their ability to lend (the bank lending channel), and of borrowing firms (the borrowers’ balance sheet channel).

Given the stated predominance of bank lending in the financing of non-financial sectors, this paper focuses on the bank lending channel of monetary policy transmission, aiming at providing a comprehensive review of the existing literature and empirical research on the existence of a bank lending channel across the euro area and the US along with its relative implications on real economic activity. As

analyzed thoroughly in subsection 3.1 the functioning of the bank lending channel differs considerably between EU and the US, owing to the observed asymmetries in their respective banking structures.

A central proposition in the research on the role that banks play in the transmission mechanism is that monetary policy poses a direct impact on deposits and deposits in turn, as long as they constitute the supply of loanable funds, act as the driving force of bank lending. These ideas are reflected more clearly in the conceptualizations of the traditional bank lending channel, as first formulated by Bernanke and Blinder (1988). The underlying mechanism suggests that a policy tightening induces a fall in deposits which in turn forces banks to substitute towards more expensive forms of market funding, thus contracting loan supply.

Yet, as explained thoroughly in section 4, the main premise of the bank lending channel, that deposits act as the primary force of bank loans, fails to capture the dynamics of the bank lending transmission mechanism in view of recent developments in the financial sector over the last decade. The current trend of lower regulatory reserve requirements, financial deregulation, the development of capital markets, the intensive use of market-based funding, the emergence of securitization, the advent of non-bank financial intermediaries all weaken the potency of the bank lending channel, as traditionally conceived, and point out the necessity for a more plausible alternative approach that may encapsulate the new aspects of financial innovation and better reflect the contemporary operational framework of the banking industry.

The reformulated bank lending channel, as introduced by Bernanke (2007), premises on the idea that the lending channel works primarily through the impact of monetary policy on banks' "external finance premium" as determined by their perceived balance sheet strength (in terms of leverage and asset quality) and risk, which are likely to affect banks' cost of funds even if their relative sources of funds stay unaffected. Variations in the external financing costs of banks are then reflected to the cost of funds to bank-dependent borrowers. All these new aspects of the reformulated bank lending channel are elaborated in section 4. This alternative approach offers a new insight into the transmission process of shocks originating within the financial sector to the real economy and highlights the special role of banks in the amplification

or absorption of shock shocks. It is of particular interest to see whether financial innovation and the new bank business models have altered the dynamics of the bank lending channel. This issue is addressed in subsection 4.3 for the case of EU, with a closer look in the reported evidence in view of the recent financial crisis.

Within this reformulated context attention is also drawn on characteristics that make banks' marginal cost of funds more or less responsive to changes in relative assets' yields, funding conditions and / or perceived riskiness of asset portfolio, following changes in short-term interest rates rather than characteristics that influence banks' ability to replace lost deposits. Along with the traditional indicators of bank size, liquidity and capitalization, bank risk turns out to be an important determinant of banks' ability and willingness to supply new loans: recent financial innovation is assumed to have increased banks' incentives towards more risk-taking when extending new loans, leading to the establishment of a new transmission mechanism of monetary policy. The so called "risk-taking channel" captures the effects of monetary policy on the risks banks are willing to accept when granting credit and its dimensions are analyzed in subsection 4.2.3.

Ultimately, the prevailing tensions in money markets during the recent financial crisis have undeniably distorted banks' ability to raise funds, which in turn forced banks to tighten their credit standards and the volume of loans extended to the non-bank sector. This may have implications for the functioning of the bank lending channel, thus a particular reference for the crisis period is made in subsections 4.2.4 and 4.3.

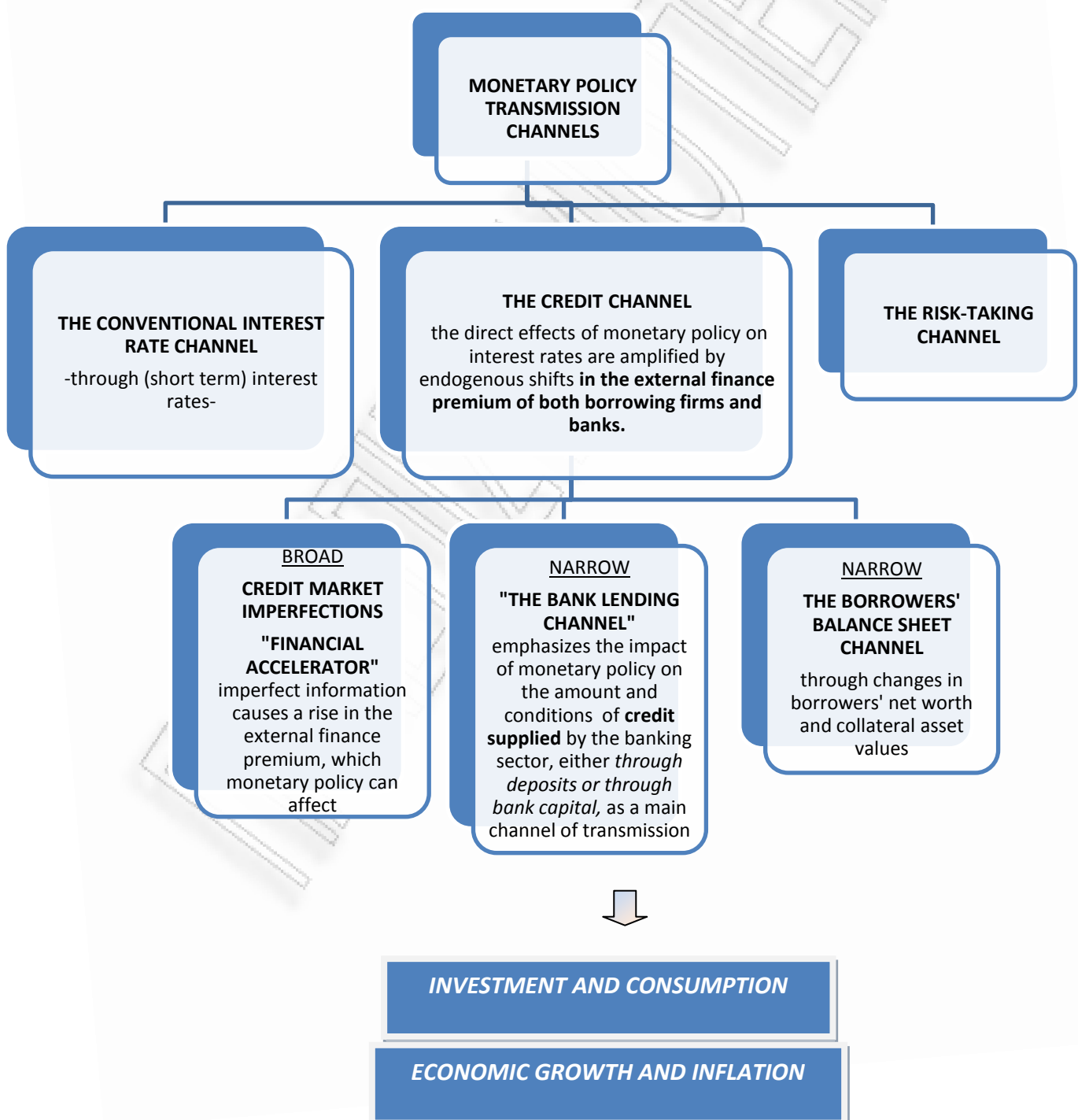
The rest of the paper is organized as follows: **Section 1** identifies the channels through which monetary policy is transmitted, with particular reference to the bank lending channel, its underlying mechanics and the prerequisites for its existence. **Section 2** proceeds with a comprehensive review of the theoretical and empirical literature with regard to the existence of a bank lending channel in the US and its relative macroeconomic significance. **Section 3** follows the same pattern for the euro area, with emphasis on the specific structural features of EU banking systems that are likely to differentiate the response of bank lending to monetary policy actions and alter the dynamics of the bank lending transmission mechanism, in contrast to the US. **Section 4** offers an insight into the reformulated bank lending channel in view of the recent financial innovation and new operational framework of the banking industry

over the last decade, with a tactful look on the new dimensions that have altered the functioning of the traditional bank lending channel and their response over the supply of bank loans. The impact of the current financial crisis is also considered. Ultimately, **section 5** provides an overview, along with some concluding remarks.

## SECTION 1

### 1.1 IDENTIFYING THE CHANNELS OF MONETARY POLICY TRANSMISSION

Chart 1: Monetary Policy Transmission Channels





According to the *traditional money view of monetary policy transmission*, policymakers exploit their leverage over short-term interest rates to influence the cost of capital and, thereby, spending on durable goods (i.e. fixed investment, housing, inventories and consumer durables). In turn, changes in aggregate demand affect the level of production (Bernanke & Gertler, 1995). The above described interest rate channel nests on a two-asset world (money and bonds), where banks are of limited importance; they simply attract demand deposits (money creation process) and invest their so obtained funds in bonds. In this conventional IS-LM context, monetary policy is solely transmitted through changes on the liability side of banks' balance sheets. For example, a monetary policy contraction that drains banks' reserves also restricts their ability to issue demand deposits. The balance sheet identity requires an equal shrink on the asset side, suggesting that banks should reduce their net holdings of bonds. Households on the other side should hold more bonds and less money. Given that prices are relatively sticky in the short run, households should have less money in real terms, which would cause an increase in real interest rates, so that equilibrium prevails. In turn, this policy induced rise in short term interest rates could entail significant effects in real economic activity (spending and investment).

Yet one could identify some inherent ambiguities in the traditional interest rate channel. Firstly, Bernanke and Blinder have pointed out that the neoclassical cost of capital variable  $[(r + d) p_k]$  has rather insignificant effects on aggregate firm expenditure. The latter is found to be mostly determined by some non-neoclassical factors, such as lagged output, sales or cash flow, which are left out of the standard money view models. Moreover, monetary policy is assumed to exert its impact on short-term interest rates, rather real long-term rates. For instance, the US federal funds rate, which is the most closely controlled interest rate, is an overnight rate. Thus, it is rather unclear how monetary policy affects the purchase of durable assets, such as housing or production equipment, which shall be sensitive to real long-term rates.

These gaps in standard theory have drawn the attention of economists on the aspects of imperfect information and other frictions in credit markets that may have altered the operation of the traditional transmission mechanism. This new approach has been summarized under the term **“credit channel” of monetary transmission** and briefly

states that the direct effects of monetary policy on interest rates are amplified by endogenous shifts in the external finance premium of both borrowing firms and banks. The external finance premium reflects the cost differential between funds raised externally (i.e. by issuing equity or debt instruments) and funds generated internally (in the form of retained earnings) and is determined by imperfections in the credit markets that create a mismatch between the expected return received by lenders and the financing costs faced by borrowers (Bernanke and Gertler, 1995). Under this spectrum, the credit channel is assumed to amplify the effects of the traditional interest-rate channel and enhance the potency of monetary policy. It is further analyzed into two separate channels: *the borrowers' balance sheet channel*, which operates mainly through changes in borrowers' net worth and perceived creditworthiness and *the bank lending channel*, which emphasizes the impact of monetary policy on the amount and/ or terms of credit supplied by the banking sector as a main channel of transmission.

*The borrowers' balance sheet channel* (or the so-called "financial accelerator" mechanism) stems from the informational asymmetry among lenders and borrowers and operates mainly through changes in the borrowers' net worth, following a shock to aggregate demand and/or real economic variables. The informational asymmetry refers to the inability of lenders to sufficiently assess their borrowers' creditworthiness, monitor their investments and enforce their full repayment of debt. This informational asymmetry justifies the existence of the external finance premium that is closely tied to the borrowers' creditworthiness, which in turn depends crucially on their net worth. Any shock that affects negatively the borrowers' net worth is expected to raise their cost of funding and thereby decrease their spending and investment, resulting in a depression of economic activity.

In addition, a decrease in the borrowers' net worth implies a decrease in the value of their assets used as collateral, thus tightening the collateral constraint, which also lowers their production and spending.

Thus the above described external finance premium mechanism seems to propagate shocks, originating from any initial change in aggregate demand, to the real economy

and amplify business cycle fluctuations, determining the function of the borrowers' balance sheet channel.

In turn, *the bank lending channel* focuses on banks rather than firms and highlights the response of loan supply by depository institutions on monetary policy changes, as the key factor underlying the transmission mechanism. The bank lending channel also builds on aspects of imperfect information and points out the special role of banks in the credit creation process. Contrary to the traditional money view, the bank lending channel premises on a three asset framework, constituting of money, publicly issued bonds and intermediated loans, where the banking sector holds a special role. Besides creating money (attracting deposits and investing in bonds), banks also engage in the supply of credit (by transferring depository savings of relatively uninformed depositors to firms and households through the extension of information-intensive loans). In this context, monetary policy operates not only through its impact on short-term interest rates, but also through its independent impact on the supply of bank loans (Kashyap and Stein, 1997). In short, in response to a monetary policy contraction, bank deposits fall and the loan supply curve shifts upwards, with the latter enhancing the interest rate-induced effect on aggregate demand. This additional effect on loan supply though should be clearly distinguished from loan demand contraction and the inward shift of the loan demand curve with respect to the fall in output that higher interest rates entail.

## **1.2 THE MECHANICS UNDERLYING THE BANK LENDING CHANNEL**

As already stated, the bank lending channel is based on imperfect information prevailing in credit markets among lenders and borrowers that provokes adverse selection and moral hazard effects.

According to Kashyap and Stein (1997), particular borrowers, whose creditworthiness is more difficult to measure (such as small and fledging firms), entail higher information gathering and monitoring costs for lenders. Banks, due to their economies of scale, scope and specialization, have competitive advantages over other financial intermediaries in the extension of loans to this group of borrowers. This fact implies that these borrowers face an extra cost for raising funds from sources other than banks, so are more dependent on the latter for financing. Since banks perform a

special role in the credit creation process for this special class of borrowers, factors that reduce the amount of credit supplied through the banking system may have significant macroeconomic effects, as long as bank dependent borrowers (who are deprived of bank loans) are now forced to cut back on their capital investment, business expansion or employment.

In turn, with respect to banks' funding costs, banks with more risky assets (loans extended to small firms, not well known to the public) in the perspective of potential depositors, face a higher external finance premium and may be prone to cut back on lending than attract new funds at higher interest rates; this constitutes the so called adverse selection problem. Banks may well overcome this problem through deposit insurance, yet this comes with the cost of holding idle reserves against the insured deposits. The amount of reserves (the relative reserve requirement) is determined by the Central Bank. This link between deposit insurance and reserve requirements strengthens the potency of monetary policy over the banking system. Banks are now able to raise depository funds despite the perceived lower quality of their own assets.

Under this spectrum, a contraction in the supply of reserves raises the cost of financing for banks, since banks will now have to pay the extra finance premium to attract non-insured deposits. Thus, banks are inclined to extend fewer loans in response to the shortfall of reserves. Borrowers, who are now deprived of bank credit and cannot easily obtain new funds, are thereby forced to reduce their spending and investment.

It is worth-mentioning though that both banks and borrowing firms are able to some extent to hedge against those risks. Banks usually hold some liquid assets<sup>1</sup> (i.e. marketable securities) in their asset portfolios as a buffer against a policy induced reserve or deposit outflow, while borrowing firms also incorporate some liquid assets in their portfolios to protect against any unexpected curtail in bank lending.

1) Banks commonly hold securities for liquidity purposes, to be used as collateral or to meet any regulatory requirements, whereas loans are held primarily for their expected return.

### 1.3 NECESSARY CONDITIONS FOR THE EXISTENCE OF A BANK LENDING CHANNEL

The necessary conditions that must be satisfied for a bank lending channel to operate are listed as follows:

- (a) **The supply of bank loans must shrink after a monetary policy induced reduction in reserves. In other words, banks shall not be able to fully insulate their supply of loans against changes in monetary policy by simply rearranging their portfolio of other assets and liabilities.**

Looking at the simplified balance sheet of a commercial bank, one could identify the alternative responses of banks to a monetary policy shock that drains the bank's reserves:

**Chart 2: The simplified balance sheet of a typical commercial bank**

*COMMERCIAL BANK*

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<i>Reserves</i>	<i>Time Deposits</i>
<i>Loans</i>	<i>Demand Deposits</i>
<i>Securities</i>	

(Unlike demand deposits, a fraction  $\tau$  of which must be held in reserves, time deposits are not subject to any reserve requirements).

If the Central Bank decides to sell securities to the banking system, the so defined monetary policy contraction, is expected to raise banks' holdings of securities and lower bank reserves by the same amount. Under the assumption of no excess reserves, demand deposits should fall by  $1/\tau$  dollars, thus in order to satisfy the balance sheet identity:

- On the liabilities side, time deposits should rise proportionally by  $1/\tau$  dollars

or alternatively

- On the asset side, loans and securities should decline by  $1/\tau$  dollars.

For a bank lending channel to operate, loans should bear the brunt of this balance sheet adjustment.

As also put by Bernanke and Blinder (1988), the intermediary sector as a whole must not be able to completely offset the policy induced drop in deposits, by resorting to alternative “reserve-insensitive” forms of finance (either CDs, commercial paper or new equity issues) or by selling bonds and other securities kept in their asset portfolios, at least without incurring any additional costs. Due to the rising finance premium that banks have to pay to bring in external funds, other than secured deposits, they will be forced to reduce their extension of loans, following the policy induced drop in reserves.

The above mentioned balance sheet rearrangement, although plausible, can be sometimes overridden. As stated by Romer & Romer (1990), following a monetary contraction, banks could well offset their loss of demand deposits by attracting more time deposits, mainly through the issuance of CDs, on which there is no binding reserve requirement. This balance sheet adjustment has therefore no effect on the supply of bank loans.

Alternatively, banks may partly offset the policy induced reserve outflow to protect their supply of loans, by drawing down on their buffer stock of securities, that is selling off some of the government and private securities held in their portfolios, usually for liquidity purposes. Yet this is not expected to fully relieve the effects of a monetary policy contraction, given that such buffer stocks are quite costly for banks (they are far less interest bearing than loans).

**(b) Bernanke and Blinder (1988) have also pointed out that for a bank lending channel to operate, firms shall not regard bank loans and open market bonds to be perfect substitutes, meaning that bank dependent borrowing firms are unable to switch to other forms of external finance (i.e. public bond markets) without incurring any additional cost, so as to offset a possible decline in the supply of bank loans.**

In this case, some spending that was previously financed with bank loans will now be suspended in the absence of bank credit, otherwise the effects of the bank lending channel on real economic variables would be negligible. In fact, this is the case for a

great number of small firms, who rely almost exclusively on bank lending to finance their investment activity. Due to informational asymmetries, small firms entail higher information gathering and monitoring costs for lenders and thereby face higher financing constraints from sources other than banks (i.e. commercial paper and equity markets). On the contrary banks, due to economies of scale, scope and specialization, have a comparative advantage in the extension of loans to this specific group of borrowers. The above combined facts increase the overall level of bank dependency in the economy and are assumed to amplify the potency of the bank lending channel.

If either of the above mentioned conditions (a) or (b) is violated, bank loans and bonds become perfect substitutes, which is the main proposition of the conventional money view. If condition (a) fails to hold, firms – under the Modigliani Miller theorem of capital structure irrelevance – will completely arbitrage away any cost differentials between bank loans and bonds. If condition (b) fails to hold, intermediary institutions will do the arbitrage. Thus, in both cases bank loans and bonds will be priced identically in equilibrium.

- (c) **There must be some form of imperfect price adjustment that prevents any monetary policy shock from being neutral.** In a frictionless system, a change in nominal reserves would trigger a proportionately equal change in prices, so that both bank and firm balance sheets would stay unaffected in real terms. This full price flexibility would make monetary policy tools completely ineffective.

## SECTION 2

### **THE TRADITIONAL BANK LENDING CHANNEL: THE CASE OF US**

The traditional bank lending channel is premised on the idea that bank deposits act as the main driving force of bank loans. Monetary policy changes place a direct impact on deposits, which as long as they constitute the main source of loanable funds, then affect the supply of bank loans. The underlying mechanism behind the bank lending channel is that banks' cost of funding increases in response to a monetary policy contraction that drains banks' deposits, since banks are forced to substitute towards more expensive forms of market funding, thereby contracting loan supply.

The theoretical establishment of the bank lending channel is attributed to **Bernanke-Blinder (1988)**, who extended the conventional IS-LM model to include/encompass the bank loan market. In their context, banks' balance sheets comprise of reserves, loans and short-term bonds on the asset side and bank deposits on the liability side. Their model is constructed under the key assumption that bonds and loans are imperfect substitutes both for borrowers and banks that choose between these credit means according to their relative interest rates. This suggests that the total amount of bank credit is determined by the spread prevailing between bank loan rates and bond rates. Within this reformulated IS-LM framework, Bernanke and Blinder argue that a monetary policy tightening results not only in the standard leftward shift in the LM curve, but also causes the IS curve to move backwards, since the policy induced rise in bank loan rates reduces the supply of available credit in the market. The transmission of monetary policy is thus amplified through the impact of bank lending. Bernanke and Blinder clearly identify a separate channel of monetary transmission, whose functioning enhances the standard interest-rate effect of monetary policy on aggregate demand.

This extension could have significant implications for policy makers; Bernanke and Blinder point out that the IS curve can be affected either by credit demand or by credit supply shocks, suggesting that bank credit targeting could serve as a complementary or even alternative instrument to monetary targeting in such cases when money demand is relatively unstable in regard to credit demand.

