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EVIDENCE FROM THE EURO AREA

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In 2013 all ECB publications feature a motif taken from the €5 banknote.

MACROPRUDENTIAL RESEARCH NETWORK

Macroprudential Research Network
This paper presents research conducted within the Macroprudential Research Network (MaRs). The network is composed of economists from the European System of Central Banks (ESCB), i.e. the national central banks of the 27 European Union (EU) Member States and the European Central Bank. The objective of MaRs is to develop core conceptual frameworks, models and/or tools supporting macro-prudential supervision in the EU.

The research is carried out in three work streams: 1) Macro-financial models linking financial stability and the performance of the economy; 2) Early warning systems and systemic risk indicators; 3) Assessing contagion risks.

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The refereeing process of this paper has been coordinated by a team composed of Gerhard Rünstler, Kalin Nikolov and Bernd Schwaab (all ECB).

The paper is released in order to make the research of MaRs generally available, in preliminary form, to encourage comments and suggestions prior to final publication. The views expressed in the paper are the ones of the author(s) and do not necessarily reflect those of the ECB or of the ESCB.

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Abstract

We analyze the impact on lending standards of short-term interest rates and macroprudential policy before the 2008 crisis, and of the provision of central bank liquidity during the crisis. Exploiting the euro area institutional setting for monetary and prudential policy and using the Bank Lending Survey, we show that in the period prior to the crisis, in an environment of low monetary policy interest rates, bank lending conditions unrelated to borrowers' risk were softened. During the same period, we also provide some suggestive evidence of excessive risk-taking for mortgages loans. At the same time, we show that the impact of low monetary policy rates on the softening of standards may be reduced by more stringent prudential policies on either bank capital or loan-to-value ratios. After the start of the 2008 crisis, we find that low monetary rates helped to soften lending conditions that were tightened because of bank capital and liquidity constraints, especially for business loans. Importantly, this softening effect is stronger for banks that borrow more long-term liquidity from the Eurosystem. Therefore, the results suggest that monetary policy rates and central bank provision of long-term liquidity complement each other in working against a possible credit crunch for firms.

JEL CODES: E51, E52, E58, G01, G21, G28

Non-technical summary

The impact of low monetary policy rates on the risk attitude of the banking sector and its implications for the provision of credit to the economy is at the centre of the policy and academic debate. A related question is whether specific macro- and micro-prudential policies, designed to limit bank risk-taking, may reduce the potential negative impact of very low monetary rates on banking stability. On the other hand, once a crisis starts – and the risk in the balance sheets of banks realizes – a central issue is also whether standard monetary policy (low monetary rates) and the provision of long-term liquidity by the central bank may induce the banking sector to increase the supply of credit to firms and households.

The empirical analysis in this paper addresses these issues in the euro area covering the period from 2002 to the end of 2010. Therefore it investigates some of the causes and features of the recent financial crisis and also identifies appropriate prudential policies that can support the stability of the banking system. The evidence provided suggests that, prior to the start of the 2008 crisis, in an environment of low interest rates, there was a general increase in the risk taken by banks through their lending activity, in turn inducing an increase in the risk of the system. The environment of relatively low short-term interest rates prior to the start of the crisis seems to have contributed, through its impact on the balance sheets of banks, to the softening of lending standards for all categories of borrowers (both firms and households). Other factors that have been mentioned as possible culprits of the crisis, like low long-term interest rates and current account deficits, do not correlate much with soft lending standards. At the same time, there is suggestive evidence of excessive risk-taking in mortgage lending.

Most importantly for what concerns regulatory policies, the analysis shows also that the impact of low monetary rates on bank risk-taking is lower when more stringent prudential

policy on either bank capital or loan-to-value ratios for mortgages are in place. This implies that the potential dangers for banking stability arising in an environment of low monetary rates may be reduced by a more stringent regulatory and supervisory setting, including the enforcement of macroprudential policies. These results thus contribute to the analysis of the interaction between monetary and macroprudential policy.