The empirical verification on the existence or not of a bank lending channel, functioning separately or in coordination with the traditional transmission mechanism through interest rates, has been rather challenging. Several empirical studies over the last two decades have indirectly tested for the existence of a special bank lending channel, using different approaches and methodologies, i.e. examining the timing relationships between quantity variables (output-mainly GDP-, volumes of bank deposits and loans, money and other bank or firm balance sheet items) with the use of aggregate data, or between price variables (interest rates or interest rate differentials), conducting panel data analysis to encapsulate the cross-sectional characteristics of banks and borrowing firms (such as bank size, firm size, bank capitalization, bank liquidity) that may account for their different response in a monetary policy shift.



At this point it is well suited to mention that the identification of a bank lending channel is analyzed into two interdependent tasks:

- Whether monetary policy changes affect the supply of bank loans **and**
- Whether these policy-induced changes in bank loan supply further affect real output.

Researchers on the bank lending channel have addressed these issues either separately (with much of the literature focusing on the effects of monetary policy on bank lending behavior), or jointly (their objective being not only to verify the existence of a bank lending channel but also to examine its relative macroeconomic significance). What follows is a critical review of the main empirical research on the existence of a bank lending channel in the US, as well as in the euro area.

## **2.1 THE MACRO DATA APPROACH**

This empirical methodology is based on the analysis of aggregate data utilizing the capabilities of VAR models and impulse response analysis. Following the time series approach, **Bernanke & Blinder (1992)** have addressed the issue by examining the timing relationships between monetary policy shifts and bank lending, using a VAR model on US data over a twenty-year period up to 1978. They concluded that output, aggregate bank lending and bank securities holdings decrease after a tightening of monetary policy, which is indicative of the existence of a bank lending channel. In particular, the applied impulse response functions of bank loans, securities and deposits to a positive innovation in the Federal Funds Rate, which was used as the indicator of monetary policy tightening, suggest that in the short-run a monetary policy contraction leads to an immediate decline in bank deposits and securities holdings and a rather lagged decline in the volume of bank loans. In the long run though (after a period of six to nine months), securities holdings start to recover, while bank loans fall further, concurring with a simultaneous increase in the rate of unemployment. (The lagged response of bank loans is attributable to previous loan commitments. Bank loans decline soon after the old commitments expire, since banks are now reluctant to extend new loans).

While these findings seem to be consistent with the credit channel theory, one could reach the exact same results within the conventional money channel context. A

possible rise in the federal funds rate could lead firms to reduce their investment spending and thereby decrease their demand for bank loans. This brings up *the bank loan supply-versus-demand identification problem*, which is one of the main inherent black spots in the research on the bank lending channel. As **Smant (2002)** has stated in his paper, it is rather difficult to distinguish whether the decline in loan volume and output, following a monetary policy tightening, reflects a contraction of loan supply, which could confirm the existence of a bank lending transmission channel, or a decrease in loan demand on the firms' side.

This issue was addressed in the paper of **Kashyap, Stein and Wilcox (1993)**, who examined the differential movements in bank loans and commercial paper volumes (that constitute an alternative nonbank credit instrument), following a monetary policy shock, using aggregate data by the US flow of funds accounts. They argued that if the underlying shock is a shift in the demand for credit, this should affect all types of external finance, namely bank loans and commercial paper, whereas a monetary shock operating through a bank lending channel should solely affect the supply of bank credit. Their finding that the ratio of commercial paper to aggregate bank loans increases, following a restrictive monetary policy, is supportive of the existence of the bank lending channel. Particularly, the rise in commercial paper volumes is explained in terms of the ability of some firms to substitute towards commercial paper issuance to counteract their loss of bank loans, leading to an overall decrease in the share of bank loans in total external finance.

Alternatively, **Oliner and Rudebusch (1995)**, trying to capture the observed divergences in commercial paper issuance among firms of different size, added "firm size" in the analysis, examining separately large and small US manufacturing firms and concluded that there is not any special bank lending effect. They argued that a monetary tightening might not only reduce the demand for all types of external finance but also redirect all types of credit from small firms to large firms, which rely more heavily on commercial paper financing. In this case, commercial paper issuance might rise relative to bank loans even if the supply of bank loans remained unchanged. Thus, heterogeneity in loan demand rather than shifts in loan supply would explain a change in the mix between bank and non-bank financing. Oliner and Rudebusch found that changes in bank and non-bank lending volumes were essentially the same, suggesting that a monetary shock does not cause a shift from

bank loans to other sources of finance either in small or in large firms. The results are not consistent with the existence of a bank lending channel.

## **2.2 THE FIRM SIZE EFFECT**

*With regard to firm size*, it is profound that the smaller the firm, the more difficult it becomes to gather the necessary information and assess its financial position, leading to a rise in the overall lending cost. Banks, due to economies of scale and specialization, face lower information gathering and monitoring costs, which can well explain the reason why bank loans are the main form of external finance for smaller firms. On the other hand, larger firms have plenty of alternative financing options, i.e. access to private bond and stock markets, international credit markets, commercial paper issuance, sale of liquid assets. Under this perspective, the greater the dependence of small firms on bank lending and the more smaller firms in the economy, the more effective is the function of a bank lending transmission channel (**Morris & Sellon, 1995**).

As also put by **Peek and Rosengren (1995)**, imperfect information exaggerates the special role of bank loans. Information asymmetries make open market credit instruments imperfect substitutes for bank loans as a source of credit for many firms, especially smaller ones, and uphold the importance of long-term bank lending relationships. Large, well-established firms that have access to national credit markets are required by the Securities and Exchange Commission to provide much publicly available information about their financial status and activities, and they often operate under the close monitoring of market analysts. On the other hand, smaller firms come with less publicly available information. Banks acquire much of this private information about smaller firms through financial relationships and, in particular, through repeated banking and lending transactions. In fact, most small and medium-sized firms are found to establish financial services relationships with local commercial banks and these banks often serve as their primary sources of credit (**Eliehausen and Wolken 1990**). For small firms, the establishment of relatively stable lending relationships with certain banks not only increases the availability of credit (Petersen and Rajan 1994) but also relaxes collateral requirements (Berger and Udell 1993), thus increasing the significance of bank lending for smaller firms.

Under this spectrum, when a small firm is cut off from bank lending, the firm may have difficulty replacing that source of credit, since it is often time-consuming for a small firm to establish a new lending relationship. In turn, banks may also be reluctant to take on new not well-known borrowers, especially in times of widespread business failures and impaired collateral values arising from declining asset prices. This problem may be further deteriorated by the enforcement of regulatory actions on banks to shrink lending. The specialness of bank loans for smaller firms coupled with the expertise of banks to extend loans to this particular class of borrowers underlines the firm size effect and its implications for the bank lending channel.

Within this context, **Peek and Rosengren (1995b)** also tackle the issue under the dimensions of bank size and firm size. Their research, based on quarterly call report data for all FDIC-insured commercial and savings banks in New England during the period 1989-1993, is conducted separately in two empirical stages: firstly, they addressed the issue of credit availability with regard to small banks, distinguishing between bank dependent loan categories (i.e. loans extended to borrowing firms most likely to be financed almost exclusively through bank loans) and non bank dependent loan categories. They concluded that the imposition of formal regulatory actions (that enforce troubled banks to restore their capital ratio and raise their loan loss reserves), which were particularly widespread across small banks in New England, are likely to alter bank lending behavior. Indeed, they found that significantly greater shrinkage in loan portfolios occurred at banks subject to such formal regulatory actions, other things held equal, with the decline being greater the lower the bank's capital ratio (which implies a proportionately greater shrinkage).

Their second empirical test examines whether the decrease in "bank dependent loans" was associated with banks that extended significant amounts of small loans to firms. They concluded that for banks under a formal regulatory action, the higher the percentage of small loans extended to small firms in the bank's portfolio, the greater the decrease in loans and the more responsive is the bank to its leverage ratio, with loan growth declining at lower leverage ratios.

Finally, their study provides indirect evidence on the impact of reduced credit availability on firms least able to find substitutes for bank lending that are consistent with the above mentioned studies of Bernanke and Blinder (1992) and Kashyap et al. (1993), arguing that the bank lending channel is primarily functioning through small bank dependent firms. The latter result is further confirmed by supportive evidence from the Federal Reserve Bank of Boston, showing that the bank-induced cutback in credit has adversely affected bank-dependent businesses. The unprecedented business bankruptcy rate that was recorded in New England during this period of reduced credit availability strongly reinforces the argued importance of bank credit in the economy.

The empirical findings of **Gertler and Gilchrist (1994)** are also in line with the above statements; their analysis of loans extended towards U.S. manufacturing firms concluded that small firms suffer greater losses in the event of a monetary policy tightening, thus contributing more to a subsequent slowdown in manufacturing activity. As long as small firms are financially weaker, exhibit higher lending costs and shorter expected lives, banks are more likely to suspend their extension of loans primarily towards those firms. Indeed, in line with their assumptions, they found that both total credit and bank loans extended towards small firms contracted sharply, following a monetary policy tightening, whereas bank loans and commercial paper issuance of large firms increased.

**Oliner and Rudebusch (1992)** complement that smaller firms' capital investment spending is more sharply reduced after a monetary policy tightening, while **Kashyap, Lamont and Stein (1992)** also indicate that bank dependent firms, (i.e. with low bond ratings or greater liquidity constraints) were found to cut off inventories more sharply during the 1981-82 monetary squeeze.

At this point it is worth mentioning that the time series approach with the use of aggregate data entails some misspecifications. Firstly, the balance sheet identity requires that changes in bank assets (loans and securities) equal changes in bank liabilities (deposits and borrowing), thus money aggregates and bank credit are not independent variables. Furthermore, the above string of research has examined relatively short-term responses of loan supply to monetary policy shifts, which can be

quite uninformative given the fact that banks can at least briefly insulate their portfolio of loans soon after a monetary tightening, due to previous loan commitments or other contractual obligations.

## 2.3 THE MICRO DATA APPROACH

Researchers on the bank lending channel have attempted to overcome the above problems with the use of individual bank accounting data, which take into account the cross-sectional bank characteristics that allow for a different response of bank lending to monetary policy shifts among various banks. The basic features of this methodology are:

- The use of micro data obtained from bank balance sheets
- The use of theoretical models of individual bank behavior from which loan supply functions are derived and
- The use of panel data analysis for the estimation of the loan supply function

### 2.3.1.1 BANKS FACING CAPITAL AND CREDIT CONSTRAINTS

The use of bank level data in reduced-form equations that link bank loans to monetary policy variables may well capture the asymmetries observed in loan supply schedules of banks (Brissimis and Delis, 2007). This heterogeneous behavior of banks originates from their different balance sheet characteristics; *the capital structure of banks, their liquidity levels and their size* are the most commonly used. Empirical research on these propositions focuses in testing whether the interaction of monetary policy variables with bank size, liquidity and capitalization is an important determinant of loan growth (of course it is implicitly assumed that these variables affect only the supply, not the demand, of bank loans).

In particular, the main assumption for **the use of bank size** is that larger banks are expected to face more relaxed conditions in raising uninsured finance (non depository liabilities such as CDs, or better access to the bond market), which would make their lending less sensitive to monetary policy shocks. The same applies for **bank capitalization**. Poorly capitalized banks are assumed to reduce their loan supply by more than better capitalized banks, since they usually meet greater financing constraints in the markets of uninsured funds. Moreover, a monetary policy tightening

reduces banks' incentives to raise their equity capital base. If capital regulations are in effect, this may force banks to lower their supply of loans, thus magnifying the contractionary effect of monetary policy (Brissimis and Delis, 2010). As for **bank liquidity** Kashyap and Stein (2000), among others, suggest that the impact of monetary policy on lending behavior is stronger for banks with less liquid balance sheets (i.e. a lower buffer stock of marketable securities on the asset side), which would make their lending more vulnerable in an unexpected policy induced loss of deposits. Brissimis and Delis 2010 point out an alternative route through which liquidity interferes with the functioning of the bank lending channel: an expansionary open market operation aims at increasing financial liquidity, which then relieves the real liquidity pressures of banks, allowing them to provide longer-term funds, thereby improving aggregate economic activity. **What is drawn as a general conclusion is that the bank lending channel operates mainly through small, undercapitalized banks with less liquid asset compositions.**

**Kashyap and Stein (1995, 1997, 2000)** have had a major contribution on this type of research, so their papers deserve a closer look. In general, arguing that the bank lending channel should be observed more strongly in the behavior of small banks, their findings suggest that, following a monetary policy contraction, deposits of different sized banks responded in a similar manner, whereas small banks' lending and securities volumes reacted more strongly. They further argue that this differential response indicates that banks per se are subject to credit constraints arising from capital market imperfections. Their findings stand in favor of the existence of the bank lending channel.

In his first research paper Stein (**Stein, 1995**) offers an adverse selection based model of bank asset and liability management, which premises on the idea that informational asymmetries distort the ability of banks to raise external funds from sources other than insured deposits.

A reduction in bank reserves, operated by the Central Bank, is assumed to tighten the financing constraint on banks, which are then forced to curtail their loan supply.

**Chart 3: Simplified bank balance sheet**

<i>Reserves <math>R</math></i>	<i>insured deposits <math>M</math></i>
<i>New loans <math>L</math></i>	<i>uninsured non-deposit</i>
<i>Old assets <math>K</math></i>	<i>external finance <math>E</math></i>

In contrast to the conventional lending view that the Central Bank cannot influence bond market interest rates due to households' assumed indifference between bank loans and bonds, Stein's model offers an innovation, arguing that banks, unlike households, are not indifferent with regard to the composition of their balance sheets. Unlike non-deposit external finance, the cost of issuing deposits does not depend on investors' perceptions with respect to the banks' financial health or risk profile. So banks, on the liability side, view deposits as the only available instrument to raise external finance without incurring any additional cost due to adverse selection problems (banks with more risky assets- i.e. riskier loan portfolio face higher financing costs). Banks' preference for insured deposits over alternative uninsured forms of security-market finance raises their demand for holding non interest-bearing reserves, as long as these reserves serve as a guarantee for issuing deposits. This enhances the potency of monetary policy that can now affect bond-market interest rates by using banks' demand for reserves.

**Kashyap and Stein (1997)** proceed with the extension of the above theoretical analysis to adapt to the emergence of alternative non-reservable deposit instruments from the perspective of households that may limit the impact of monetary policy on interest rates. Their paper sets the function of the bank lending channel under two dimensions:

- Whether a shift in monetary policy poses an impact on bank lending.
- Whether this effect of monetary policy is transmitted into real economic activity (spending and investment expenditure).

They note that the conventional money view rests upon two basic assumptions, namely that (i) household portfolios consist of money and bonds and (ii) that



monetary policy shall be able to affect money supply either directly by changing the supply of currency into circulation or by exploiting the reserve requirements (in the case of transaction accounts). Then they go on counteracting those assumptions on the grounds that there are alternative deposit options besides transaction accounts from the household perspective, which are not subject to reserve requirements and thereby uncontrollable by the Central Bank (i.e. mutual funds with check writing options). The emergence of those non - reservable deposit instruments may limit the Central Bank's leverage over interest rates. In this context, they further analyze *the bank centric view* in a three asset framework (consisting of money, bonds and bank loans) and emphasize the response of banks' loan supply to monetary policy changes in the transmission process. Kashyap and Stein identify two basic factors that determine the significance of the bank lending channel, the degree of bank dependence in the economy and the extent to which monetary policy actions affect bank loan supply. The bank lending channel will be effective, if:

- *Bank loans are special, at least for some borrowers, who cannot easily switch to alternative sources of finance.* There shall be at least some bank dependent borrowers that are forced to cut back on their spending or investment expenditure, in the event of an unexpected shortfall in bank lending.
- *Bank loan supply is sensitive to monetary policy.* Banks shall not be able to fully insulate their lending activities, following a policy-induced loss of reserves, by substituting their lost deposits with other sources of external finance (wholesale CD issuance, equity issuance etc.) or by liquidating some of the marketable-securities held in their asset portfolios.

In their model, bank dependence is measured by the proportion of small firms (in terms of employment) in the economy and by the availability of nonbank finance, which is tied to the effective functioning of capital markets (securities, bond and equity markets) in each country. The larger the fraction of large firms in the economy and the more the nonbank financing options, the least the effectiveness of the bank lending channel in the transmission of monetary policy.

Kashyap and Stein used an extensive dataset on 12 EMU countries, measuring the importance of small banks in the economy, bank health (in terms of banks' credit ratings, ROA, profitability and loan portfolio quality), the importance of small firms

in the economy and the availability of nonbank finance for each country. They ended up listing those countries according to the expected potency of each country's lending channel and concluded that the bank lending channel is expected to be more effective in countries with a majority of small banks with less healthy balance sheet characteristics, a large proportion of smaller bank-dependent firms and less effective capital (bond and equity) markets.

**Kashyap and Stein (2000)** addressed the supply-demand identification problem, examining the lending behavior at the individual bank level. For this they used an extensive dataset of individual quarterly observations of U.S. commercial banks from 1976 to 1993 to capture the cross-sectional differences in the way that banks with varying characteristics respond to shifts in the monetary policy stance. They argued that banks can insulate their supply of lending by rebalancing their holdings of liquid assets. As expected, their findings support the existence of a bank lending channel, operating mainly through smaller banks (in terms of asset size) with less liquid asset compositions (i.e. banks with lower ratios of securities to assets). Total and business loans provided by smaller banks were found to shrink, while loans extended by large banks were almost unaffected; thus supporting the function of a special bank lending channel.

Their argument rests on the fact that banks cannot frictionlessly smooth a policy induced decline in insured deposits by simply raising uninsured (non - reservable) funds. Under the assumption that banks have restricted access in alternative sources of external finance, a policy induced loss in deposits also implies a shrink on the asset side. Yet the response of each bank relies on the liquidity of its balance sheets; the more liquid bank can relatively easily protect its loan portfolio, by drawing down on its large buffer stock of securities, whereas the less liquid bank is forced to suspend its extension of loans significantly, so as to retain its securities holdings from falling at even lower levels.

In this context, Kashyap and Stein test for two hypotheses:

$$(i) \quad \frac{\partial^2 L_{it}}{\partial B_{it} \partial M_t} < 0,$$

where

$L_{it}$  measures bank lending activity (either total loans or commercial and industrial loans),

$B_{it}$  measures balance sheet strength in terms of liquidity (ratio of securities and federal funds sold to total assets), and

$M_t$  is a monetary-policy indicator (with higher values of  $M_t$  corresponding to easier policy).

This hypothesis exploits both cross-sectional and time-series aspects of the data, and can be explained in two forms:

- The cross-sectional derivative  $\partial^2 L_{it} / \partial B_{it}$  captures the degree of liquidity constraint on lending, which is assumed to be intensified during tight money periods.
- The time-series derivative  $\partial^2 L_{it} / \partial M_t$  captures the sensitivity of lending volume to monetary policy for a bank, which is assumed to be higher for banks with weaker balance sheets.

This first hypothesis is tested among the subsample of smaller banks on the grounds that these banks are less able to obtain uninsured finance.

- (ii)  $\partial^3 L_{it} / \partial B_{it} \partial M_t \partial \text{SIZE}_{it} > 0$ , which implies that the above effect should be strongest among smaller banks, since large banks are assumed to have better access to uninsured sources of finance, thereby making their lending less sensitive to monetary-policy shocks, irrespective of their internal liquidity positions.

Indeed, in real banking practice small banks face financing barriers where credit risk is involved; thus on the asset side they are inclined to hold more securities as a buffer stock and make fewer loans, given their restricted ability in raising external finance. On the liability side, the smaller banks are financed almost exclusively with deposits and common equity. In contrast, larger banks finance themselves mainly in the interbank market, while using less deposits and equity; the smallest banks do virtually no interbank borrowing (unsecured financing instrument).

At this point it is worth mentioning that since it is mainly through small banks that monetary policy is transmitted and that small banks represent a moderate fraction of the total supply of bank loans, the significance of the bank lending channel in the transmission of monetary policy to the real economy is under question. Trying to quantify the relative implications of a bank lending contraction for the real economic variables given the size differentiation, **Hanock and Wilcox (1998)** found that a

dollar reduction in loans extended by small banks has a greater impact in economic activity than a dollar reduction in loans extended by large banks.

**Kishan and Opiela (2000)** included bank capitalization in the analysis. They segregated banks into different groups in terms of their asset size and capital leverage ratio and conducted the analysis separately. They found that loans of small and undercapitalized banks exhibit the greatest response to monetary policy changes, whereas large time deposits of these banks (which are indifferent to capital requirements) are unresponsive, indicating that smaller banks have less access to alternative sources of finance (are themselves capital constrained), which is one of the main conditions for the existence of a bank lending channel.

**Peek and Rosengren (1995b)** also reached the above conclusion. Examining the 1989-1993 credit crunch and consequent recession in the US state of New England, they found that following a contraction in the money growth rate, poorly capitalized banks were forced to reduce their lending by more than better capitalized ones, which is also attributable to their limited access to uninsured funds. Yet **Sharpe (1995)** provides a different explanation, suggesting that banks' balance sheets may also shrink when the perceived loss ratio for their loan portfolio rises or when they are forced to pay a higher risk premium to attract deposits or borrowing, which both lie within the normal equilibrium effects and are not induced by banks' level of capitalization.

**Brissimis and Delis (2010)** further examined the heterogeneous response of banks' lending, risk taking behavior and profitability with regard to their capitalization liquidity and market power, following a change in monetary policy, with the use of a different empirical methodology. In particular, they applied the smoothing technique of LGMM (Local Generalized Method of Moments) in a lending equation:

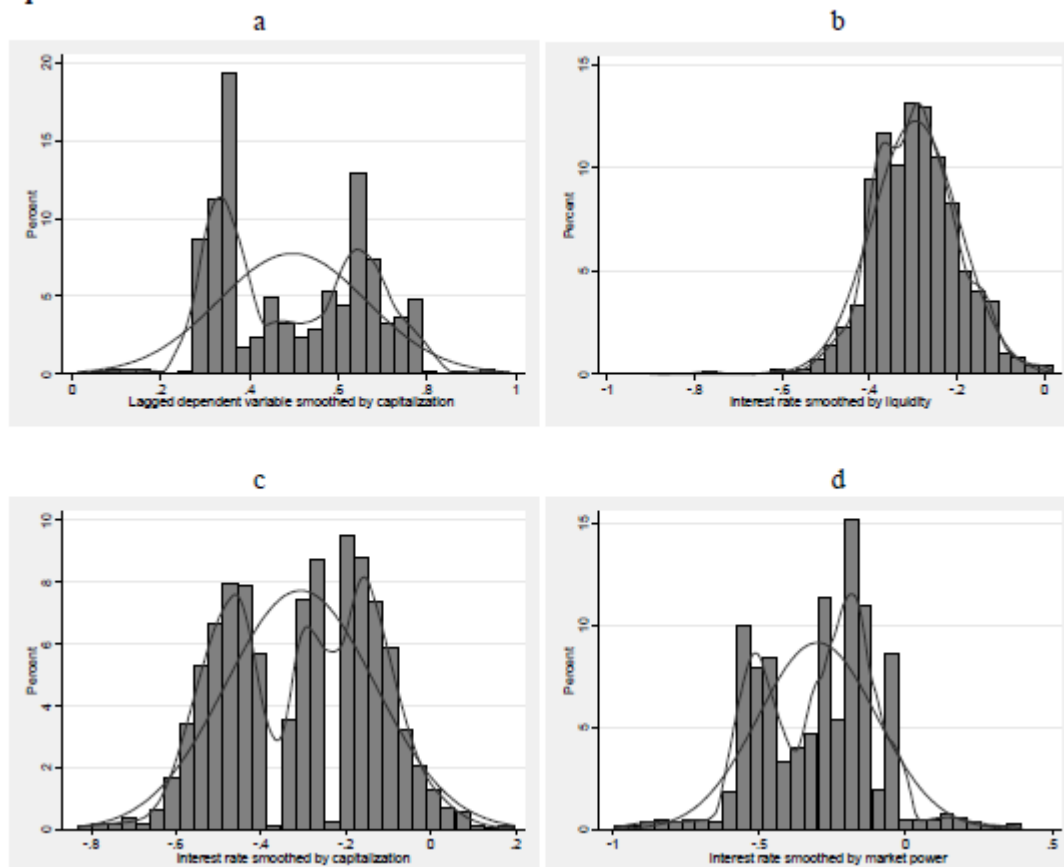
$$\Delta(l_{it}) = a_1(z_{it}) \Delta(l_{i,t-1}) + a_2(z_{it}) \Delta M_t + u_{it}$$

which serves to relax the strict assumption that banks share similar incentives, operating framework and balance sheet characteristics, which would dictate a common reaction to a monetary policy shift. They concluded that monetary policy changes cause a differentiating response of banks with different capital structures, with more capitalized banks (lying on the right end of the distribution) being less

sensitive to monetary policy shifts. Similar, yet more pronounced, results are also obtained with regard to the market power of banks. Banks with high market power tend to buffer the impact of a monetary policy shift, which suggests that market power along with improved competition among banks clearly determine the response of bank lending to monetary policy actions. As for liquidity, the findings suggest that monetary policy mostly exerts its impact through banks with higher levels of liquidity. Yet the large variance of the coefficients, shown in diagram 1b indicates that the impact of monetary policy is quite heterogeneous across banks (more important for banks around the left end of the distribution).

**Diagram 1:**

**Distribution of coefficients on the monetary policy variable obtained from the lending equation**



**Source: Brissimis and Delis (2010)**

## 2.4 BANKS' "FLIGHT TO QUALITY" AND LOAN COMMITMENTS

Some other group of researchers has focused on *the bank behavior towards different groups of borrowers*. In this context, **Nakamura and Lang (1992)** stressed out the banks' "flight to quality", meaning that banks are likely to cut off more marginal borrowers (that is smaller firms) at the event of a monetary policy tightening. In the same context **Morgan (1992)**, under the assumption that pre-committed bank credit lines are mainly held by larger financially stronger borrowers, found significant increases in the percentage of loans made under commitment during tight policy periods. As for the timing relationships, non-committed loans seem to contract soon after a monetary policy tightening, whereas loans under commitment do not react at all.

The loan commitment practice, combined with the non price credit rationing followed by banks (that is the variation in non-interest rate terms of loan contracts, such as collateral requirements, compensating balances, loan maturity etc.) have also drawn the attention of researchers. Under this spectrum, credit rationing can only affect firms with no effective loan commitments; the fraction of total loans made under commitment should therefore increase in periods of tight credit conditions. **Hirtle (1990)** in his paper seems to verify the above statement; he found that non-committed loans Granger cause output, the effect though is rather weak, whereas loans under commitment do not. Likewise, **Lown (1990)** found that the percentage of new loans extended under commitment has a significant negative relationship with real output. **Morgan (1992)** also confirmed that loans under commitment track movements in economic activity. Non-committed loans were found to respond relatively quickly and with similar intensity as monetary aggregates to a monetary policy change. **Kashyap and Stein (2000)** also found that a monetary policy tightening causes a contraction in the amount of uncommitted loans, while loans made under previous commitment stay unaffected.

On the other side, **Burger and Udell (1992)** found that the amount of new loans extended under previous commitment do not rise following a monetary policy tightening. Instead, all types of commercial loans, both committed and uncommitted, tend to increase, while the loan rates of both types of loans are quite sticky. The relatively sluggish adjustment of bank lending rates can be partly attributed to prior

commitments that tend to fix the loan rate. Moreover, **Morris and Sellon (1995)** point out that although loan commitments exhibit an increasing trend during periods of tight credit, in fact this upward trend is observed in any period. Eliminating trending behavior in their model, they found no significant evidence indicating that loans under commitment rise in response to a monetary policy tightening.

## **2.5 THE IMPLICATIONS OF POLICY-INDUCED CHANGES IN BANK LOAN SUPPLY ON REAL ECONOMIC ACTIVITY**

A large part of the research reviewed above has provided evidence consistent with the existence of a bank lending channel, where the effects of monetary policy on bank lending are amplified by the limited ability of some constrained banks to replace a policy-induced outflow of insured deposits with alternative sources of finance (i.e. CDs or interbank borrowing). In this sense, the response of bank loan supply to monetary policy shocks might be of particular importance, but do banks indeed play a special role in the transmission of monetary policy to the real economy?

While the use of panel data has necessitated researchers to distinguish between loan supply and loan demand shocks across banks, the lending channel could end up being a minor part of the transmission mechanism, if either banks could smooth the effects of monetary policy on their supply of loans or borrowing firms, deprived of bank lending, could costlessly substitute towards alternative financing sources. It seems that part of the relative research has failed to establish a link between bank-level financial constraints and the response of aggregate bank loan supply to monetary policy, thus it is rather questionable whether the evidence provided by micro data actually adds up to the lending channel being an important part of the transmission mechanism. Indeed a relationship between the federal funds rate and aggregate bank loan supply arising from imperfect access to external funds is not likely to reveal the whole story of the bank lending transmission mechanism. Financial constraints imposed in banks may amplify the effects of monetary policy on real economic activity, if only firms are unable to substitute bank loans with open market credit or other nonbank sources of finance. While such a substitution admittedly increases the external finance premium faced by borrowers, **Caballero's review on the existing**

**literature (1997)** suggests that investment is extremely insensitive to the cost of capital.

Moreover, existing research has yielded mixed results in the establishment of a linkage between aggregate bank loan supply shocks and real economic activity. For example, **Driscoll (2000)** concludes that shifts in state bank loan supply driven by state-level money demand shocks have no effect on the real economy. In contrast, **Peek and Rosengren (1997)** find evidence that capital constraints in Japanese banks related to the collapse of the Nikkei affected U.S. real estate investment in the early 1990s. **Van den Heuvel (2002)** concludes that the bank leverage ratio at the state level propagates the effect of monetary policy on state output. On the other side, **Aschraft (2006)** found that economic activity is rather insensitive in lending, implying that the macroeconomic implications of the bank lending channel are rather weak. So it becomes apparent that, unless a linkage between policy-induced loan supply shocks and real economic activity is identified, the importance of the bank lending channel in the overall monetary policy transmission process is diminished.

Addressing this latter issue in his paper, **Driscoll (2000)** examines whether changes in bank loan supply cause subsequent changes in output, using a different methodology to overcome the inherent problems in the identification of the bank lending channel. Driscoll argues that since the US states are rather small open economies under a fixed exchange rate system, state specific shocks to money demand shall be automatically relieved, thus leading to shifts in bank lending in case banks rely on deposits as a primary source of funding. In this context, building on the model of Bernanke and Blinder (1988), Driscoll inserts these shocks as an instrumental variable to identify shocks to loan supply in his regressions of output on loans and tests jointly whether the money demand - induced shift in deposits restricts bank lending and whether the above changes in the supply of bank loans do have effects on real output.

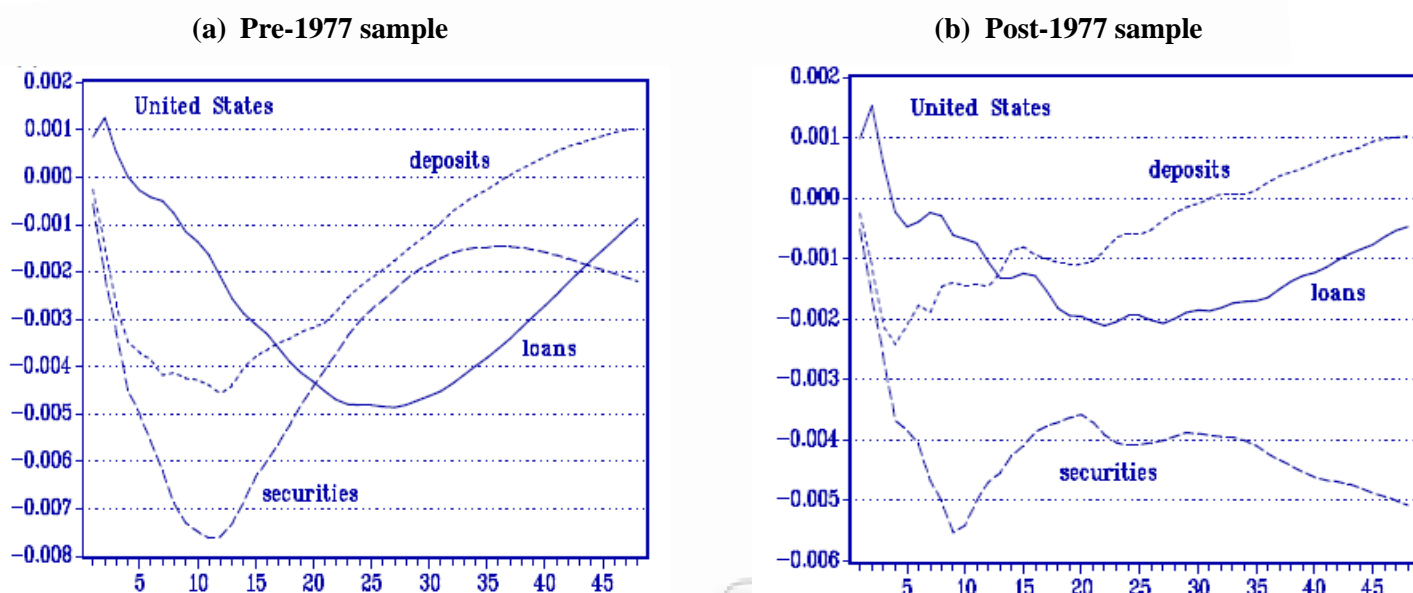
He concludes that shocks to money demand have a large and statistically significant effect on bank loans, yet the supply of loans poses a generally small (often negative) and statistically insignificant effect on state personal income. In particular running the regression of loans on money demand shocks, a one percentage point growth of money demand above its cross-sectional average is found to cause a 1.11 percentage



points rise in the C&I loan growth in the first year; the results suggesting that the level of bank deposits may seriously determine bank loan supply and that money demand shocks prove to be appropriate instruments for the regression of output on loans. However, when re-running the regression of output on loans, using money demand shocks as instrumental variables, an increase in the growth rate of loan supply was found to pose a slight, statistically insignificant (and sometimes negative) impact on income growth. Obviously, Driscoll's findings seem to satisfy the first condition of the bank lending channel, namely that banks are not readily able to easily substitute for lost deposits, while the second requirement of a sufficient degree of bank dependency is not met.

**Smant (2002)** also tackles the dual objective to identify the role of banks in the transmission of monetary policy shocks and further verify the importance of bank loans as a possible causal factor for economic activity, offering a cross-country analysis for the periods 1957-1976 and 1977-1993, when financial deregulation prevailed. Examining the response of money growth (narrow M1 or broad M2/M3) and bank lending to monetary policy actions, he found that bank loans in the US are significantly related to the short-term T-Bill rate, with the interest rate effect on loans being smaller in the post-1977 sample. Smant further examined the dynamic effects of monetary policy on bank balance sheets with the use of impulse response functions that report the response of deposits, bank loans and security holdings of banks to a positive innovation in the policy rate. Deposits and securities were found to react first to a tightening in monetary policy, whereas bank loans to the private sector exhibit a more sluggish adjustment; they initially remain unaffected but eventually decline with a lag of four to eight months. In the post-1977 period the response of US banks to interest rate shocks is smaller on average.

Figure 1: Bank balance sheet adjustments after an interest rate shock



Note: The impulse responses are calculated from six-variable VARs that include log industrial production, the 12-month log change in the consumer price index, a short-term interest rate as the indicator of monetary policy, log real bank loans to the private sector, log real non-currency component of the broad money aggregates M2/M3, and log real securities held by banks. The three bank-balance-sheet variables were deflated by the CPI. A final prediction error search procedure was used to determine whether or not to include a variable, with a maximum of 12 lags.

Source: Smant (2000)

Aschraft (2006) complements on the existing literature by introducing a new source of financial constraints to identify shifts in loan supply across banks: affiliation with multibank holding companies. The mispricing of deposit insurance creates well-known incentives for asset substitution, but these incentives are blunted for banks affiliated with large bank holding companies. The obligation of a parent company to assist a troubled subsidiary extends the liability of equity holders beyond their initial stake in the bank, and has the potential to attenuate bank's incentives to take on excessive risk. In this context, Aschraft argues that stand-alone banks actually do face more severe financial constraints than affiliated banks, as measured by the sensitivity of loan growth to insured deposit growth. He concludes that bank-level financial constraints may help explain how monetary policy affects aggregate bank lending, yet at the aggregate level these loans are not special enough to establish the relative significance of the bank lending channel for the monetary policy transmission into the real economy.

At a glance, facing reduced agency problems, affiliated banks have better access to markets for large CDs and federal funds, and thus are better able to shelter their lending activities from any policy-induced outflow of insured deposits. What is more, the use of affiliation as a determinant of variation in financial constraints across banks is attractive because it enables a comparison of banks otherwise identical except for affiliation (i.e. of similar size and/ or leverage), while at the same time eliminates any unobserved differences in the response of loan demand to monetary policy. Indeed Aschraft found that affiliated banks are better able to smooth outflows of insured deposits by issuing large CDs and federal funds, thereby shielding their lending from a monetary policy contraction. In particular, in response to a 1 percentage point increase in the federal funds rate, the loan growth of a stand-alone bank falls by 1 percentage point while the loan growth of an affiliated bank is rather unaffected.

What is new in Aschraft is his approach to aggregate the banking sector up to the state level, equating state lending with equilibrium lending. In this context, he found evidence that the loan market share of banks affiliated with multibank holding companies tends to mitigate the negative response of state bank loan growth to monetary policy, implying that the impact of monetary policy on equilibrium lending is amplified through financial - constraint banks. In particular, an increase in the loan market share of affiliated banks by 10 percentage points reduces the response of bank lending to a 1 percentage point of monetary contraction by about 1.15 percentage points. This suggests that financial constraints in banks appear important enough to affect the response of equilibrium lending to monetary policy. On the other hand, there is no apt evidence that may sufficiently connect these aggregate loan supply shocks to real economic activity. In particular, Aschraft found that there is no differential response of state income to monetary policy across the loan market share of affiliated banks. Instrumental variables estimates of the elasticity of state income growth to state loan growth are actually negative, yet statistically not different from zero, and confidence intervals eliminate anything larger than 10%. Using an estimate of the response of aggregate bank loan supply to monetary policy from a structural VAR, it follows that about 25% of the response of aggregate bank lending but no more than 5% of the response of real GDP to monetary policy can be attributed to frictions related to the lending channel.

## SECTION 3

### THE BANK LENDING CHANNEL ACROSS EU COUNTRIES

#### 3.1 DIFFERENTIATING STRUCTURAL CHARACTERISTICS OF EU BANKING SYSTEMS AND THEIR IMPLICATIONS ON THE RESPONSE OF BANK LOAN SUPPLY TO MONETARY POLICY

The findings on the existence of a bank lending channel in the US are rather unlikely to be applicable to the euro area. This is mainly due to the observed asymmetries within the relative structures of the banking and financial markets across EU and the US, which are likely to differentiate the response of bank lending to monetary policy actions and alter the dynamics of the bank lending transmission mechanism.

Firstly, the level of bank dependence in the euro area is sufficiently higher than in the US. Banks are found to be predominant among all EU countries, while the corporate sector relies much more heavily on bank loans to meet their funding needs. Beyond the overall degree of bank dependence, there are also plenty of other structural characteristics within the national banking systems in the euro area that may determine the response of bank lending to monetary policy changes and the relevant macroeconomic implications of the bank lending channel. Namely these are: the availability of market funding sources (i.e. effective stock markets and corporate securities markets), the prominence of long term lending relationships between banks and their customers, the ownership patterns and the degree of government intervention, the extensive deposit insurance schemes, the existence of bank networks, the level of concentration within the banking sector and the size structure of banks (Ehrmann, Gambacorta, Martínez-Pagés, Sevestre and Worms, 2002). All the above specific features are assumed to have sheltered to some extent banks from the effects of monetary policy on their funding and thus on their ability to supply credit, thereby weakening the significance of the bank lending channel in most EU countries.

As for *the availability of market funding sources*, it is closely tied to the ability of borrowing firms to easily substitute towards market financing instruments in response to a contraction in the supply of bank loans. Banks hold a predominant role in

corporate financing among EU members, while market financing is far less developed than in the US. The vast majority of EU firms, even the larger ones, is facing rising costs in issuing debt instruments and is left behind in terms of stock market capitalization, compared to their US counterparts. This could imply that policy-induced shifts in bank loan supply may affect EU firms more strongly, since they cannot easily offset the drop in bank financing by switching to the corporate securities market.

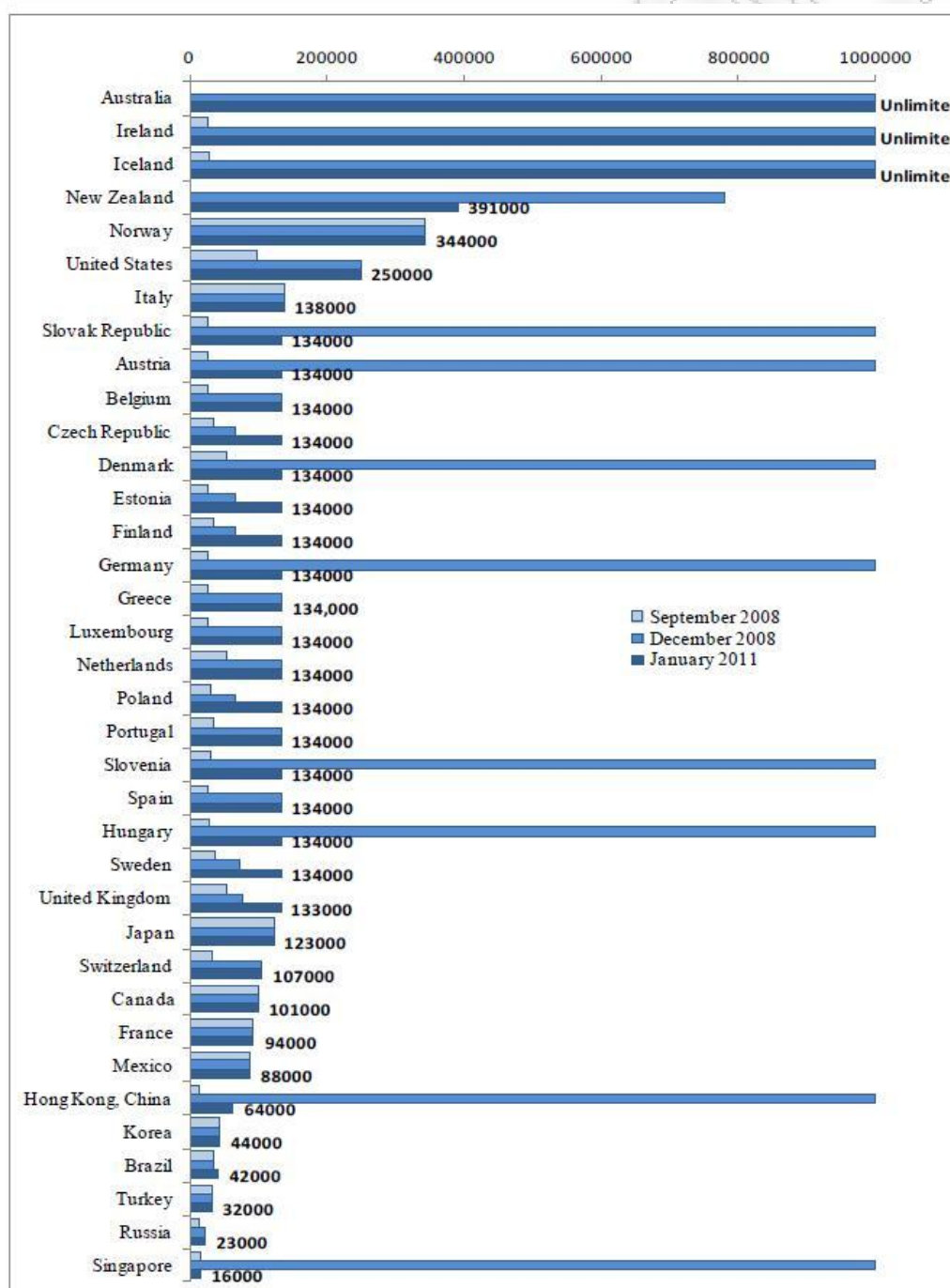
Moreover, *the establishment of rather long-term lending relationships* between banks and their customers is common practice in the euro banking system, especially with regard to smaller banks that operate in local markets. These banks are likely to retain their credit lines, even in tight money periods, and are reluctant to immediately pass any rise in the policy rate on to their customers. In such cases, the response of bank loan supply to monetary policy shifts is expected to be rather weak. *The contractual terms of loans extended* (i.e. short-term vs. long term-loans, fixed vs. floating lending rate, collateralization) also deserve attention in the analysis. Loans granted for shorter periods under floating interest rates are likely to amplify the transmission of monetary policy effects on bank lending rates and thus borrowing costs. This is the case in Italy and Spain. On the other hand, Austrian and Dutch banks use to extend loans with longer maturities and fixed interest rate contracts, which is likely to attenuate the effects of monetary policy on the price terms of loan contracts. Moreover **collateralization** is assumed to strengthen the potency of the bank lending channel. When a large fraction of loans is backed by collateral, which is a common trend in Italy, the dynamics of the bank lending channel intervene with the balance sheet channel and the reaction of bank loans to monetary policy may be magnified.