After the start of the 2008 crisis, low monetary interest rates, by easing bank balance sheet constraints on capital and liquidity, have helped to soften lending standards for borrowers. This effect, moreover, is more pronounced for weaker banks –the banks with more need of stimulus. Our results suggest that monetary policy rates and central bank provision of long-term liquidity complement each other in working against a possible credit crunch for firms.

1. Introduction

Since the start of the severe banking crisis of 2008, the question of how monetary policy affects banking stability has been at the center of an intense academic and policy debate. Concerning the period before the crisis, a key question is whether low monetary policy rates might have spurred risk-taking by banks. Nominal rates during the 2002-2005 period were the lowest in the last decades, below Taylor-rule implied rates and even real rates were negative in several countries.[2]

While some recent literature shows that keeping monetary policy rates too low can increase banks' appetite for credit and liquidity risk due to banks' moral hazard problems (Jiménez et al., 2012a), overall the theoretical literature on this topic is inconclusive. In particular, recent theoretical banking micro-based work suggests that changes in the monetary policy rate may affect credit risk-taking by financial institutions. Allen and Gale (2000, 2004, 2007) show that under expansive monetary policy, and in the presence of bank moral hazard, risk-shifting in lending may occur.[3] Adrian and Shin (2010b) describe the risk-taking channel of monetary policy and show that expansive monetary policy increases lending and risk-taking by banks when their Value at Risk (VaR) constraint is binding in capital. Acute agency problems in banks, combined with a reliance on short-term funding, may therefore lead low short-term interest rate - more than low long-term interest rate - to spur risk-taking (Diamond

[2] See Rajan (2010), Taylor (2007 and 2008), Calomiris (2008), Besley and Hennessy (2009), Diamond and Rajan (2009), Blanchard (2008 and 2009), Allen and Carletti (2010), Allen and Rogoff (2011), among others. See Reinhart and Rogoff (2009) for a history of financial crisis.

[3] See Allen and Rogoff (2011), pages 23-25 for a summary of the Allen and Gale (2000, 2004, 2007) models. Low short-term interest rates make riskless assets less attractive and may result in a search-for-yield especially by those financial institutions with short-term time horizons (Rajan 2005, Blanchard 2008, Borio and Zhu 2008; See also Holmstrom and Tirole 2011, and the many references therein, Borio and Lowe 2002, Dell'Ariccia and Marquez 2006, Dell'Ariccia, Laeven and Marquez 2011, Valencia 2011).

and Rajan, 2006 and 2012). On the other hand, there are also mechanisms that could work in the other direction. Higher interest rates may, in general, increase the risk-taking incentives of borrowers due to moral hazard (Stiglitz and Weiss 1981), or even reduce the banks' net worth or charter value enough to make a "gambling for resurrection" strategy attractive (Kane 1989). These countervailing effects make the impact of the short-term interest rate on credit risk-taking ultimately a critical, yet largely unaddressed, empirical question.

A related question is whether prudential policy, by limiting moral hazard frictions, may reduce the impact of low monetary rates on risk-taking. But once the risk in the balance sheets of banks realizes and the crisis period starts, a central issue is whether low monetary rates and public provision of long-term liquidity may induce the banking sector to increase credit supply for firms and households.[4]

In this paper we empirically analyze these issues in the euro area, exploiting some unique features of the Monetary Union. First of all, the euro area represents a unique institutional setting with a common monetary policy but differences in the business and credit cycle and in prudential supervision. Moreover, in the euro area, funding to the corporate sector largely comes from banks and, therefore, a crisis affecting the banking sector has dramatic consequences for the real economy through the reduced credit provision. Finally, we take advantage of a unique dataset on lending conditions for the euro area (the Bank Lending Survey, BLS) – where we know whether and *why* loan conditions change for the pool of all borrowers, including the rejected applications.