*The structure of banks in terms of liquidity and capitalization* is also a differentiating feature of banks of different size among different countries. For instance small banks in France, Italy and Spain are sufficiently liquid and better capitalized than larger banks, whereas German banks are found to be more homogeneous; there is no substantial systematic difference between small and large banks in their degree of liquidity and capitalization.

What is more, *the role of the government* in the banking sector is more pronounced in EU than in the US, although recently showing a decreasing trend. State power, either

through state ownership of banks, state control or state guarantees (i.e. deposit guarantee schemes) is still a common feature in some EU countries, such as Austria, Finland or Greece, whereas in other countries state power is rather limited. The latter trend is best reflected in Spain, where the banking system is almost fully privatized. In this context, *deposit insurance* also appears to be of relevant significance, though its extent differs considerably across EU countries, as reflected in figure 2 below.

**Figure 2: Deposit insurance coverage limits**



Source: OECD

*The existence of extensive bank networks* also determines the relative impact of monetary policy on bank loan supply. Bank networks constitute of a mixture of banks of different size and services provided (i.e. savings banks, credit banks or a combination of them), and often provide a centralized liquidity management. Large banks within a bank network serve as head institutions that provide liquidity to smaller banks in the form of long-term loans, while small banks in turn hold a fraction of their depository funds within large banks, serving as a source of short-term funds. This structure is common in Germany, Austria, Finland and Spain. The involvement of an individual bank in a wider network is expected to de-emphasize the impact of monetary policy on the supply of bank loans.

*The level of concentration in the banking sector* is also among the factors that cannot be ignored in the analysis. Banking systems across EU countries have shown an increasing trend of concentration during the 1990s. In most of the EU countries a rather small number of large banks hold the lion's share in both the loan and deposit market. Yet the degree of concentration differs considerably across EU countries; Belgium, Finland, Greece and the Netherlands have highly concentrated banking systems, whereas Germany and Italy stand at the lower end.

Given the above mentioned peculiarities of EU banking systems, it seems plausible that the response of EU banks' loan supply to monetary policy shocks may be determined in a different manner not only in contrast to their US counterparts but also across various EU countries. Yet one general approximation is quite obvious: given the special features of EU banking systems, informational frictions in EU banking markets are likely to be less pronounced than in the US.

In particular, EU banks are less risky in the perception of both interbank markets and potential depositors. This combined with the relatively few bank failures of EU banks, has facilitated their funding from the interbank market. Moreover, the active role of governments in the banking sector may also mitigate the risk of depositors. Under public ownership or government guarantee, banks are less likely to suffer an immediate drain of reserves, following a monetary contraction, thus preventing any adverse effect in their lending activities. The extensive degree of deposit insurance also counteracts depositors' risk. Deposits held at smaller or less capitalized banks are not perceived riskier than those held at large, well-capitalized banks, so that bank size

or capitalization are not so indicative of the distributional effects of monetary policy. What is more, state-guaranteed banks with weaker financial positions have sometimes greater incentive to expand their loan portfolio, despite a possible increase in its riskiness, which exaggerates standard banking practice.

As mentioned above, the role of bank size is also de-emphasized in European banking systems. European small banks are assumed to maintain tight lending relationships with their customers, thus may be more inclined to partly shelter their customers from the effects of a monetary policy tightening by retaining their credit lines. This can be achieved either through a higher degree of liquidity (this is the case in Italy and France), through liquidity facilitation schemes within bank networks (i.e. in Germany) or through better capitalization (i.e. Italy, France, Spain). Therefore unlike in the US, where the transmission mechanism operates primarily through small banks, bank size in the euro area is not always a reliable indicator for differential loan supply reactions to monetary policy. Overall, informational frictions are expected to be less important in most EU countries, thus attenuating the potency of the bank lending channel.

### **3.2 EMPIRICAL EVIDENCE ON THE EXISTENCE OF A BANK LENDING CHANNEL AMONG EU COUNTRIES**

Given the above mentioned structural features of European banking systems, a few researchers have tried to test empirically for the existence of a bank lending channel in EU, following the stylized facts and applied models in US studies. Yet the existing studies have generated rather inconclusive results. Among them, Favero et al. (2001) have found no support for a bank lending channel in the euro area, whereas the findings of De Bondt (1999), King (2000) and Altunbas et al. (2002) stand in favor of a bank lending channel, although weak in some countries.

In particular **Favero, Giavazzi and Flabbi (1999)** used individual bank balance sheet data to examine the response of bank lending in France, Germany, Italy and Spain to the monetary tightening episode of 1992, which caused a uniform liquidity squeeze that affected all banks in their sample. Assuming heterogeneity in the effects of monetary policy on banks, depending on their specific characteristics, they attempted to capture these cross-sectional differences by using two variables: the strength, as



best measured by liquidity, and the size of banks' balance sheets. They found no evidence of a lending channel. In particular, small banks in Germany, Italy and France were found to use their excess liquidity to expand their deposits and loans, following a monetary policy tightening, while large German banks used the strength of their balance sheets to insulate their loan portfolio from monetary policy fluctuations.

**De Bondt (1998)** on the other side used micro bank data to test for the existence of a bank lending channel across various European countries. He examined the differential response of banks with varying characteristics (asset size and liquidity) to changes in the stance of monetary policy, as measured by changes in the short-term market interest rates, during a six-year period (1990-1995). Ultimately, he found evidence of a bank lending channel in Germany, Belgium and the Netherlands, whereas in the rest of its sample (namely France, Italy and the UK) the effects of monetary policy on the supply of bank loans were rather insignificant. Yet the introduction of a monetary condition index to control for the stance of monetary policy enhanced the potency of the bank lending channel also for Italy and France. **De Bondt (1999)** adopted a different approach with the use of aggregate bank data to examine the bank lending channels in the same sample of EU countries. He inserted bank security holdings in a VEC model to detect for loan supply effects and - in contrast to his previous findings - concluded that the contraction in the supply of bank loans following a monetary policy tightening is significant in Italy, Germany and France, whereas in the UK, Belgium and the Netherlands the bank lending channel seems to be rather ineffective.

**Altunbas, Fazylov and Molyneux (2002)** applying a panel data analysis on bank balance sheet data for the 11- EMU countries for the period 1991-1999, found further evidence supportive of the bank lending channel, stressing that bank capital strength rather than size primarily determines the banks' response to a monetary policy shock. At the country level their results showed that the bank lending channel is more prevalent in smaller EMU countries.

**Erhmann, Gambacorta, Martinez-Pages, Sevestre and Worms (2002)** have sought to examine the dynamics of the bank lending channel in Europe's four largest economies (namely Germany, France, Italy and Spain) using micro bank data. Their empirical analysis aims to capture the distributional effects of monetary policy across banks with regard to bank size, liquidity and capitalization and identify the

implications of these variables in the reaction of bank loans to monetary policy changes. What is drawn as a general conclusion is that, in contrast to US banks, bank size and capitalization are found to have limited explanatory power over the bank lending channel across EU banks, whereas bank liquidity emerges as the single best criterion that determines the sensitivity of bank loans to monetary policy changes. Europe's four leading economies grant similar results that are generally in line with the existence of a bank lending channel and highlight the significance of bank liquidity in the channel's micro foundation. In general, restrictive monetary policy is found to reduce bank lending in the long run. The degree of liquidity is found to be a highly significant indicator for distributional effects across banks in Germany, Italy and France, since it dominates bank size and capitalization in all specifications in which the three bank characteristics are jointly tested. The obtained positive coefficient on the interaction of the monetary policy indicator with the degree of liquidity on these three countries suggests that less liquid banks exhibit a stronger decline in their lending following a monetary policy tightening than more liquid banks do, implying that the latter can use their stock of liquid assets to shelter their loan portfolio from a monetary policy contraction. In the case of Spain, the liquidity effect is far less pronounced and does not seem to interact with the response of bank loan supply to a monetary policy shock.

On the other hand, the role of bank size and bank capitalization is highly de-emphasized in the determination of bank loan supply to monetary policy shocks. In particular, bank size is found to be irrelevant in all countries, which can be partly attributed to the specific structural features of the banking systems across EU (i.e. banking networks, the active role of government, the scarcity of bank failures) that tend to diminish the overall level of informational frictions.

Bank capitalization is also found to be of minor importance. In particular, testing for the significance of capitalization either autonomously or interacting with the variables of size and liquidity, they found that its contribution on the effects of monetary policy on bank lending is rather insignificant. Yet it can be said that a rough measurement of bank capitalization per se might fail to sufficiently capture banks' risk profile as perceived by the Basle capital requirements, since its measurement is not directly linked to the risk characteristics entailed in banks mixture of assets or liabilities (i.e. the risks associated with their loan portfolio). A more risk-oriented capitalization

measurement might enhance its explanatory power. For example, **Gambacorta and Mistrulli (2002)**, using the regulatory BIS ratio over an extensive sample of Italian banks, concluded that better capitalized banks that choose to hold excessive capital over the BIS capital requirements, are better able to insulate their loan portfolio from monetary policy shocks, which is consistent with the bank lending transmission mechanism. It should also be mentioned that the overall level of bank capitalization is higher among EU banking systems, in contrast to their US peers. Therefore, as long as EU banks are on average adequately capitalized, capitalization becomes a rather uninformative indicator of banks' soundness or financial position.

Some other studies also confirm the limited role of bank size and capitalization. **Loupias et al. (2002)** tested the joint significance of bank size and capitalization across French banks, querying whether the US findings, that small and undercapitalized banks are likely to reduce their loan supply by more than large banks do, also apply in the case of EU. Their findings suggest that both the above factors do not seem to affect bank loan supply.

**Brissimis and Delis (2010)** point out the relative importance of market power rather than bank size as a determinant of the differential response of bank loan supply to monetary policy changes. Using the Local Generalised Method of Moments (LGMM) technique that identifies parameter heterogeneity at the bank level, they aim to analyze and quantify the heterogeneous response of US and EU banks following a change in monetary policy, in terms of their liquidity, capitalization and market power. Based on the findings of Baglioni (2007) that the effects of monetary policy are amplified within a monopolistic competition environment and diminish within a Cournot oligopoly, Brissimis and Delis argue that market power instead of size could serve as a better determinant of the differential reaction of bank lending to monetary policy shocks. If, in response to a monetary policy expansion, banks on average take on higher credit risk in search for yield, banks with established market power are less likely to engage in such activities, since they already reap the benefits of their larger market stake. What is more, banks with market power have alternative sources of interest income besides their lending activities (i.e. revenues from capital markets or off-balance sheet activities) and thus may gain abnormal profits in case of a decline in policy rates. Therefore the effects of monetary policy shocks on bank lending are expected to be stronger among banks with higher levels of market power.

The above mentioned studies were conducted with the use of data samples covering the period prior to the introduction of the euro. Moreover, they primarily sought to ascertain whether monetary policy has any distributional effects on bank loan supply across banks with varying balance sheet characteristics (namely size, capitalization and liquidity). Yet they fail to capture the effects of the observed policy-induced changes in bank loan supply on real economic variables. A string of more recent research using data covering the period of EMU from 1999 onwards have found some evidence supportive of the functioning of a bank lending channel among EU countries.

Among them, **Melzer (2007)** examines the bank lending channel in EMU. He proceeds one step further to identify whether monetary policy has an effect on economic activity by affecting the supply of bank loans, constructing a balanced panel data set covering a five year period from the introduction of the euro in 1999 to 2003 for all EMU countries (except for Luxembourg and Greece). The interesting point in his paper is the use of a different modeling approach to identify bank loan supply, inaugurated by Driscoll (2000) in his research for the bank lending channel in US (see section 2.5). He concludes that banks alter their loan supply following a monetary policy shock to bank deposits (table 1), yet loan supply has no significant effect on real output (table 2), thus suggesting that monetary policy, at least since the introduction of the euro, is not primarily transmitted through the bank lending channel.

**Table 1: OLS Panel Regression on the relationship between loans and monetary shocks**

	$\Delta \tilde{y}_{it-1}$	$\Delta \tilde{y}_{it-2}$	$\Delta \tilde{y}_{it-3}$	$\Delta \epsilon_{it}$	$\Delta \epsilon_{it-1}$
dependent variable $\Delta \tilde{l}_{it}$	0.188** (0.056)	0.592** (0.109)	0.047 (0.129)	0.148** (0.062)	–
$R_{adj}^2$	0.153				

Sample: 2000:1-2003:1, 130 obs. Standard errors in parentheses.

Note: \*\*, \* indicate significance at the 5% and 10% level.

Source: Melzer C. (2007)

**Table 2: 2SLS Panel Regression on the relationship between output and loan supply**

	$\Delta \tilde{y}_{it-1}$	$\Delta \tilde{y}_{it-2}$	$\Delta \tilde{y}_{it-3}$	$\Delta \tilde{l}_{it}$	$\Delta \tilde{l}_{it-1}$
dependent variable $\Delta \tilde{y}_{it}$	-0.225** (0.082)	0.189* (0.088)	0.328** (0.087)	0.038 (0.092)	-
$R_{adj}^2$	0.166				

Sample: 2000:1-2003:1, 130 obs. Standard errors in parentheses.

Note: \*\*, \* indicate significance at the 5% and 10% level.

Source: Melzer C. (2007)

More recently **Ciccarelli, Peydro & Maddaloni (2011)** also aimed at identifying whether the observed effects of monetary policy changes on credit availability, affect real economic variables, namely GDP growth and inflation rate, conducting a comparative analysis between EU and the US utilizing the confidential Bank Lending Survey (BLS) for the euro area and Senior Loan Officer Survey (SLOS) for the US.

The above databases contain detailed information on the actual lending standards applied to the whole range of demanded (not only extended) loans and on the specific factors determining one bank's lending standards, i.e. *credit supply factors* (bank balance sheet capacity and competition pressures) underlying the bank lending channel, *borrowers' quality indicators* (firm/household balance sheet strength and risk) underlying the borrowers' balance sheet channel and *credit demand factors*. This approach allows for the disentangling of loan supply versus demand effects and the distinction of the different sub-channels of monetary policy transmission-namely bank lending channel, borrowers' balance sheet channel and classic interest rate channel along with their relevant macroeconomic importance. The analysis also incorporates three macroeconomic variables: aggregate output (measured in terms of yearly real

GDP), prices (proxied by the yearly growth rate of the GDP deflator) and the monetary policy rate (EONIA for the euro area and the federal funds rate for US).

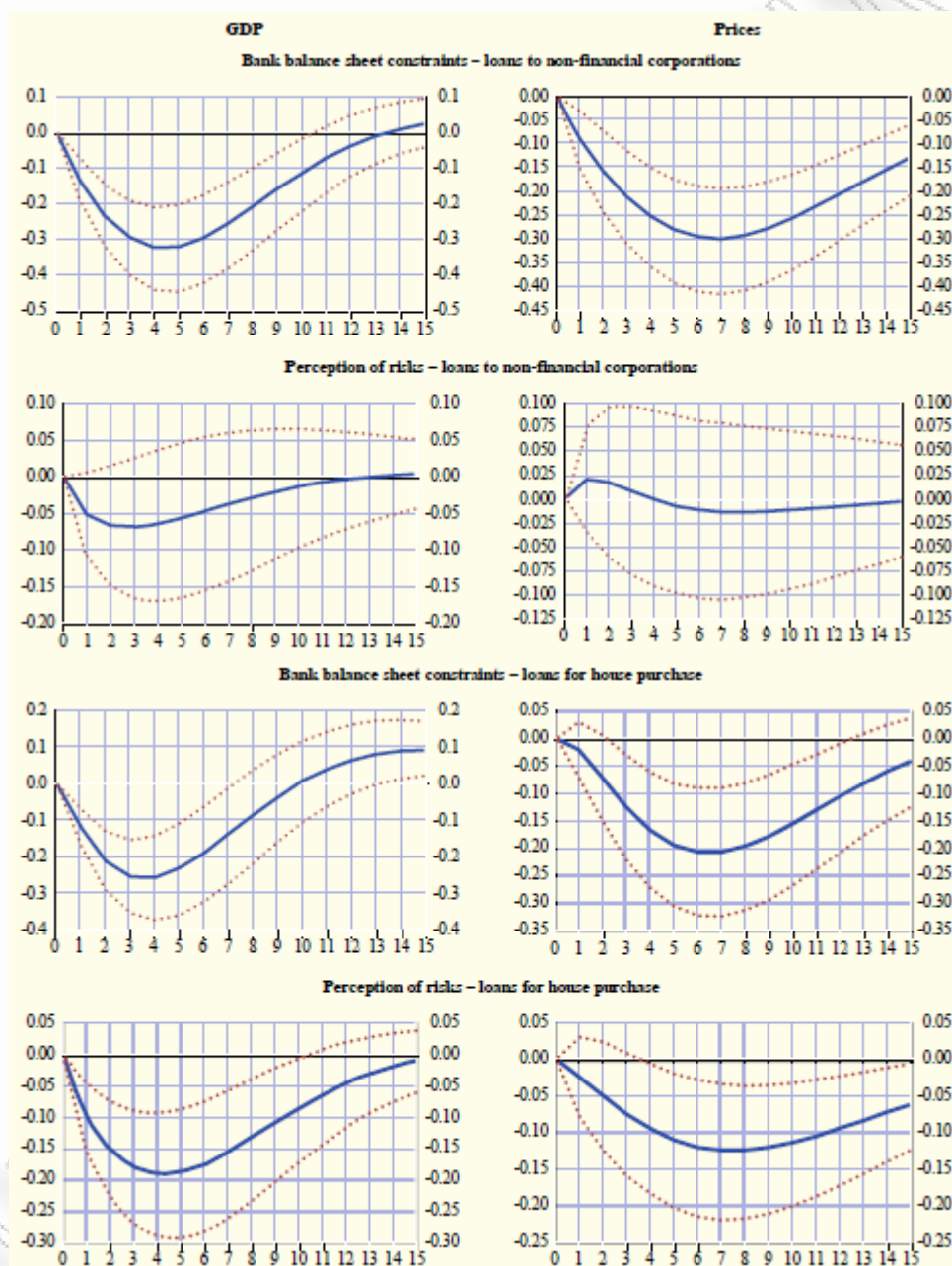
They followed a three-step analysis using quarterly data, applied within panel VAR models, impulse response functions and counterfactual experiments. Firstly, they examined the impact of a monetary policy shock on credit availability and credit demand, to distinguish between credit supply and credit demand shocks. Secondly, they examined the impact of shocks to credit variables on GDP growth and inflation and finally they assessed the economic relevance of the credit channel with a specific look on:

- Whether credit availability amplifies the impact of a monetary policy shock on GDP growth and inflation
- How does this impact differ among loans to firms and households
- Quantifying the relative significance of the three sub-channels. This is achieved by comparing the responses of GDP growth and inflation to a monetary policy shock with their counterfactual responses obtained when isolating the effects of one channel at a time.

Their findings verify the existence of a broad credit channel that magnifies a monetary policy shock on GDP and inflation through the balance sheets of households, firms (the borrowers' balance sheet channel) and banks (the bank lending channel). In the euro area, the applied counterfactual experiments suggest that it is the bank lending channel that has the most serious macroeconomic implications both for GDP and inflation. On the contrary the bank lending channel in the US is of secondary importance, since a monetary policy shock is transmitted to real economic variables primarily through the firm balance sheet and the credit demand channels.

In addition, the impulse response functions in the following chart serve to disentangle the relative importance of the bank lending and the borrower balance sheet channel. The reported functions suggest that all transmission mechanisms are found to operate in the euro area, with the bank lending channel posing a greater impact on economic activity, primarily through its effect on corporate loans, and the balance sheet channel affecting mainly mortgage loans respectively.

**Chart 4: Responses of GDP and prices to credit supply restrictions due to bank balance sheet constraints and perception of risk**



**Notes:** These graphs plot the response of log real GDP and a GDP deflator to a shock to credit supply in the order of one standard deviation. Credit supply is measured by the answers related to “bank balance sheet constraints” and “perception of (borrower) risk” applied to loans to non-financial corporations and loans to households for house purchase as reported in the Eurosystem bank lending survey. The confidence bands are 68% Bayesian credible bands.

**Source:** Ciccarelli et al. (2009)

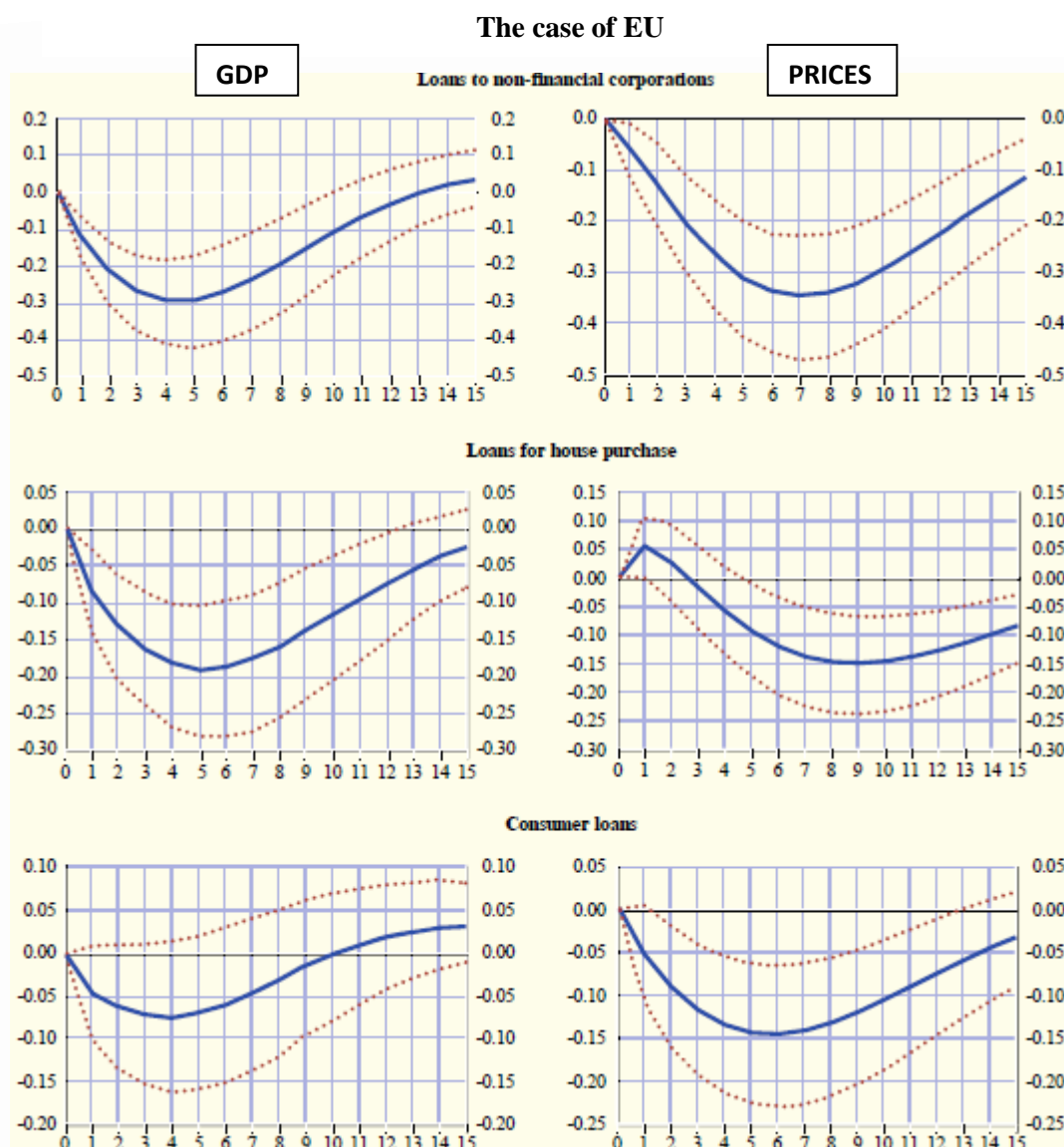
The observed differences can be well attributed to the differentiated capital structures among EU and US firms. As for EU, bank loans constitute the main source of external finance for firms: about 70% of external financing of EU firms comes from bank loans, whereas this fraction is considerably lower at 20% for US firms (according to ECB reports for 2009). Moreover, a large fraction of corporate equity in the euro area is non-quoted, as opposed to the US.

Another feature that strengthens bank dependency among EU firms is the legal form of limited-liability that many firms have acquired, which raises agency issues. These agency problems impose stricter financing constraints on firms and increase their bank dependency. Thus firms' increased sensitivity to shocks affecting the supply of bank loans is likely to enhance the potency of the bank lending channel in the transmission of monetary policy shocks to real activity in the euro area. US firms instead have a more diversified capital structure consisting of bank loans, credit provided by non-financial intermediaries and marketable securities, which can partly explain their comparative immunity to an unexpected contraction in bank loan supply.

Their analysis of micro-level data also reveals that the bank credit channel of monetary policy across EU countries is determined by heterogeneity of firms as well as banks in terms of their respective financial structures (namely firm size and bank size) and stresses the relevant importance of the banking system for the funding of the non financial sector. Their findings suggest that monetary policy is primarily transmitted through the credit supply towards large EU firms (whereas in the US through loans granted to small firms) and highlight the relative importance of small and thus more financially constrained banks in the transmission mechanism. Particularly, the impulse response functions applied have shown that the effects of monetary policy on GDP growth through the credit channel are more sizeable via large EU firms, which is well justified given the fact that the latter are financed mainly through bank loans and their overall macroeconomic significance is larger than small firms (although these are admittedly more affected by a monetary induced contraction in bank loan supply). In the US instead the bank lending channel is more effective through small firms, since large firms are more dependent on market-based funding than bank loans. In terms of bank size, the bank lending channel is found more operative through small banks for corporate loans, while it is relatively insignificant for household loans (mortgage or consumer) regardless of bank size.



Chart 5: Response of GDP and prices to credit supply restrictions



**Notes:** These graphs plot the response of log real GDP and a GDP deflator to a shock to credit supply in the order of one standard deviation. Credit supply is measured by the answers related to credit standards applied to loans to non-financial corporations, loans to households for house purchase and consumer loans as reported in the Eurosystem bank lending survey. The confidence bands are 68% Bayesian credible bands.

**Source: Ciccarelli et al. (2009)**

As shown in chart 5 a tightening of credit standards (applied in all terms and conditions of a loan, such as loan margins, volume, maturity, collateral requirements) leads to a decline in GDP, with the latter reaching a peak after around one year and diminishing approximately after three years. The impact of reduced lending on GDP exhibits similar patterns for C&I loans and mortgage loans, whereas it is rather insignificant for consumer loans. A drop in credit supply also affects the dynamics of price growth: it is found to cause a decrease in inflation for all types of loans.

Furthermore, **Haldane (2010)**, using an extensive dataset on 12 developed countries (namely Australia, Canada, Germany, Denmark, Spain, France, UK, Italy, Netherlands, Norway, Sweden and the US), attempts to quantify the dynamic behavior of the credit cycle and identify its interaction with the real economic cycle, as well as its evolution over time and across countries.

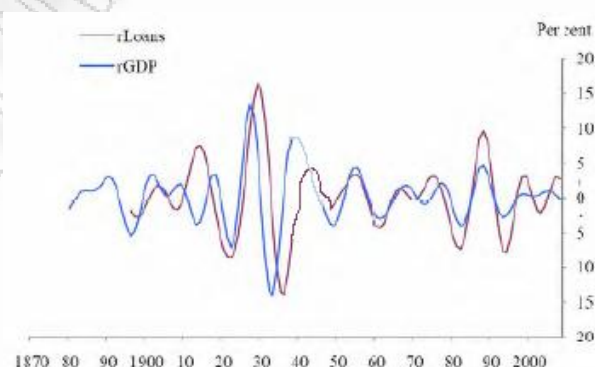
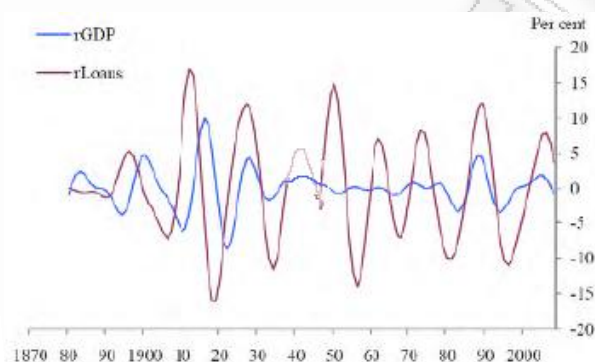
Applying a filtering technique to the data Haldane concluded that, stemming primarily from coordination failures, credit growth follows a clear cyclical pattern that is both clearly observable and regular, with its frequency being determined by factors other than the business cycle, such as financial deregulation and increased competition among banks.

What is more, Haldane concluded that credit cycles are quite distinct from business cycles in terms of amplitude and frequency, as plotted in the diagrams below:

**Diagram 2: Medium-term cycle in real GDP and credit**

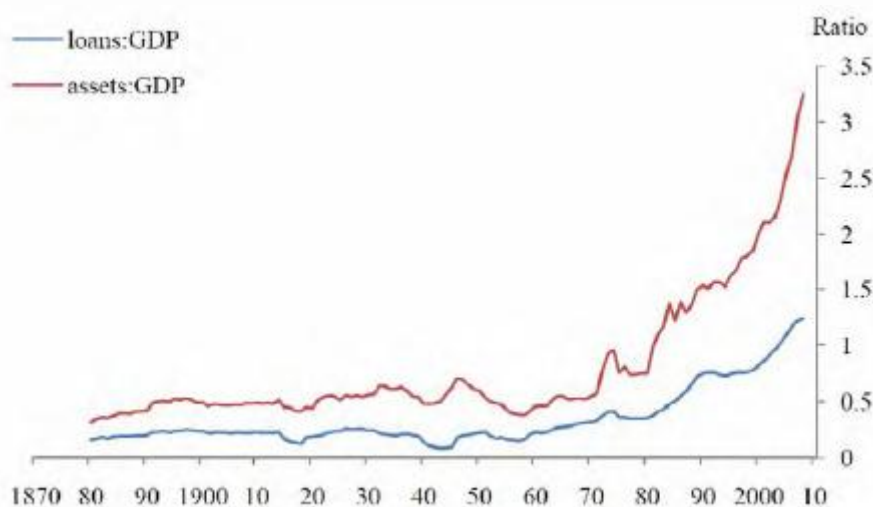
**(UK)**

**(US)**

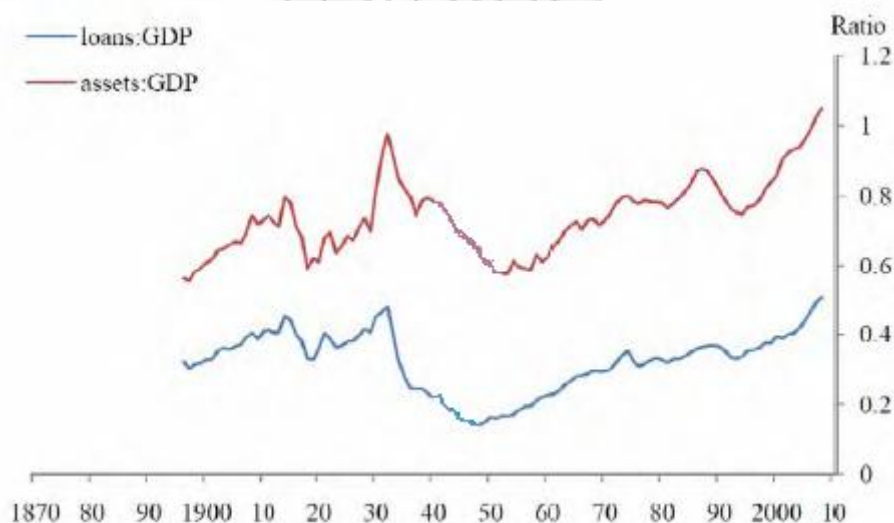


**Source: Bank of England**

In particular, real credit growth was found to outnumber real GDP growth, as reflected in the upward trend of loan to GDP ratio from 1945 onwards (charts 6, 7). This may be well attributed to the gradual liberalization and deepening of financial markets of the post-war period.

**Chart 6: Ratio of loans to GDP and bank assets to GDP (UK)**

Source: Shularick and Taylor (2009) & Bank of England calculations

**Chart 7: Ratio of loans to GDP and bank assets to GDP (US)**

Source: Shularick and Taylor (2009) & Bank of England calculations

Volatility of real output and credit also follow similar patterns: while the amplitude of real GDP growth has shown a decreasing trend since 1945, real credit growth has risen notably. As reflected in table 3 the standard deviation of real credit growth is about fivefold compared to real GDP growth.

Table 3:

## Summary statistics of real GDP growth and real loan growth in the UK and the US

		MEAN		STANDARD DEVIATION	
		GDP	LOANS	GDP	LOANS
UK	1880-1913	1.8	2.7	4.1	3.8
	1914-1945	1.2	-1.4	4.7	12.3
	1946-1979	2.5	6.4	2.0	12.9
	1980-2008	2.2	6.6	2.0	4.5
US	1880-1913	3.5	5.8	4.6	4.2
	1914-1945	3.8	0.2	8.2	6.5
	1946-1979	3.1	6.4	3.7	5.4
	1980-2008	2.2	3.6	2.1	4.0

Source: Shularick and Taylor (2009) & Bank of England calculations

Haldane's observation of increasing synchronicity of both the GDP and the credit cycles across different countries is also noteworthy. Higher correlations among countries' credit cycles soon after 1980 may be attributed to the increased competition, the rising integration in banking activities and the emergence of cross-border lending, while the synchronization of GDP cycles is primarily driven by increasing trade flows and financial liberalization at the international level.

Finally, Haldane pointed out the significance of capturing the interaction of the credit cycle with the real course of economy. Comparing the timing of credit peaks and troughs with the emergence of realized banking or currency crises, he found that credit booms and busts have systematically preceded the outburst of such crises. As shown in table 4, over the half of all financial crises periods across the 12 countries are found to have been preceded by a credit boom, suggesting that the credit cycle might have serious implications on real output. The results are more robust among the Anglo-Saxon countries (US, UK and Australia), where the respective fraction climbs up to 75%.

**Table 4: The credit cycle and subsequent crises**

	Total peaks 1880–2008*	Crisis years** within 5 years following a peak	% peaks with crisis years within the following 5 years	Banking crisis within 5 years following a peak	% peaks with Banking crisis within the following 5 years
AUS	9	6	66.7%	2	22.2%
CAN	11	6	54.5%	2	18.2%
DEU	9	2	22.2%	1	11.1%
DNK	10	4	40.0%	3	30.0%
ESP	8	5	62.5%	2	25.0%
FRA	5	3	60.0%	1	20.0%
GBR	9	7	77.8%	3	33.3%
ITA	11	8	72.7%	6	54.5%
NLD	8	1	12.5%	1	12.5%
NOR	13	5	38.5%	2	15.4%
SWE	10	4	40.0%	2	20.0%
USA	9	6	66.7%	5	55.6%
	112	57	50.9%	30	26.8%

\* Interwar data missing for most countries. Data coverage incomplete for other countries e.g. only post-1945 data available for France. \*\* Defined as years in which either a banking crisis or a currency crisis or both ("twin crisis") occur.

**Source: Bordo et al. (2001) & Bank of England**

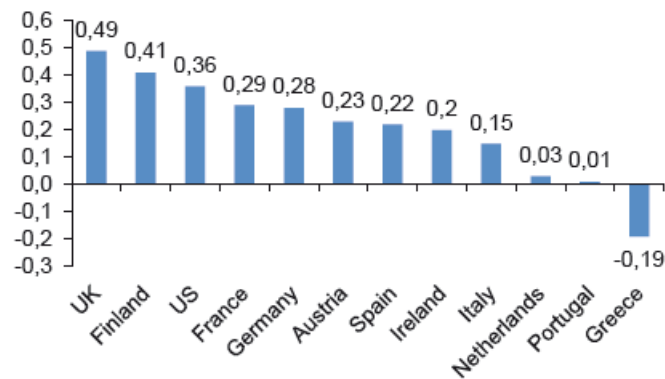
This latter finding can be seen as part of a wider debate whether credit aggregates outperform money aggregates in their ability to forecast economic growth, which has not yet reached a consensus. While King (1986), Ramey (1993) and Walsh and Wilcox (1995) found little support for the forecasting power of credit aggregates, noting that once the monetary variable is incorporated in regressions, credit variables lose their explanatory power over the shifts in real output following a change in monetary policy, Bernanke (1986), Lown (1988, 1990), Schularick and Taylor (2009) and Haldane (2010) stand in the opposite side, arguing that shifts in bank credit do precede changes in economic activity and/ or are likely to presage financial crises.

Within the same context, **the Economic and Monetary Affairs Committee of the European Banking Federation (EMAC-EFB)** launched a research paper in 2011, seeking to examine the dynamics and interaction of bank credit and real economic activity across 12 developed economies, with the use of bank credit and real GDP data covering a thirty-year period from 1980 to 2010.

EMAC's Chief Economists firstly examine the dynamic relationship between credit growth and economic activity. Testing the correlations between credit and real variables throughout the whole sample period, credit growth was found to move along

with real GDP growth, yet their correlation varying among countries. In particular, the co-movement was particularly evident in UK, Finland, US, France and Germany, while in Greece, Portugal and the Netherlands it was found rather weak.

**Figure 3: Correlation between bank credit and real GDP growth, 1980-2010**



Source: EBF-EMAC (November 2011)

They move one step forward to identify whether there is a causal link between bank lending and economic activity, performing Granger Causality tests. What is drawn as a general conclusion is that in most of the countries there is found to be a causal relationship from GDP growth to credit growth, such that higher GDP growth leads in credit growth in the future, although not necessarily vice versa. Indeed, there is no evidence of a unidirectional causality from credit to GDP growth in any country of the sample. Their findings suggest that although increased bank lending during economic upswings may amplify business cycle fluctuations, the real business cycle per se is not primarily driven by the lending behavior of banks.

**Table 5: Causality tests between credit and economic activity**

Granger causality tests	
	Order of VAR Causality
Germany	4 GDP => Credit ***
France	2 GDP => Credit ***
Spain	2 GDP => Credit *
Italy	2 NO
Netherlands	1 NO
Austria	GDP => Credit ** 4 Credit => GDP*
Greece	1 GDP => Credit **
Portugal	1 NO
Ireland	2 GDP => Credit **
Finland	2 GDP => Credit *** GDP => Credit *
UK	1 Credit => GDP***
US	4 GDP => Credit **

Notes: Significance levels: \*: 10%, \*\*: 5%, \*\*\*: 1%.

GDP=> CREDIT means that lagged changes in GDP help predict changes in credit.

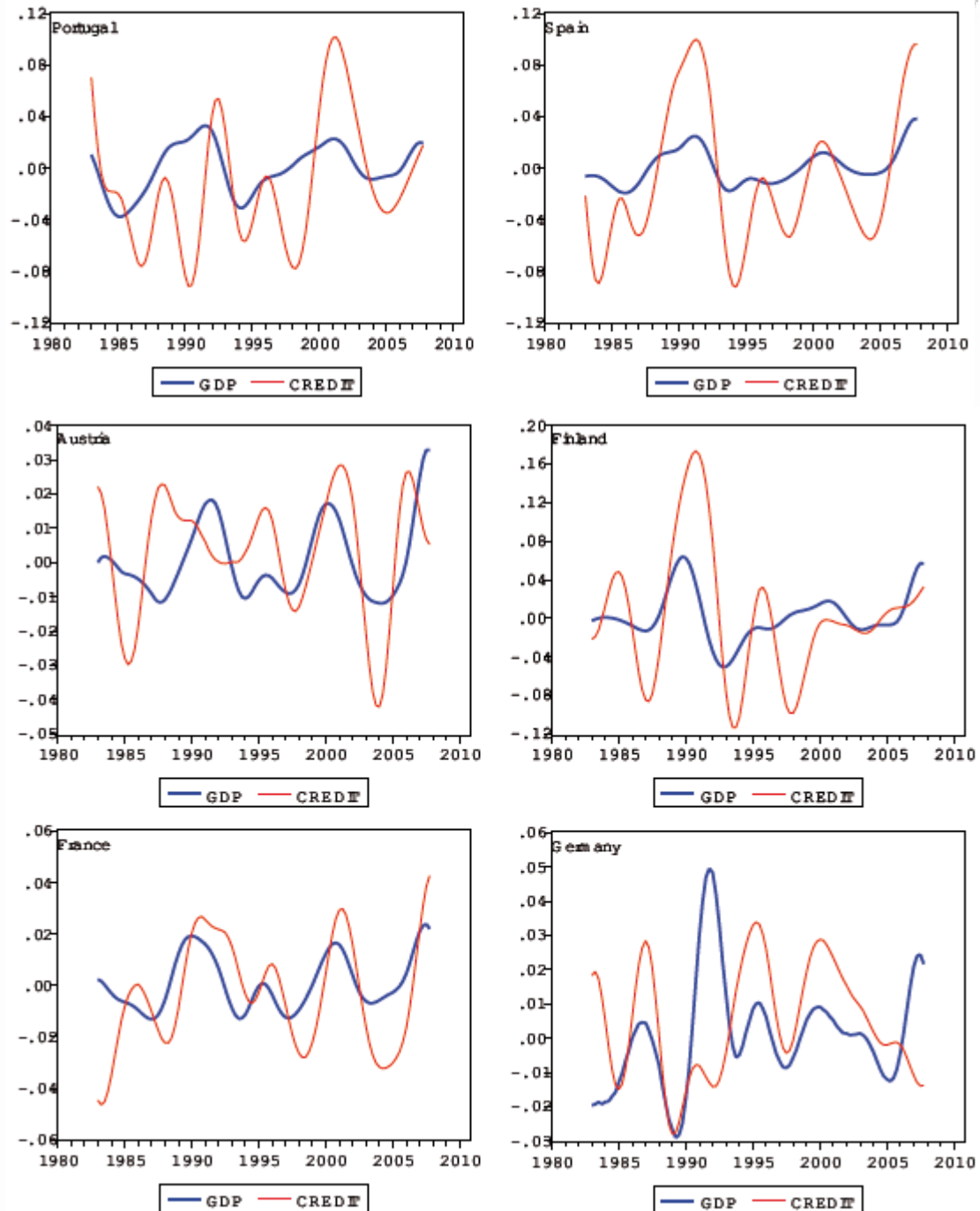
Order of VAR was chosen based on the Schwarz criterion.