First, before the 2008 crisis, we analyze whether monetary policy rates affect lending terms and conditions for business and household loans, over and above other factors identified

[4] See e.g. Bernanke and Gertler (1995), Bernanke and Blinder (1992), Kashyap and Stein (2000), Gertler and Kiyotaki (2010), Adrian and Shin (2010b), Jiménez et al. (2012b). See also Giavazzi and Giovannini (2010).

as culprits of the last crisis, in particular low long-term interest rates and current account deficits, among others.[5] In particular, we focus on whether monetary policy rates affect changes in lending conditions that can be related to bank credit supply factors. These factors are bank capital and liquidity constraints – balance sheet factors - and competition pressures. They are not related to changes in the net worth and credit risk of borrowers, which can be considered credit demand factors related to the fundamentals of firms and households. Therefore, since these lending terms and conditions are unrelated to borrower quality, they reflect changes in credit and liquidity risk-taking by banks.[6]

We analyze whether more stringent prudential supervision and regulation for banks affect the impact of monetary policy on lending standards. We use two cross-country measures of prudential banking policy. The first is a measure originally developed by researchers at the World Bank on the *stringency* of bank capital supervision, i.e. how stringent capital requirements are applied to the banking sector in each country. The other measure, more related to macro-prudential policy, is based on the restrictions to the loan-to-value ratios (LTV) for mortgage loans applied in different countries.[7] Second, once the 2008 crisis starts, we run a similar analysis and investigate whether lower monetary policy rates soften lending conditions and in particular lending conditions due to bank capital and liquidity problems (supply factors). Moreover, we also include in the analysis the long-term liquidity provision of the ECB – the key (non-standard) monetary policy measure that has been implemented in the crisis. In this way we analyze whether the potential softening of lending conditions is stronger

[5] Low long-term rates and current account deficits may proxy for global imbalances for capital inflows (a key determinant of liquidity). These factors may have been important for the crisis (see Besley and Hennessy 2009, Diamond and Rajan 2009, Bernanke 2010).

[6] Banks take higher risk in their lending activity by granting loans with higher default probability and loss given default (credit risk), but also by lengthening the loan maturity as in Diamond and Rajan (2012), i.e. liquidity risk-taking.

[7] See Barth, Caprio and Levine (2006) for the measure of stringency of bank capital and IMF (2011) for the restrictions on LTV ratios.

in banking systems where banks have limited access to private liquidity in the wholesale markets and, therefore, recur more to the public liquidity from the Eurosystem (credit enhancement operations carried out by the ECB through full allotment fixed-rate long-term liquidity providing operations).

The empirical analysis of these questions in the euro area is of particular interest for three main reasons: (i) the European economy and its banking sector were heavily affected by the financial crisis. Moreover, bank financing constitutes around 75-80% of corporate funding in the euro area.[8] (ii) The unique data on lending conditions in the euro area (from the Bank Lending Survey), as explained above and in Section 2, allow the identification of bank credit supply (not related to non-financial borrower demand/fundamentals). (iii) The monetary union provides a unique setting for this kind of analysis. Monetary policy (nominal) rates in the euro area are identical across countries, but there are significant differences in terms of GDP growth and inflation.[9] Moreover, banking supervision (and even somewhat regulation) is a responsibility of the national authorities, whereas the monetary policy is set by the Governing Council of the European Central Bank (ECB). Furthermore, as we will discuss also later, through time fixed effects we can control for unobservable time-varying common variables shocks that affect the monetary policy decisions of the ECB and lending standards, as for example commodity and oil prices shocks or expectations on euro area future GDP growth and inflation. In this case, the identification of monetary policy is largely cross-sectional which allow us to deal with the typical endogeneity problem of monetary policy to local economic conditions.

[8] See Allen, Chui and Maddaloni (2004) for a comparison of the financial systems of Europe, USA and Asia.
[9] See e.g. Camacho et al. (2008) and Taylor (2008).

A major identification challenge faced by researchers wanting to analyze the credit channel of monetary policy is to disentangle changes in loan demand and in loan supply.[10] It is very difficult to obtain data on the lending conditions applied to the *pool of potential borrowers* (including households and firms that were rejected), and to know whether, how and especially *why* banks change their lending conditions. The detailed answers of the confidential and unique Bank Lending Survey (BLS) for the euro area countries provide this information.[11] Importantly, the BLS reports and quantifies the factors affecting banks' decisions concerning change in lending conditions, which is a key piece of information to analyze credit and liquidity risk by banks. These factors can be grouped in (i) factors related to the quality and risk of loan applicants: net worth, collateral and credit risk of borrowing firms and households (therefore credit demand factors) and (ii) factors related to bank balance sheet capacity (capital and liquidity constraints and access to market funding) and competition pressures. These factors are not related to borrowers' risk and we interpret them as identifying bank risk-taking. This detailed information that is available in the BLS is therefore crucial to identify the impact of monetary policy on loan supply and risk-taking.

We show that – prior to the start of the 2008 crisis – low (monetary policy) short-term interest rates may have contributed to soften lending conditions and terms, for both firms and households.[12] Specifically, low short-term rates tend to soften lending conditions due to changes in bank net worth, liquidity and competition (supply factors). When we include other factors that have been mentioned as possible culprits of the crisis, we note that the

[10] See Bernanke and Gertler (1995) and Bernanke (2007) for the definitions of the (broad) credit channel of monetary policy, the non-financial borrower (firm and household) balance sheet channel, and the bank lending channel (or bank balance sheet channel).

[11] See the Appendix for details about the survey and Maddaloni and Peydró (2011) for a discussion on the reliability of the information contained in it.

[12] Maddaloni and Peydró (2011) also show these results. They analyze changes in lending conditions and terms, whereas the key innovation of this paper is to analyze changes in lending conditions not related to borrower risk (i.e. to study bank risk-taking and credit supply).

impact of low short-term rates on lending standards is statistically and economically more significant than the effect of low long-term interest rates or current account deficits. In fact, we do not find robust evidence that low long-term rates and current account deficits correlate with soft lending standards. Finally, concerning regulatory policies, we find that the impact of low monetary policy rates on the softening of lending standards is reduced by more stringent prudential policy on either bank capital or LTV – i.e., we find a heterogeneous impact of monetary rates on lending standards depending on the stringency of prudential policy.

The evidence that we present, suggests that, in an environment of low interest rates, there was a general increase in the risk taken by the banks through their lending decisions. It is important to point out that even this evidence would be enough to argue that the stability of the entire banking system was hampered and therefore the likelihood of a crisis increased. In other words, even if each single bank takes consciously more risk and correctly accounts for that, the accumulation of risk in the system would be greater with potential negative externalities to the financial sector and the real sector – i.e., systemic risk increases. However, we take one further step in the analysis and try to analyze the issue of "excessive" risk-taking from banks. Indeed, we find some suggestive evidence consistent with "excessive" risk-taking in mortgage loans when interest rates are low. We find that lending conditions are softened for borrowers that are considered riskier from the banks (as opposed to average borrowers). In this analysis we control for key factors as the business cycle, the long-term rates, the aggregate bank capital and liquidity position, and, crucially, for the changes in borrower risk and quality. Controlling for long-term interest rates is particularly important in this case as mortgage loans have long maturity and the lending standards should therefore be less affected by short-term rates.

After the start of the 2008 crisis, we find evidence that low (monetary policy) short-term interest rates soften lending conditions and terms that were tightened because of bank capital and liquidity constraints. Moreover, these effects are stronger for banks that borrow more long-term liquidity provided by the Eurosystem through its "credit enhancement" policies (i.e., the banks with weaker balance sheets that are therefore more rationed in the wholesale market).[13] All these results are robust for business loans. Therefore, the results suggest that monetary policy rates and public provision of long-term liquidity complement each other in reducing a credit crunch for firms.[14]

We also find that banks entering the crisis with a better capital position can soften lending conditions more than banks with higher capital constraints. All this evidence is consistent with the action of the bank lending channel of monetary policy, both through changes in monetary rates and non-standard monetary policy measures (see Kashyap and Stein 2000; Bernanke and Gertler 1995; Adrian and Shin 2010b, Gertler and Kiyotaki 2010) – i.e., monetary policy has an effect on the supply of credit (over and above changes in borrowers' quality and risk). .