Source: EBF-EMAC (2011)

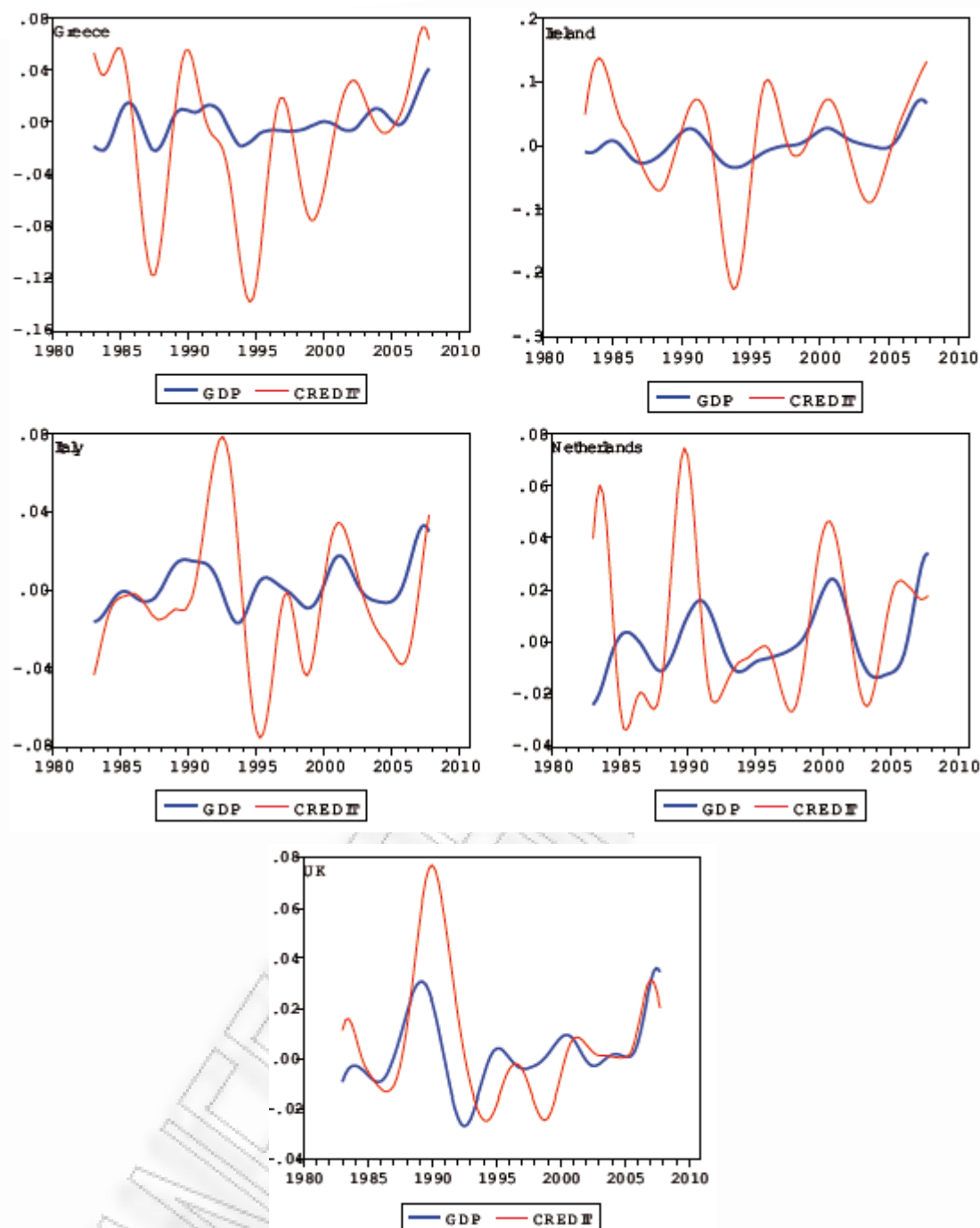
They further seek to identify the interaction between the credit cycle and the real business cycle. As reflected in figure 4, they find that the amplitude of the credit cycle has decreased substantially in most countries since the second half of the 1990s, implying that credit creation has been increasingly aligned with the real economy. The policy implication is that the case for macro-prudential regulation of the commercial banking business has not become stronger over the past ten to fifteen years, as opposed to the need for stronger regulation of the investment banking business.

**Figure 4: The cyclical component of real GDP (the business cycle) and the cyclical component of bank credit (the credit cycle) for each country**

- Notes: - The cyclical component of real GDP: the deviation of real GDP from its long-run trend, i.e. the “output gap”, measured in percentage points of real GDP.  
 - The cyclical component of bank credit: the deviation of credit from its long-run trend, i.e. the “credit gap”, measured in percentage points of total bank credit.





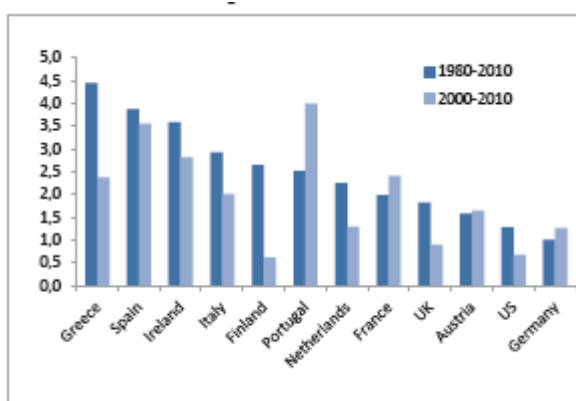


Source: EBF-EMAC (2011)

As shown in figure 4, the credit cycle is rather distinct from the business cycle in terms of both synchronicity and amplitude. In most of the EU countries under consideration (except for Germany and France), credit cycles display a much larger amplitude than business cycles, as also reflected in the reported larger volatility of credit compared of that of real GDP (figure 5). Explicitly volatility of the credit cycle is found to be on average 2 ½ times higher than volatility of the business cycle, which is best demonstrated in Greece, Spain, Portugal, Ireland and Italy.

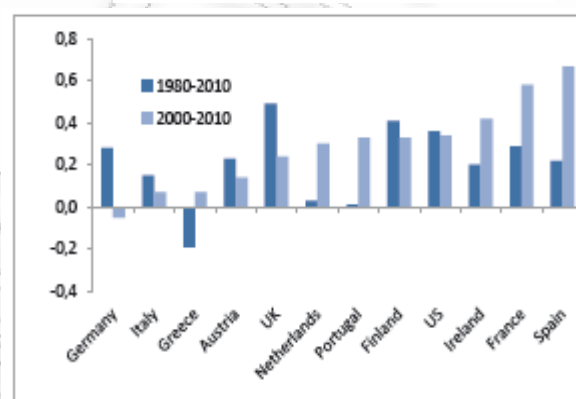
What is more, the amplitude of the credit cycle has significantly diminished in most countries since the second half of 1990s. This downward trend is more pronounced among Greece, Finland and the UK, where volatility of the credit cycle has decreased notably by 45 to 80 percentage points.

**Figure 5: Volatility of bank credit**



Source: EBF-EMAC (November 2011)

**Figure 6: Correlation between credit and economic activity**



Source: EBF-EMAC (November 2011)

With regard to the correlation between bank credit and economic activity (figure 6) there seems to be a mismatch across different countries. While in France, Spain, Portugal, the Netherlands and Ireland correlation between credit and economic activity has increased substantially during the last decade, implying that the banking sector is becoming more closely linked to the countries' economy over time, in countries such as Germany, Italy, Austria and the UK the respective correlations have significantly decreased.

EMAC's Chief Economists ultimately provide an insight in respect to the co-movement of credit growth across EU countries, pointing out that the stronger financial and economic integration over the last 10-15 years has coincided with stronger co-movement of credit expansion. The cross-country average correlation has been increasing notably, but has also acquired a more uniform pattern. In particular, the credit cycle has been more synchronized between countries that previously exhibited negative or weak positive co-movement in credit. Evidently, the median correlation across countries is found to have risen substantially during the last decade

(from near zero during 1980-1999 to 0.46 during 2000-2010), suggesting that credit linkages among EU countries have been strengthened over time. At the same time, the fraction of negative correlations has declined significantly. This may stem from the effects of the common monetary policy in the euro area, but may also be attributed to the stronger synchronization of the business cycle in the EU (in particular, the median correlation among the business cycles has doubled from 0.45 to 0.90 over the last decade and the whole distribution of cross-country correlations has shifted upwards and has narrowed).

### **3.3 THE BANK LENDING CHANNEL IN GREECE**

#### **3.3.1 THE STRUCTURE OF THE GREEK BANKING SECTOR**

Until the mid nineties Greek banks used to hold a dominant role in the transmission of savings from deficit to surplus units, while other financial organizations (such as mutual funds or pension funds) were of restricted importance in terms of aggregate financial intermediation. The special role of banks was based to some specific characteristics of the Greek financial system. Far and foremost, the banking sector was functioning within a strict regulatory framework, i.e. the distribution of bank credit into the real economy was conducted under close regulatory supervision that promoted the funding of specific sectors. Moreover, until the end of 1990 the investment policy of Greek banks was conducted under policy intervention, i.e. Greek banks were forced to invest 40 out of each 100 monetary units of their depository funds in Greek government securities (that policy was abandoned later at the end of 1993, when banks converted their so obtained securities into medium-term negotiable government bonds). Yet this market was relatively illiquid, thus the banks that managed to sell off some of their bonds, suffered significant capital losses. The above mentioned regulations led to a low degree of substitution between bonds and bank loans. In addition, both banks and borrowing firms were not able to sufficiently raise alternative external funds due to the limited growth of capital markets. In particular, Athens' Stock of Exchange emerged in the early nineties. Strict restrictions were also imposed on foreign trade and capital flows.

Yet recent developments in global financial markets and the integration of our country in the European Union forced Greece to incorporate EU directives into its domestic

law and move one step forward to the gradual deregulation of its domestic financial and credit markets until the mid nineties. As a result, bank intermediation was severely hit, while the stock exchange and mutual funds grew rapidly in the following years. Banks rushed to reverse this trend by adopting financial innovations (i.e. the intensive use of synthetic foreign exchange swaps and financial derivatives is quite representative of this new trend). The emergence of these new financial instruments in banks' balance sheets can also be partly explained by the fact that they were not subject to the relatively high regulatory reserve requirements prevailing at that time (12% in contrast to 2%, which is now the effective rate within the euro system), which earned a much lower return with regard to market rates. In response to these developments, the Central Bank of Greece raised banks' reserve requirements, to be applied in all forms of bank liabilities (either deposits, credit or asset management agreements). This system remained in effect until June 2000, when it complied with the EU regulation of lower reserve requirements. The higher amount of reserve requirements weakened the ability of Greek banks to insulate their funding activities (through reservable sources of financing) from adverse monetary policy shocks, thereby forcing them to reduce their supply of bank loans. It is worth-mentioning that banks could neither easily substitute towards equity issuance to replace their lost deposits, due to the complex regulatory system in case of an equity capital increase. Besides the liability management, banks could neither easily rearrange their asset portfolio, by substituting loans with securities, which became possible soon after the full deregulation of the financial system.

### **3.3.2 EMPIRICAL EVIDENCE ON THE EXISTENCE OF A BANK LENDING CHANNEL IN GREECE**

Under this spectrum, the bank lending channel was assumed to be significant in the years prior to the financial deregulation; the latter is then assumed to have weakened its effectiveness in the transmission of monetary policy. Indeed, the empirical findings of Kastricianakis and Brissimis (1997) confirm the above argument. They conducted a time series analysis to examine the relationship among GDP, aggregate money and bank lending volumes, using an extensive dataset for the period 1972-1996 and found that the bank lending channel was particularly important through the years prior to the financial deregulation. Kashyap and Stein (1997), in their research for the existence of

a bank lending channel in EU-12 countries with respect to the four main determinants that drive the channel's effective functioning, namely the concentration of the banking sector, bank capitalization, the size of bank-dependent borrowers and their access to alternative sources of finance (i.e. bond or equity markets), ranked Greece among the countries in which the bank lending channel is expected to operate. In particular, Greek banks were found to be highly concentrated (3 major banks held about 50% of banks' total assets), rather small in size (with assets less than 50 million euros), holding more loans than marketable securities in their asset portfolios (in contrast to larger banks that were found to hold more securities, thus showing higher liquidity ratios). Moreover, on the liability side larger banks showed a higher ratio of deposits than smaller banks, though the latter were found to be better capitalized. These inherent characteristics of the Greek banking sector, according to Kashyap and Stein (1997), obviously accommodated the effectiveness of the bank lending transmission mechanism.

In a further empirical research following the Kashyap and Stein (1995) methodology, Brissimis, Kamberoglou and Simigiannis (2001) found results that are consistent with the functioning of a bank lending channel in Greece (the results though being statistically insignificant) and also, through a different methodology, that shifts in the stance of monetary policy seriously affect the supply of bank credit, which in turn amplifies the propagation of these shocks to the real economy. More specifically, they attempted to test for heterogeneity among banks and its impact on the relative movements of the supply curve of bank loans and argued that heterogeneity could help in the analysis of the effectiveness of the bank lending channel, yet it is not the single determinant of the supply of bank credit. Following some specifications of the Bernanke-Blinder (1988) methodology coupled with the Kashyap and Stein reduced form equation, with the use of monthly individual bank accounting data for 12 Greek banks covering a five year period (01/1995-12/1999), they tested for the response of bank loan volumes to a monetary policy variable and two bank specific variables that account for bank size and liquidity ratio respectively.

The interaction of the above variables with deposits implies the impact they pose on the supply of bank loans. In turn, the relative shifts in the supply curve of bank loans accommodate the transmission of monetary policy into the real economy. In terms of size, large banks were able to partly insulate their loan portfolios after a monetary

policy tightening. This is also the case for banks with higher liquidity. As expected, the volume of bank loans was found to be more sensitive to monetary policy shocks for smaller banks with lower liquidity. The spread between bank loan and bond rates was found positive and statistically significant, which satisfies the condition of imperfect substitution between bank loans and securities held in banks' asset portfolios and verifies the existence of the bank lending channel.

## **SECTION 4**

### **THE NEW BANK LENDING CHANNEL**

#### **4.1 THE “DECOMPOSITION” OF THE TRADITIONAL BANK LENDING CHANNEL**

The traditional bank lending channel is based on the proposition that bank loan supply is primarily driven by monetary policy - induced changes in bank deposits. The link between monetary policy and bank deposits is further established through the money multiplier view and the household portfolio rebalancing view. The former suggests that monetary policy changes are implemented through changes in reserves, which in turn determine the amount of deposits through the reserve requirement. The latter argues that monetary policy actions modify the relative yields of deposits (money) and other assets in the perception of households, thus determining their desired level of deposits.

Yet the theoretical foundation of the bank lending channel entails some ambiguities. Firstly, while the transmission mechanism is primarily based upon changes in banks' deposits as a key determinant of the supply of bank loans, these are usually neglected in the regressions used. The relative empirical framework fails to sufficiently model deposits and focuses more on the direct relationship between bank loans and monetary policy indicators.

In addition, the money multiplier concept, on which the link between monetary policy and bank deposits is established, is somehow flawed. The money multiplier concept suggests that open market operations by Central Banks change the amount of bank reserves, which in turn determine the amount of deposits through the binding reserve requirement. In a deregulated financial system though, the supply of credit is not

subject to any exogenous constraint except for regulatory capital requirements. Thus a well capitalized bank should always be able to meet the demand for loans at its will.

Moreover, monetary policy nowadays has focused more in determining the appropriate short-term interest rate target. Banks on the other side hold reserves either to meet any regulatory reserve requirement or to reduce uncertainty with respect to their future payments. Thus the amount of reserves banks hold is determined primarily by reserve requirements and is not sensitive to changes in the policy rate. When the policy rate paid on reserves is determined below the market rate, monetary policy shall provide banks with the demanded reserves in order to achieve its short-term target rate. When the policy rate paid on reserves equals the market rate, reserves become close substitutes to alternative short-term liquid assets and the Central Bank determines the amount of reserves in the banking system. In either case the optimal interest rate can be set independently of the amount of reserves in the banking system, thus the link between monetary policy and bank reserves weakens. In fact, this is the case for many countries, as **Disyatat (2010)** points out, where movements in the money multiplier reflect changes in reserves, while those changes are not linked to the dynamics of bank lending. Therefore, one should reconsider the money multiplier concept that underpins the bank lending channel foundation.

As noted above the link between monetary policy and bank deposits can also be explained under the view of household portfolio rebalancing. Under this spectrum, monetary policy-induced changes in short-term interest rates alter the opportunity cost of holding deposits, thus leading households to switch from deposits towards more profitable investments. This does not always hold for a number of reasons. Firstly, certain types of deposit accounts are perfectly interest rate - inelastic (i.e. current accounts that pay little or no interest). Secondly, deposit rates in many cases are closely tied to money market rates, so that changes in market interest rates do not significantly alter the opportunity cost of holding deposits. Moreover, a distinction should be made between micro-bank level and aggregate data. A drop in deposits for a particular bank can indeed be forced by a monetary policy tightening, whereas a substantial change in the aggregate amount of deposits in one country's banking system is likely to be driven by structural factors in the financial system (i.e. increased competition, increased use of market funding), rather than a monetary policy shift.

What is more, traditional models fail to incorporate the structural changes that have taken place in the financial sector over the last decade (i.e. intensive use of market funding instruments, securitization and new business models). Recent literature has highlighted new dimensions that enrich our current view of how monetary policy affects banks' ability to extend loans and their willingness to bear risks. In this context, particular attention has recently been devoted to analyzing the implications of securitization, intensive use of market funding, new business models and financial innovation in general for the transmission of monetary policy, as well as the impact of supervisory regulations on the capital adequacy of banks and their incentives to take on risk as determinants of banks' loan supply.

The process of financial innovation in credit markets has been widespread across developed financial systems over the last ten years. During this period the banking sector has entered a phase of intense deregulation, which in turn has increased the competition among financial institutions. This increased competition has reduced the market share of banks, thereby reducing their charter values. This development, combined with the banks' limited liability and the enforcement of deposit insurance, have necessitated banks to take on higher risks, thus boosting the expansion of bank lending and the emergence of new financial products.

At the same time, banks have adopted new business models, i.e. under the terms of the OTD-model ("Originate To Distribute"), banks extend new loans, repackage these loans and then sell them on to the financial market, thereby transferring the relevant risks to financial markets. In this pattern, banks have also made some of their assets, on which they had exclusive access until recently, available to new institutional investors.

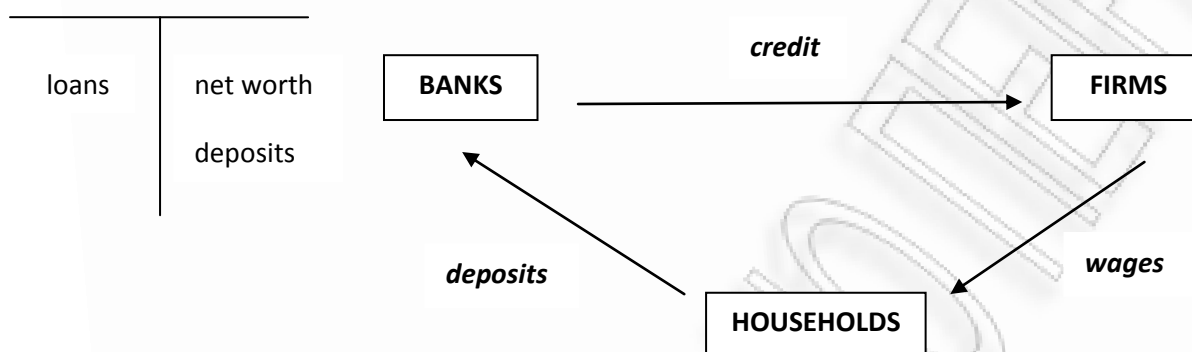
The strengthening of the financial status of these institutional investors, has counteractively enhanced banks' access to alternative (besides deposits) market sources of funding, thus contributing to the expansion of securitization and covered bond markets and the greater reliance of banks to financial market conditions.