We make three specific contributions to the literature: (1) Given the detailed data available in the euro area BLS, we can analyze whether there is evidence of risk-taking by banks by focusing on changes in lending conditions and standards not related to borrower-demand (firm or household) fundamentals (risk and quality), but due to changes in bank net worth and competition (capital, liquidity and competition), i.e. supply factors. This represents a step forward in the analysis of risk-taking compared to Maddaloni and Peydró (2011), where

[13] See Trichet (2009).
[14] See Jiménez et al (2012b) for the analysis and identification of credit crunch in Spain and Ciccarelli, Maddaloni and Peydró (2013) for an aggregate analysis at the euro area level, taking into account heterogeneity across countries.

we analyze changes only in the *overall* lending conditions. Overall lending conditions depend also on borrowers' quality and net worth (that are affected by "demand" factors). We control explicitly for changes in credit demand (as reported in the BLS) and we analyze the impact of low interest rates on specific lending conditions such as loan spread, volume, maturity, collateral and LTV. To identify *excessive* risk-taking we analyze loan conditions that banks apply to riskier borrowers, over and above improvements in borrowers' quality and risk, bank capital and liquidity and long-term interest rates. Moreover, we analyze the impact on lending standards (risk-taking) of monetary policy rates compared to other key factors mentioned as culprits of the crisis (in particular, current account deficits and long-term interest rates). (2) We use LTV restrictions for mortgage loans to analyze the impact on lending standards of the interaction between monetary policy and macro-prudential policy. (3) During the time of the crisis we investigate the impact of monetary policy on lending conditions and standards by considering changes in short-term monetary rates in conjunction with non-standard monetary policy measures carried out by the ECB through the full allotment fixed-rate long-term liquidity operations – we analyze whether changes in monetary policy carried out by variations in short-term rates and in public provision of long-term liquidity complement (or substitute) each other in softening lending standards.

The rest of the paper proceeds as follows. Section 2 describes the data and the methodological setup. Section 3 discusses the results, and Section 4 presents the conclusions.

2. Data

Lending standards

The main dataset used in the study are the answers from the Bank Lending Survey for the euro area (the BLS). National central banks request that banks (senior loan officers, such as the chairperson of the bank's credit committee) provide quarterly information on the lending conditions and terms they apply to customers and on the loan demand they receive, distinguishing between business, mortgage, and consumer loans.[15] Credit supply is monitored by asking about changes in lending conditions, about the factors responsible for these changes, and about the specific terms applied to customers (i.e., whether, why, and how lending conditions are changed).

The euro area results of the survey – a weighted average of the answers received by commercial banks in each euro area country – are published every quarter on the website of the ECB. In a few countries the aggregate answers of the domestic samples are published by the respective national central banks. However, the overall sample including all the answers at the country and bank level is confidential.

Data from the euro area BLS are available since 2002:Q4. The main set of questions did not change since the start of the survey. While data are currently available for the 17 countries comprising the euro area, we restrict the analysis to the 12 countries in the monetary union as of 2002:Q4, thus we work with a balanced panel. Over this period we consistently have data for Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. The sample of banks is representative of the banking sector

[15] We report only the results of the analysis on business and mortgage loans. Consumer loans amount to around 10% of the total outstanding amount of bank loans in the euro area.

in each country.[16] This implies that the sample generally includes banks of different size, although at the onset of the survey some preference was given to the inclusion of large banks.[17]

In the first part of the paper, we examine the impact of monetary policy on lending conditions and standards (bank risk-taking as defined in the Introduction) before the start of the financial crisis, i.e. we stop the analysis in 2008:Q3, in correspondence with the bankruptcy of Lehman Brothers and the start of the implementation of *non-standard* measures by the central banks. In the second part we analyze the crisis period up to 2010:Q4, when the Eurosystem implemented the non-standard measures of liquidity provision to the banking sector (full allotment, fixed-rate, long-term liquidity).

We use the answers related to the changes in lending standards over the previous three months (see Berg at al. 2005 and the Appendix for a detailed description of the BLS questions). The questions imply only qualitative answers and no figures are required: banks indicate softening, tightening or no change of standards. Following for instance Lown and Morgan (2006), we quantify the different answers on standards by using the net percentage of banks that have tightened their lending standards over the previous quarter, which is defined as follows: the difference between the percentage of banks reporting a tightening of lending standards and the percentage of banks reporting a softening of standards. Therefore, a positive figure indicates a *net tightening* of lending standards. We calculate this variable for both corporate and mortgage loans.

As explained earlier, in order to identify the impact of low rates on bank risk-taking, in most regressions we use the answers related to the bank balance sheet factors affecting the

[16] When foreign banks are part of the sample, the lending standards refer to the credit policy applied in the domestic market.
[17] See Berg et al. (2005), Maddaloni and Peydró (2011) and Ciccarelli et al. (2010).

decision to change lending standards. These factors are in particular capital and liquidity constraints and difficulty in accessing market funding. Since these factors are not related directly to borrower's risk, we consider these answers from the BLS as a good proxy for the *capacity* of banks to extend credit, in other words a measure of credit supply. We focus on the role played by low interest rates and by the central bank liquidity provision in relaxing bank balance sheet constraints and ultimately supporting bank lending to the non-financial sector by increasing credit supply. We also look at the effect on credit supply of different supervision standards for bank capital and different norms for loan-to-value (LTV) ratios applied to mortgage loans across countries.

To give some flavor of the cross-country dimension of the BLS data, Figure 1 shows how lending standards have changed over time in the euro area, in Germany and in Italy. The Figure shows that there is heterogeneity across the euro area countries, both for credit demand and loan conditions unrelated to borrowers' net worth and risk). Although factors related to borrower risk (general economic outlook and borrowers specific risks, the light grey areas in the charts) have played a major role in affecting lending conditions since the start of the crisis, factors related to bank balance sheet factors (the dark grey areas) have been important as well and resurfaced in the last quarters of our sample due to the intensification of the sovereign crisis and the difficulties of banks to access funding. At the same time, during the boom years, lending conditions, especially due to bank balance-sheet factors and competition were softer. The charts also show changes in the demand for loans, highlighting the cross-country differences.

Since lending standards set by the banks may be influenced also by the loan demand received, we use the responses from the BLS related to the demand for loans as a control variable in the regressions.

Tables 1 describe the summary statistics of overall lending conditions and lending conditions due to changes in bank balance sheet factors, before the crisis and during the crisis (Panel B). In the Appendix we report the main questions of the BLS and the mapping between these questions and the variables that we use in the analysis.

Macroeconomic and financial variables

The macro and financial variables included in the main analysis are short-term (monetary policy) rates, long-term (government bond) interest rates, current account balance (over GDP), GDP growth, inflation, supervision standards for bank capital and restrictions on the maximum loan-to-value ratio applied to mortgage loans. We also collect data on total bank capital ratio and on bank liquidity (interbank ratio) from the balance sheets of the sample of banks of the euro area countries included in Bankscope.[18] In the analysis during the crisis we also use data on the liquidity provisions of the Eurosystem to euro area banks, and we concentrate in particular on the long-term refinancing operations (from 3-month to 1-year maturity). Table A.2 in the Appendix details all the variables and the data sources.

Before the crisis, we make use of two different measures to identify monetary policy. First, we use the quarterly average of the EONIA rate, the overnight interest rate for unsecured interbank transactions in the euro area (as published by the ECB).[19] To control for

[18] In Bankscope, the interbank ratio for a bank is defined as the funds lent to other banks divided by the funds borrowed from other banks. If this ratio is greater than 100 then the bank is a net lender of funds in the interbank market, and therefore it is more liquid.