The above mentioned developments have altered the traditional bank lending channel and offered some new insights with regard to the monetary policy transmission mechanism. The reformulated bank lending channel works primarily through the impact of monetary policy on banks' external finance premium as determined by their



perceived balance sheet strength, in terms of leverage, asset quality as well as their perceptions of risk. Conventional quantitative constraints on the supply of bank loans (i.e. the amount of deposits or the drop in reserves) are quite de-emphasized and the attention is now drawn on financial frictions faced by banks and on the way policy induced variations in their external finance premium affect the cost of funds incurred by bank dependant borrowers (**Bernanke, 2007**).

**Chart 8: The economic circuit with bank intermediation**



A monetary policy contraction raises the market interest rate ( $1 + r_f$ ), thereby raising the opportunity cost of holding deposits. Thus banks are forced to raise deposit rates in order to retain their level of depository funds, so that loan supply decreases. Given a fixed nominal wage rate, the rise in loan rates increases real costs, so that firms are discouraged to hire labor. The latter reduces loan demand and output ultimately shrinks. It has been made obvious that the reformulated bank lending channel operates through the impact of monetary policy on the external finance premium faced by banks, depending on their expected probability of default, which is mainly determined by banks' net worth and risk profile of their asset portfolio. A rise in banks' external finance premium implies a higher cost of funds for banks, which is then passed on to borrowing firms. More expensive credit, in turn, induces firms to reduce their demand for bank loans, which then causes firms to cut back on hiring, reducing the equilibrium level of employment. In this context, the banking system is considered to propagate monetary policy-induced shocks initiated in the financial sector into the real economy (**Disyatat, 2010**).

## 4.2 DETERMINANTS OF THE REFORMULATED BANK LENDING CHANNEL

Some new financial elements within the banking sector are likely to determine banks' net worth or perceived riskiness of their asset portfolio. These factors are not incorporated in models of the traditional bank lending channel, though they are likely to affect or even alter the transmission mechanism of monetary policy:

**Table 6: Financial innovation and current developments in the banking system**

<b>Bank capital (Tier 1)</b>
Bank risk, as perceived by financial markets, coupled with risk based capital requirements have been a key determinant of bank loan supply
<b>Banks' business models</b>
<ul style="list-style-type: none"> <li>▪ The ratio of market funding</li> <li>▪ The ratio of securitization</li> <li>▪ The presence of internal capital markets within bank holding companies</li> <li>▪ The amount of non-interest income (fee-based revenues)</li> <li>▪ The degree of financial supervision</li> </ul>
<b>Prolonged periods of low interest rates</b> that favor lending expansion
<b>Financial crisis</b>
The <b>aggressive interest rate cuts</b> and <b>unconventional monetary policy</b> , which are common features in an environment of financial distress, can have significant implications on the effectiveness of monetary policy.

### 4.2.1 THE ROLE OF BANK CAPITAL

**Bank capital** can be a key determinant of loan supply, especially in tight periods, when regulatory authorities impose stricter capital constraints. This fact can have serious implications on the link between bank capital regulation and monetary policy. The traditional bank lending channel conceives the drop in banks' deposits as the main driving force for the loan supply contraction, after a monetary policy tightening, under the preposition that banks cannot completely offset their loss of deposits by issuing non-reservable liabilities (i.e. CDs) or liquidating some of their assets (i.e.

selling off bonds kept in their portfolios). The funding through non-reservable liabilities comes with a higher cost for banks, depending on each bank's creditworthiness, as measured by the potential investors. The new bank lending channel stresses the importance of bank capital in the evaluation of one bank's creditworthiness and thus in the relative amount of external finance premium faced by banks. The basic argument outlines that better capitalized banks have easier access to finance, thus allowing them to extend more credit to firms. On the other hand, low capitalized banks are expected to be more strongly affected by a tightening of monetary policy, as this would increase their marginal cost for obtaining external finance, as long as the market considers them to be riskier. As **Jayaratne and Morgan (2000)** have stated, low-capitalized banks are more exposed to asymmetric information problems and are less capable of shielding their credit relationships.

For bank capital to affect the supply of loans, two conditions must hold. Firstly, as Van den Heuvel (2002) has stated, the higher the cost of breaking regulatory capital requirements, the more banks are induced to meet those requirements, in order to limit the risks of a possible future capital inadequacy. Since capital requirements are tied to the amount of credit outstanding, the latter would set an immediate adjustment in lending. On the other hand, if banks kept excessive capital, a possible future drop in capital could be easily counteracted, with no serious implications for banks' portfolio of loans. Equity issuance though is rather costly relatively to other funding instruments (deposits, bonds), thus banks tend to minimize their amount of capital in excess, even contrary to the regulatory dictates or the market requirements. Secondly, there should be some imperfect form of bank equity market, meaning that banks could not issue new equity without incurring any additional cost (i.e. tax disadvantages, adverse selection problems, agency costs).

The above two conditions are confirmed in practice by recent empirical evidence. Kishan and Opiela (2000, 2006), Gambacorta and Mistrulli (2004), Gambacorta and Marqués (2009) stress the importance of bank capital in the propagation of shocks to bank loan supply, showing that bank capital could be a key determinant of banks' structure, especially in periods of financial stress, when the cost of raising capital increases. So in periods of financial crisis, tighter capital constraints are expected to limit the supply of bank loans.

Capital constraints have launched officially with the Basel II Accord, initiated on 2004, which has implemented international standards on supervisory regulations determining the capital adequacy of banks. These regulatory standards are likely to have altered the dynamics of the bank lending transmission mechanism. At this point it should be mentioned that banks' increasing use of derivative instruments, such as credit default swaps, to move risk off balance sheets further facilitates their provision of credit by relieving these capital constraints.

While it is likely that bank capital indeed serves as a buffer against a monetary policy-induced drop in bank deposits, one should note that conventional measures of bank capital have altered significantly. In recent years, preceding the financial crisis, many banks increased their actual leverage, while retaining or even improving their regulatory capital ratios, mainly by expanding on riskier areas with relatively lower capital charges.

#### **4.2.2 MARKET FUNDING, SECURITIZATION AND THE NEW BANK BUSINESS MODEL**

Recent financial innovations have had serious implications on the effectiveness of the bank lending channel. Namely, banks' increased use of market funding and the emergence of securitization have untied loan supply from the amount of deposits. In line with the Romer and Romer (1990) critique on the bank lending channel, banks could use alternative non-deposit funding instruments (such as CDs, covered bonds, asset-backed securities) to complement or even substitute deposits, following a monetary policy tightening. In general, **the intensive use of market funding sources** is said to increase bank loan supply, at any given monetary policy rate.

Moreover **the presence of internal capital markets in bank holding companies** is likely to reduce the effectiveness of the bank lending channel. Due to the existence of internal capital markets, banks affiliated with multibank holding companies are better able to protect their loan base from policy-induced changes in official rates, since a large holding company can raise external funds at a lower cost and then channel those

funds to its subsidiaries. According to the empirical findings of Ehrmann and Worms (2004), Gambacorta (2005) and Aschraft (2006) the loan growth rate of affiliated companies is less sensitive to changes in policy rates than that of unaffiliated banks.

The above mentioned financial innovations have obviously made banks more sensitive to investors' perceptions and financial market conditions. As Schleifer and Vishny (2009) have stated, this is mainly due to the fact that deposits are rather sticky relatively to alternative sources of funding (i.e. tradable instruments), which rely more on financial market conditions. This greater reliance could have significant implications from a monetary policy perspective, since, according to Hale and Santos (2010) the impact of a given level of interest rates on bank loan supply and loans pricing could change over time, depending on financial market developments.

Among recent financial innovations, **the emergence of securitization** is also of crucial importance. In the euro area the practice of securitizing bank loans -that is issuing fixed-income securities backed by a pool of bank loans- has increased during the last decade, prior to the outbreak of the recent crisis. The elimination of exchange rate risk among EU countries, the increased financial integration and the trend towards a more market-based financial system contributed to the development of the securitization market.

Banks' shift into the OTD model has seriously affected the transmission mechanism of monetary policy. Securitization facilitates the leveraging of risk, since banks can now pass their products and the relative risks on to the market. Securitization involves both short and longer term effects. In the short run, it relaxes banks' screening procedures of borrowers. As banks pass tradable securities (and the relative risks) off their balance sheet to the markets, through securitization, they have fewer incentives to sufficiently screen borrowers, leading to a loosening of credit standards, so that some borrowers, who were denied credit in the past, would now be able to obtain it. In the long term, this could lead to an increase in the amount of non-performing loans and default rates.

What is more, securitization supports bank loan supply against any monetary policy change. Indeed, this fact is confirmed by the findings of Altunbas, Gambacorta and

Marqués-Ibanez (2009), who showed that banks more involved in securitization activities, prior to the current financial crisis, were more sheltered against any immediate drop in deposits, following a monetary policy contraction. Indeed securitization implies an extra financing source for banks, thereby reducing the weight of deposits as a liability side constraint to the expansion of bank loans, thus reducing the effectiveness of the traditional bank lending channel.

Another challenging financial innovation is **the expansion of banks' income sources**. In recent years, banks have got involved in non-interest income activities, such as trading or investment banking. This increase in non-interest income has provided banks with additional sources of revenue, based on higher fees and commissions, which can improve banks' financial stability. Yet non-interest income is subject to higher volatility than interest rate income, thus undermining by even more banks' loss of revenues in case of financial stress. In this context, it is likely that this shift in banks' business model may have an impact on banks' performance and ability to supply credit. This is more profound for investment banks, which rely heavily on non-interest income earned in the form of brokerage costs and fee-based revenues. Indeed, investment banks were found to be more profitable than commercial banks through the years prior to the crisis, yet they faced a higher leverage ratio and their earnings were far more volatile.

#### **4.2.3 MONETARY POLICY, BANK RISK AND THE EMERGENCE OF THE “RISK-TAKING CHANNEL”**

Financial innovations coupled with the stronger interaction established between banks and financial market conditions have strengthened the role of monetary policy in maintaining financial stability. Altunbas, Gambacorta and Marqués (2009) have stressed the importance of **bank risk**, when analyzing the functioning of the bank lending channel of monetary policy. Traditional empirical models usually incorporate bank specific characteristics, such as bank asset size, liquidity or capitalization to assess banks' willingness or ability to supply additional credit. Yet, as Instefjord (2005) has stated, recent financial innovation seems to have increased banks' incentives towards more risk-taking, a fact that should be considered when testing for the effectiveness of the bank lending channel.

More specifically, bank size, among the standard indicators of the traditional bank lending channel, has lost in effectiveness as a determinant of bank loan supply, since banks that have implemented the OTD model have securitized significant amounts of their assets, therefore reducing their asset size, as reflected on their balance sheet. Moreover, the new banks' practice of extending new loans and then repackage and sell them into the market, acquiring immediate liquidity, has reduced banks' need to hold certain amounts of risk-free securities on the asset size of their balance sheet, which in turn has altered the relative significance of conventional liquidity ratios. In addition, new accounting practices and a closer link to market perceptions have distorted the significance of the capital to asset ratio. This was highlighted by the recent financial crisis, where a substantial amount of risks was not sufficiently captured on banks' financial statements.

As stated above, monetary policy may also affect banks' incentives to take on more risk when providing loans, leading to a new transmission mechanism of monetary policy, the so-called "**risk-taking channel**". This mechanism complements the understanding of the bank lending channel, drawing the attention from the effects of monetary policy on the quantity of loans supplied (which is the main argument of the bank lending channel) to its effects on the risks that banks are willing to accept when extending loans.

According to its supporters, prolonged periods of low interest rates could induce financial imbalances, under the dual incentive of undertaking more risk and searching for higher yield. This leads to a disproportionate increase in banks' demand for riskier assets, offering higher expected returns. Low interest rates also affect the valuation of income, assets and cash flows. In particular, low interest rates boost asset and collateral values, thus altering bank estimates of volatilities, probabilities of default and loss given default. The latter, according to Bernanke et al (1996), reduces borrowing constraints and induces banks to take on more risk. The so induced softening of credit standards may lead to an excessive increase in loan supply, which causes serious implications for monetary policy's primary objective to maintain price stability.

The existence of a risk-taking channel has been recently verified empirically both in the euro area and the US. Adrian and Shin (2010) have shown that changes in market interest rates determine adjustments in banks' balance sheet and leverage ratios and alter their risk appetite, thereby amplifying business cycle movements through banks' choice of funds allocation. In addition, Jiménez et al (2009) and Ioannidou et al (2009) found evidence that a too accommodative monetary policy stance may have led to an additional or even excessive risk taking by banks in the years prior to the crisis. Altunbas, Gambacorta and Marqués (2009) also found evidence of a significant link between monetary policy loosening and bank risk-taking worldwide. According to their findings, prolonged periods of low short-term interest rates lead to an increase in banks' attitude towards risk both in quantitative (increase in the loan amount and the total number of loans extended) and price terms (lower lending rates). As Maddaloni and Peydró (2010) have also pointed out, this effect is more evident for banks more engaged in securitization activity.

The advent of securitization over the last decade may have contributed to more risk-taking by banks through the softening of credit standards and insufficient screening of borrowers. Indeed in the case of euro area, one of the main determinants of the coordinated effort of EU banks to tighten their credit standards at the face of the recent financial crisis was the disruption of the securitization market. In this respect, it is worth mentioning that financial innovation, coupled with financial deregulation and higher levels of financial leverage are assumed to have amplified financial crisis. On the other hand, the reinforcement of regulatory supervision (i.e. the launch of Basle II Accord) may force banks to a more prudent capital and liquidity management and reduce their risk-taking incentives, thus alleviating the relevant significance of the "risk-taking channel". Central Banks should therefore reconsider their effect on bank risk attitudes, when determining their actions and regulatory intervention.

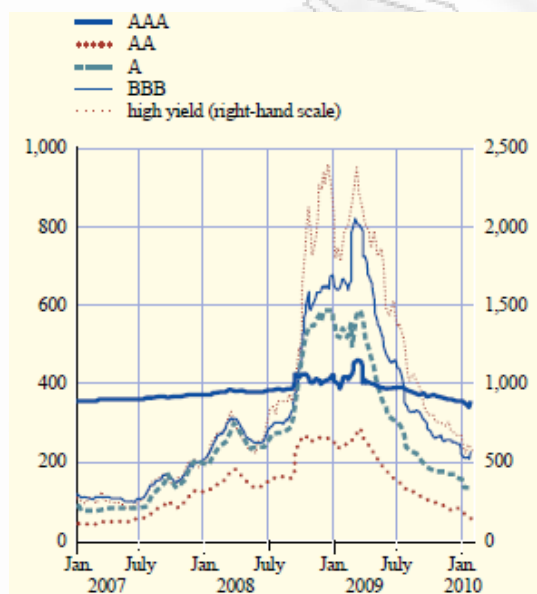
#### **4.2.4 FINANCIAL CRISIS AND THE ROLE OF NON-STANDARD MONETARY POLICY ACTIONS**

The financial turmoil launched late in 2007 and the interbank market was the first to be hit; risk premia on interbank loans soared and transactions within the interbank



market dropped rapidly. By September 2008, when the risk of a widespread systemic crisis in the financial system worldwide became very apparent, key financial market spreads reached historically high levels. Moreover interest rate volatility, indicative of the worsening conditions in money markets, made the stance of monetary policy difficult to gauge. Under these circumstances, given that a considerable fraction of bank loans were at that time indexed to unsecured money markets, the widening of the spread posed a direct impact on lending rates. The impact of the financial turmoil was also reflected in the increased cost of market financing. Credit spreads in EU corporate bond markets reached historic levels in the fourth quarter of 2008 (as shown in chart 9), which made the funding of both nonfinancial and financial firms more expensive. As a result of the decline in banks' ability to raise funds, the latter were forced to significantly tighten their applied credit standards to the approval of loans to borrowing firms (see Chart 10). In this context, where the functioning of monetary policy transmission channels had been impaired, the conventional monetary policy leverage over short-term interest rates per se might have been insufficient to ensure the maintenance of price stability.

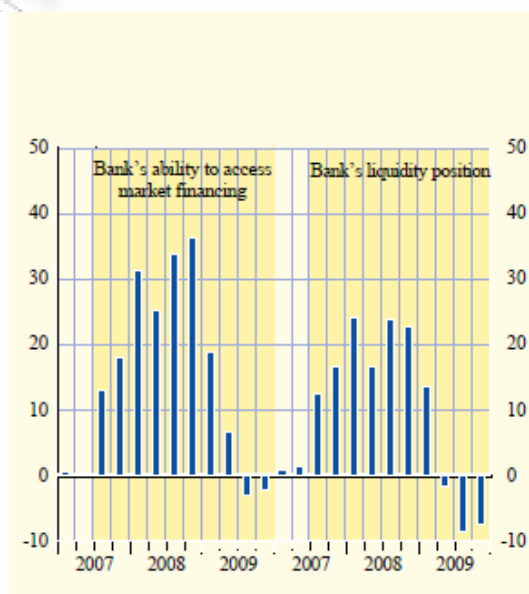
**Chart 9: Euro Area corporate bond spreads**



Notes: (basis points, daily data)

Source: Reuters, ECB Monthly Bulletin, May 2010

**Chart 10: Liquidity-related factors affecting credit standards in the Euro Area**



Notes: Net percentages of banks reporting a contribution to the tightening of credit standards; quarterly data

Credit standards applied to the approval of loans and credit lines to enterprises

Source: ECB bank lending survey, ECB Monthly Bulletin, May 2010

Within this adverse environment, ECB prompted to lower interest rates at very low levels, so as to alleviate the ongoing tensions in money markets. The effect on interest rates is primarily reflected in the drop of the key money market rates that EU banks typically use as benchmarks to reset floating rate loans and price new short-term loans. Yet ECB was also confronted with the contraction of bank loan supply to firms and households, as a result of banks' distorted ability to raise funds. Thus, ECB hastened to reinforce the effects of the reduction in the key ECB policy rate with the implementation of enhanced credit support policies, so as to retain the transmission chains fully operational.

These **non-standard credit support policies** have had a direct impact not only on interest rates but also on the supply of credit. Their impact on credit supply may be best captured through the above joint measures:

- *The provision of funding liquidity to banks via (i) full – allotment liquidity operations (ii) the widening of the relative collateral framework (iii) the extension of maturity of liquidity operations* than enhances banks' funding liquidity and thus leads to an expansion of credit.

- *The acquisition of bank assets or securitized bank debt.*

- *The outright purchase of covered bonds*, which facilitates the funding of banks in a key segment of the capital market.

- *The direct supply of funds to the real economy* via (i) the purchase of debt issued by private non financial firms or (ii) the provision of funds to state - sponsored banks, who engage primarily in lending activities with small and medium sized firms.

Thus the adopted ECB credit support policies maintained the effectiveness of the bank lending channel even in periods of financial distress, when banks' external financing from both capital and money markets was greatly suspended.

### **4.3 THE BANK LENDING CHANNEL IN EU UNDER THE NEW REFORMULATED FRAMEWORK**

The current financial turmoil has undoubtedly put substantial strain on banks' funding abilities via deposits and markets. In particular, market-based funding through securitization, which constitutes a rather significant refinancing source for banks, has

been severely hit throughout the crisis period. In addition, banks' weaker profitability has impaired their capital position, which has further deteriorated their balance sheet strength. The above pressures on bank' balance sheets along with their rising funding costs are assumed to have affected bank loan supply to the non financial sector.

At the same time the deterioration of borrowers' net worth and consequent creditworthiness has posed a notable impact on the quality of borrowers and has further distorted banks' ability and willingness to lend (i.e. as provided by the EU Bank Lending Surveys). Meanwhile the overall economic downturn has also burdened the demand for loans from the real sector, suggesting that in periods of financial distress it might be loan demand that primarily drives loan supply, which counteracts the perceived functioning of the bank lending channel.

**Gambacorta and Marques-Ibanez (2010)** have launched a fruitful research with regard to the functioning of the bank lending channel during the recent financial crisis. Using an extensive dataset of quarterly individual banking data for the period 1999 to 2009, they examine the impact of monetary policy on bank lending in view of the current financial crisis across 14 EU countries (Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, the Netherlands, Portugal, Spain Sweden, UK) and the US, taking into account the prevailing developments in the banking sector. Their analysis sheds light on the new dimensions of the bank lending transmission mechanism, since it encompasses, besides the traditional bank specific characteristics of size, liquidity and capitalization, variables able to control for some newly emerged institutional characteristics at the bank level (securitization activity, bank risk, fraction of non-interest revenues, the ratio of deposits to liabilities, the fraction of short-term funding) as well as at the country level (monetary policy indicators, government intervention, banks' investment activities – i.e. their engagement in securities, insurance or real estate activities –, the overall degree of risk aversion, the intensity of supervision).

In this context they test for three hypotheses:

- Whether certain bank specific characteristics affect bank loan supply

And more importantly:

- Whether certain bank specific characteristics affect the impact of monetary shocks on bank loan supply and
- Whether the recent financial crisis has altered the magnitude of these effects.

Their empirical findings suggest that bank lending decreases in response to a positive innovation in short-term interest rates, while this response is amplified during the period of financial crisis: in normal times, a one percentage point increase in the policy rate causes a proportionate drop in lending, with this effect being almost triple (namely -2.8%) during the crisis period. This evidence indicates that the potency of monetary policy was enhanced during the crisis period, when interest rate cuts have been particularly sharp and a mixture of unconventional monetary policy measures was implemented. The effectiveness of these measures is also reflected in the positive and statistically significant sign of the crisis variable, while these non-standard measures are found to have increased the long-run stock of lending by around 10%.

With regard to bank liquidity, its effect on bank lending in normal times is consistent with previous studies: banks with more liquid balance sheets are more likely to expand their loan portfolio and are better able to shelter their bank loan supply in response to an adverse monetary policy shock. On the contrary, although capitalization (in terms of Tier 1 ratio -Tier 1 capital over risk-weighted assets-) enhances banks' ability to extend their loan portfolio especially during crisis periods, it is insignificant to explain different-capitalized banks' reaction to changes in the policy rates. Size also fails to capture meaningful cross-sectional differences in the response of bank lending to monetary policy shocks. Gambacorta and Marques-Ibanez replaced size with lagged values of the proxy of Expected Default Frequencies (since it is a rather forward-looking) and tested for its interaction with the monetary policy indicator and the crisis dummy. They argued that EDF may capture markets' perceptions of the banks' riskiness and consequent ability to issue riskier uninsured funds (i.e. bonds or CDs), which is directly linked to banks' risk profile; less risky banks are perceived to be able to absorb future losses. As expected, their findings suggest that riskier banks, in the perception of investors and other market participants, face greater difficulties in issuing uninsured debt or equity to finance their lending activities, especially during the period of financial crisis. This latter evident is also confirmed by Shin (2008).

As for the impact of non-interest income on the monetary transmission mechanism, banks that refrained from traditional retail banking services and were more engaged on investment banking and other fee-based activities (i.e. securitization, credit derivatives, CDOs) were found to be most hit during the financial crisis: banks with higher amounts of more profitable, yet more volatile non-interest income extended more loans in normal times, but also contracted their lending by more during the crisis. This effect though was partly counteracted by their higher yields arising from the applied interest rate cuts. The effects of non-interest income seem to be favored by weak regulatory supervision.

With respect to securitization, it is found to be positively related to bank lending, suggesting that banks that engage more in securitization activity display on average a higher credit growth. This fact highlights the assumed role of securitization activity as a source of capital relief and additional funding that can serve for the additional extension for bank loans. Altunbas et al (2009a) also reach the same conclusion. Moreover, securitization reacts positively with monetary policy, suggesting that banks with better access to the securitization market are better able to buffer their lending activities against policy-induced shocks to their availability or cost of external finance. This effect though is more pronounced during the financial crisis than in normal times. For instance, in normal times a one percentage point increase in money market rates drives, after three months, a drop in bank lending of 0.7% for the average bank (i.e. that securitizes 0.3% of its assets) and of 0.6% for a bank that is engaged in more intensive securitization activity (i.e. 0.9% of its assets), with these effects being larger if the monetary policy shock occurs during a crisis period: the drop in lending is far more pronounced (3.7%) for the average bank and less severe (0.1%) for the bank that is active in the securitization market. Yet the securitization market was severely hit during the recent financial crisis since August 2009 and banks' ability to originate and distribute ABS was therefore distorted. Thus many ABS ( $\approx$  90% of Euro-denominated ABS issued in 2008) remained self-retained in banks' asset portfolios and mainly served as collateral in refinancing operations with the ECB, implying that the insulation effect of securitization was overall limited during the crisis period 2007-2009. Banks with great involvement in non-traditional banking activities (such as securities, real estate or insurance activities) were also found to supply more lending.

The findings of Gambacorta and Marques-Ibanez also verify the existence of a “risk-taking channel” and control for the previously neglected role of bank funding composition on the supply of bank loans. As for the former, bank lending is found to have expanded by more during periods of particularly low interest rates for a prolonged period of time, which is consistent with the functioning of a risk-taking channel. As for the latter, the impact of banks’ financing mix is examined with the use of two proxies: the deposit to total liability ratio and the short-term funding ratio. They argue that banks with a significant deposit to liabilities ratio will be reluctant to change their deposit rates, since this could have a disproportionately large effect on their total interest rate costs. Meanwhile, banks whose liabilities consist of more bonds than deposits face greater constraints, since their costs rise contemporaneously and proportionally to the market rates. This mechanism may probably become more apparent during crisis periods. Their results confirm the above statements: the impact of deposit to liabilities ratio on bank lending is positive during the period of crisis, whereas it is negative in normal times, suggesting that when the bond market works properly, banks that rely on additional forms of funding are more likely to expand their credit portfolio. The same also applies for the ratio of short-term funding; the higher this ratio during the period of financial crisis, the more banks are forced to alter their loan supply in response to a monetary policy shock.

The above evidence convincingly demonstrates that financial innovation and changes in banks’ business models have obviously altered the dynamics of the traditional bank lending channel, with this outcome becoming more apparent during the recent financial crisis.

## SECTION 5

### 5.1 OVERVIEW

At a glance, this paper has proceeded with a comprehensive review of the existing literature and empirical research on the existence of a bank lending channel across the euro area and the US along with its relative implications on real economic activity.

As said, the traditional bank lending channel focuses on banks and highlights the response of loan supply by depository institutions on monetary policy changes, as the key factor underlying the transmission mechanism. Its function premises on the idea that, besides its direct impact on short-term interest rates, monetary policy also induces a fall in bank deposits, which in turn forces banks to substitute towards more expensive forms of market funding, thus contracting loan supply. The functioning of the bank lending channel is based upon two key assumptions: firstly, banks shall not be able to fully insulate their lending portfolio from a policy-induced drop in deposits and secondly, there shall be some bank-dependent borrowers that cannot easily substitute towards alternative sources of external finance to smooth their lack of bank loans, so that a contraction in bank lending adversely affects their investment and spending decisions. Unless these two preconditions are met, the implications of the bank lending channel on real economic activity are rather insignificant.

So it becomes obvious that the empirical verification of the bank lending channel is set under two dimensions:

- Whether a shift in monetary policy poses an impact on bank lending.
- Whether this effect of monetary policy is transmitted into real economic activity (spending and investment expenditure).

In the US case, the research on the bank lending channel has yielded rather mixed results that can be partly attributed to the different empirical methodologies that have been applied. With respect to the time-series approach with the use of aggregate data, Bernanke & Blinder (1992), Kashyap, Stein and Wilcox (1993) and Gertler & Gilchrist (1994) stand in favor of the existence of a bank lending channel, whereas the findings of Oliner & Rudebusch (1995) are contradictory. Yet the use of aggregate data is somehow misplaced, since it suffers from the loan supply versus demand

identification problem. Another string of research [(Stein (1995), Kashyap and Stein (1997, 2000), Brisimis & Delis (2010), Kishan & Opiela (2000), Peek & Rosengren (1995b)] has tackled this issue, with the use of micro-data at the bank level, applied in reduced form equations that link bank loan supply to monetary policy variables, aiming to test whether the interaction of monetary policy variables with bank size, liquidity and capitalization is an important determinant of loan growth among banks with different balance sheet characteristics. What is drawn as a general conclusion is that the bank lending channel operates mainly through small, undercapitalized banks with less liquid asset compositions.

Moreover, existing research has yielded mixed results in the establishment of a linkage between aggregate bank loan supply shocks and real economic activity. Whereas Peek & Rosengren (1997), Van den Heuvel (2002) and Smant (2002) find evidence suggestive of a possible link between policy-induced changes in the availability on bank credit and real economic activity, Driscoll (2000) and Aschraft (2006) found that economic activity is rather insensitive in lending, implying that the macroeconomic implications of the bank lending channel are rather weak. So it becomes apparent that, unless a linkage between policy-induced loan supply shocks and real economic activity is identified, the importance of the bank lending channel in the overall monetary policy transmission process is diminished.

The findings on the existence of a bank lending channel in the US are rather unlikely to be applicable to the euro area. This is mainly due to the observed asymmetries within the relative structures of the banking and financial markets across EU and the US, which are likely to differentiate the response of bank lending to monetary policy actions and alter the dynamics of the bank lending transmission mechanism.

Indeed, the level of bank dependence in the euro area is sufficiently higher than in the US. Banks hold a predominant role in corporate financing among EU members, while market financing is far less developed than in the US. Beyond the overall degree of bank dependency, there are also plenty of other structural characteristics within the national banking systems (i.e. the prominence of long term lending relationships, the ownership patterns and the degree of government intervention, the extensive deposit insurance schemes, the existence of bank networks, the level of bank concentration



and the size structure of banks) that decrease the overall importance of informational frictions and tend to attenuate the potency of the bank lending channel.

Following the stylized facts and applied models in US studies, the existing studies for the euro area have generated rather inconclusive results. Among them, Favero et al. (2001) have found no support for a bank lending channel in the euro area, whereas the findings of De Bondt (1999), King (2000) and Altunbas et al. (2002) stand in favor of a bank lending channel, although weak in some countries. Erhmann, Gambacorta, Martinez-Pages, Sevestre and Worms (2002) point out that in contrast to US banks, bank size and capitalization are found to have limited explanatory power over the bank lending channel across EU banks, whereas bank liquidity emerges as the single best criterion that determines the sensitivity of bank loans to monetary policy changes. Brissimis and Delis (2010) further highlight the relative importance of market power instead of bank size as a determinant of the differential response of bank loan supply to monetary policy changes.

A string of more recent research using data covering the period of EMU from 1999 onwards have found some evidence supportive of the functioning of a bank lending channel among EU countries. These studies not only ascertain whether monetary policy has any distributional effects on bank loan supply across banks with varying balance sheet characteristics, but also examine the effects of the observed policy-induced changes in bank loan supply on real economic variables. Among them, Melzer (2007) concludes that monetary policy, at least since the introduction of the euro, is not primarily transmitted through the bank lending channel. In contrast, Ciccarelli, Peydro & Maddaloni (2011) verify the existence of a broad credit channel that magnifies a monetary policy shock on GDP and inflation through the balance sheets of households, firms (the borrowers' balance sheet channel) and banks (the bank lending channel) and suggests that in the EU, among alternative channels, the bank lending channel has the most serious macroeconomic implications both for GDP and inflation. Furthermore, Haldane (2010) attempts to quantify the dynamic behavior of the credit cycle and identify its interaction with the real economic cycle, as well as its evolution over time and across countries. He concluded that credit cycles are quite distinct from business cycles in terms of amplitude and frequency, with the latter being determined by factors other than the business cycle, such as financial deregulation and increased competition among banks. He also stressed that credit

aggregates may be able to forecast economic growth. Within the same context, the Economic and Monetary Affairs Committee of the European Banking Federation (EMAC-EFB) verified previous findings that the credit cycle is rather distinct from the business cycle in terms of both synchronicity and amplitude. They further observed that credit growth was found to move along with real GDP growth, yet their correlation varying among countries. Ultimately, they found almost no evidence of a unidirectional causality from credit to GDP growth in any EU country under examination, suggesting that the real business cycle per se is not primarily driven by the lending behavior of banks.

Yet the traditional models fail to incorporate the structural changes that have taken place in the financial sector over the last decade (i.e. intensive use of market funding instruments, securitization and new bank business models). More recent literature has highlighted new dimensions that enrich the current view of how monetary policy affects banks' ability to extend loans and their willingness to bear risks and has altered the micro foundations of the traditional bank lending channel. The so reformulated bank lending channel works primarily through the impact of monetary policy on banks' external finance premium, as determined by their perceived balance sheet strength, in terms of leverage, asset quality and risk attitude. Conventional quantitative constraints on the supply of bank loans (i.e. the amount of deposits or the drop in reserves) are quite de-emphasized and the attention is now drawn on financial frictions faced by banks and on the way policy-induced variations in their external finance premium affect the cost of funds incurred by bank dependant borrowers.

Ultimately under this new framework, Gambacorta and Marques-Ibanez (2010) have further examined whether financial innovation and the new bank business models have altered the dynamics of the bank lending channel, with a closer look in the reported evidence in view of the recent financial crisis. Their paper reports significant changes in the functioning of the bank lending channel of monetary policy due to these innovations and points out that, compared to earlier evidence, the standard bank-specific characteristics usually included in the literature (bank size, liquidity, capitalization) are not able to fully capture the functioning of the reformulated bank lending channel. Instead, the type of funding turns out to be a key determinant in the assessment of banks' ability to withstand policy shocks, short-term funding and

securitization activity being particularly important in this respect. The amount of non-interest, fee-based revenues is also relevant in the transmission process, since banks with high amounts of more profitable yet more volatile non-interest income were found to supply more lending prior to the crisis, but also contracted their lending activity by more during the crisis.

## 5.2 CONCLUDING REMARKS

**From a euro area perspective**, the introduction of the euro has had a positive contribution primarily by removing exchange rate risks among EU countries and better serving for the dual mandate of price stability and inflation targeting, which promotes more harmonized economic development among member-countries. At the same time, a number of changes in the financial sector over the last decade are likely to have affected the potency of monetary policy transmission in the euro area. The first decade of the EMU coincided with an intense process of financial innovation. Securitization activity has served as an alternative source of financing for banks directly through financial markets, thereby weakening the effectiveness of monetary policy in normal times. Furthermore, the emergence of securitization and the enhanced ability of banks to transfer credit risk off their balance sheets have sometimes led them to take on excessive risk, as exemplified by laxer lending standards and their engagement in complex financial products. These developments may have amplified the impact of monetary policy, especially with respect to the risk-taking attitudes of banks. The potential intensification of the risk-taking channel poses challenges for monetary policy makers, in their pursuit for price stability. Yet while affecting the supply of loans at the individual bank level, the relevant significance of these innovations on the overall transmission mechanism as well as their implications on real output and inflation in response to monetary policy changes are left to be examined.

**With regard to the applied empirical methodologies and identification strategies**, nonlinearities and structural instabilities are not properly addressed within the applied empirical models that control for the interaction between shocks within the financial sector and the real economy. This particular deficiency is evident in all classes of models (reduced-form and SVAR models, micro founded DSGE models) exploited.

In fact TVAR models allow for nonlinearities, yet it remains unclear whether this empirical methodology suits well in realistic conditions. The important thing is that the applied models have indeed found nonlinearities in the functioning of the transmission mechanism between normal times and crisis episodes, thus suggesting that these reported differential responses shall be taken into consideration in the conduct of monetary policy within different phases of the economic cycle.

The endogeneity problem, premised on whether the observed correlations between output and money are due to output responding to money and not money demand responding to expectations of future output, is primarily addressed by instrumenting for shocks to the money supply, thereby determining the overall effect of monetary innovations on output. The next step that identifies whether shifts in bank loan supply have any effect on output entails similar difficulties. Given that the demand for loans presumably depends on the level of output, there is simultaneous equations bias in running a regression of output on the quantity of loans. Again loans may also be endogeneously rising in response to an expected future rise in output.

What is more, the disentangling between loan supply versus loan demand shocks in the response of banks to a monetary policy shock is a rather demanding task. From a monetary policy perspective, it is important to understand whether developments in aggregate loans to the non-financial sector are primarily driven by changes in the demand for loans or changes in the supply of loans. Indeed the monetary policy instruments and actions may considerably differ, depending on whether they tackle loan supply, loan demand effects or both. This problem is addressed with the use of micro data derived from bank balance sheets, which take into account the cross-sectional bank characteristics (i.e. bank size, liquidity or capitalization) that may account for a differential response of bank lending to a monetary policy change among various banks. Yet the reduced form equations used are often built under strong assumptions: they often assume uniform loan demand across banks and implicitly regard that those bank specific characteristics identified as determinants of the differential response of loan supply to monetary shocks, do not affect bank loan demand at all. One empirical attempt to overcome the above ambiguity is found in Driscoll (2000) who argues that state-specific money demand shocks is a well suited instrument for shocks to loan supply in regression of output on loans for the US.

Moreover, Ciccarelli, Peydro & Maddaloni (2011) aimed at identifying whether the observed effects of monetary policy changes on credit availability, affect real economic variables, utilizing the confidential Bank Lending Survey (BLS) for the euro area and Senior Loan Officer Survey (SLOS) for the US, which contain detailed information on the actual lending standards applied to the whole range of demanded (not only extended) loans and on the specific factors determining one bank's lending standards, i.e. *credit supply factors*, underlying the bank lending channel, *borrowers' quality indicators*, underlying the borrowers' balance sheet channel and *credit demand factors*. This approach allows for the disentangling of loan supply versus demand effects and the distinction of the different sub-channels of monetary policy transmission-namely bank lending channel, borrowers' balance sheet channel and classic interest rate channel along with their relevant macroeconomic importance.

Turning to this latter fact, a key gap in our knowledge is on the effects of lending on real economic activity. In particular, while there is a sizeable research on how bank balance sheet strength affects the supply of bank loans, there seems to be significantly less research on how these policy-induced shifts in bank lending affect real economic activity. Lately there is a fruitful string of research on this topic that helps to identify the link between policy-induced changes in bank loan supply and shifts in real economic variables. Among them, Haldane (2010) and the Economic and Monetary Affairs Committee of the European Banking Federation (2011) both achieve to quantify the dynamic behavior of the credit cycle and identify its interaction with the real economic cycle as well as its evolution over time and across countries.

What is more, **from a policy perspective** it is quite useful to identify the underlying source of a shock to loan supply. Monetary policy actions may differ substantially if say bank loan supply drops due to banks' reduced ability to raise funds or due to deterioration in borrowers' net worth and distorted creditworthiness. In the former case, an interest rate cut would trigger aggregate demand, so that firms' net worth would improve and the willingness of banks to lend would increase over time. In the latter case, liquidity provision schemes directed to banks would enable them to satisfy the demand for loans and preserve their credit lines with creditworthy borrowers.

Moreover the recent financial crisis, along with its adverse effects on interbank and capital markets, distorted banks' ability to raise funds, thereby forcing them to significantly tighten their credit standards. In this adverse environment, the smooth functioning of monetary policy transmission channels had been impaired and the conventional monetary policy leverage over short-term interest rates per se was found to be insufficient to ensure the maintenance of price stability. In such cases it is crucial for policy makers to have an accurate knowledge of the possible effects of their policy actions on bank lending, so as to be able to alleviate the strains on bank loan supply and enhance the capability of banks to provide funds to the non-financial sector. Indeed this was the case in EMU, where ECB proceeded with a set of non-standard policy measures (i.e. full allotment liquidity operations, the widening of the collateral framework, direct acquisition of bank assets or securitized bank debt), directly targeted to strengthen the resilience of the EU banking sector. Looking ahead, it is still premature to assess whether the consequences of the crisis will pose a more permanent impact on the transmission mechanism. This may highlight the need for a more rigorous regulatory framework that guarantees the sustainability of the banking system, so as to stabilize the potency of the bank credit channel. What is more, the stronger effectiveness of monetary policy reported during the crisis period has to be seen as temporary against the backdrop of the aforementioned unconventional monetary policy actions. Prolonged periods of interest rates are assumed to create distortions in the optimal allocation of spending and investments, while the use of non-standard monetary policies, such as excessive liquidity provision may distort managerial decisions on projects highly sensitive to interest rates.

In particular, the enforcement of *stricter capital requirements* might strengthen the bank capital channel of monetary policy transmission: as more banks become more capital-constrained, they might react more strongly to changes in policy rates by adjusting their loan supply. Though, it might also be expected that banks will respond to the new, more stringent capital requirements by simply increasing their capital buffers, and thereby will not need to adjust their loan supply in response to changes in monetary policy rates. In addition, *more prudent capital and liquidity management* by banks might reduce their risk-taking behavior over the cycle and hence the relevance of the risk-taking channel might be alleviated to some extent. Banks' enhanced liquidity management might also induce banks to operate with higher liquidity buffers

in the future. A common finding in literature on this subject is that banks with higher liquidity ratios are typically better able to shield their loan portfolio from changes in monetary policy. Yet, *ceteris paribus*, more stringent liquidity requirements would, by definition, make liquidity more scarce, thus having the same effect as an increase in interest rates on average, with restrictive implications for the economy whose magnitude is quite difficult to assess. What is more, *the imposition of stricter regulation on securitization activity* might limit funding opportunities for banks, thereby reinforcing the strength of the traditional bank lending channel. The interest rate channel might also be affected, as some studies have found that securitization speeds up the pass-through of policy rates to bank lending rates.

Finally, linking banks' internal credit risk models with regulatory requirements was one of the main purposes of Basel II. Arguably, banks' pricing of credit would become more discriminatory, in the sense of better reflecting the actual underlying risks pertaining to individual exposures. In this sense, it might be assumed that, under the more risk-sensitive Basel II framework, banks' provision of credit is more sensitive to the actual borrower's net worth. This might suggest that the balance sheet channel was reinforced with the introduction of Basel II. To the extent that the new proposals somewhat untie this close link between required capital and underlying risk, some relaxation of the borrower balance sheet channel could be observed in the future.

To conclude, it is quite evident that monetary policy is not neutral from a financial stability perspective. Deregulation and financial innovation have made banking operations much more dynamic and banks are now subject to market conditions and financial instability bouts. In face of this newly emerged financial environment and given their observed impact on bank lending, policy makers should reconsider, along with their primary objective of economic growth and price stability, the effects of their policy actions on banks, so as to promote the soundness of the banking system and preserve financial stability.

Furthermore, the findings of a linkage between policy-induced shifts in bank lending and real economic activity and the interaction of credit and real business cycles, along with the predominant role of banks as key suppliers of loans to non-financial

intermediaries in many countries worldwide, suggests that the bank credit channel deserves the attention of policy makers within a framework of policy coordination.

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