[19] In the US the overnight interest rate has been used as an indicator of the U.S. stance of monetary policy by Bernanke and Blinder (1992) and Christiano et al. (1996) among others. In the euro area, the Governing Council of the ECB set the values of the three key policy rates defining the corridor where the overnight money market rate

the endogeneity of monetary policy we use cross-sectional variation of monetary conditions as measured by the Taylor rule residuals obtained by regressing the overnight rates on GDP growth and inflation.[20] We estimate the residuals for the euro area with panel least squares (LS) regressions, imposing common coefficients for all 12 countries, given the common monetary policy. A positive residual indicates relatively high monetary policy rates (tight monetary conditions for a certain countries), while negative residuals proxy for low rates (soft conditions). Figure 2 shows the changes of Taylor-rule residuals for the euro area and their volatility. There is a lot of variation of Taylor rule residuals during our sample period and this variation is exactly what we want to exploit.

In the second part of the analysis, when we estimate the impact of low monetary rates during the crisis times, we also characterize monetary policy with an additional variable, the outstanding amount of long-term liquidity (with maturity between three month and one year) that the central banks provided to the banking sector of each euro area country (scaled by GDP). Longer-term refinancing operations (where banks could go to the central banks of the Eurosystem and get liquidity in exchange of collateral for up to one-year) and the full allotment policy (no limit in the amount of liquidity provided in exchange of collateral) are the most important non-standard monetary policy measures implemented by the ECB. EONIA rates were affected by the overall effect of the fixed-rate full allotment liquidity policy (implying that EONIA rates dropped at levels substantially lower than the MRO (policy) rate after the implementation of the full allotment). In addition, we include the cross-country

(EONIA) can fluctuate. Therefore, the overnight rate is also a sensible measure of the monetary policy stance in the euro area.

[20] See also Maddaloni and Peydró (2011). The purpose of this exercise is to exploit the cross-sectional variation of monetary policy conditions in the euro area reflecting the fact that monetary policy rates are identical for euro area countries but GDP and inflation remain different. Therefore, we are interested mainly in identifying differences in monetary policy shocks across countries more than correctly identifying the size of monetary policy shock for each country, which would require the estimation of more precise Taylor-rules possibly including other variables in addition to GDP and inflation.

heterogeneity over time in the banks' borrowing at the Eurosystem liquidity operations (with maturity higher than 3 months). We analyze how these measures have interacted with monetary conditions, as defined by Taylor-rule residuals.

Global imbalances have been often mentioned as significant factors bringing to the crisis. These global imbalances resulted in very low levels of interest rates over the maturity spectrum and in considerable current account deficits. Therefore, we include in the analysis the 10-year government bond interest rate and the current account balance (as % of GDP) for each euro area country to take into account global imbalances.

The main macroeconomic controls are the annual real GDP growth rate and the inflation rate, defined as the quarterly average of monthly inflation rates expressed in annual terms. We also include in the model the interbank ratio and the total capital ratio to control for bank liquidity and capital position. These measures are the median values at the country level of the ratios on total bank capital and interbank ratio from the sample of banks reported in Bankscope.

It has been argued that regulatory arbitrage for bank capital has been key in precipitating the financial crisis (Acharya and Richardson 2010). To shed some light on this matter, we look at the impact of low interest rates on lending conditions controlling for supervision standards. We use a bank capital stringency index as a measure of supervision standards for bank capital. Capital stringency is an index of regulatory oversight of bank capital which quantifies the supervisory approach to assessing and verifying the degree of bank capital at risk (Barth et al. 2006, Laeven and Levine 2009).

A measure that it is often mentioned as a possible tool for macroprudential policy is the imposition of limits to the loan-to-value ratios applied to mortgage loans. This tool is

particularly important since it is directed to the mortgage market where the most significant imbalances accumulated before the current crisis. We include in the analysis a measure of the LTV ratio restrictions applied in different euro area countries; we take this information from a recent IMF publication (IMF 2011).

Table 1, Panel A, provide the summary statistics of all these variables. It is important to note that there is ample cross-country and over time heterogeneity in Taylor-rule residuals, business cycle and lending conditions (see also Figure 1, for the variation over time in the euro area, Germany and Italy for the cross-country variation of lending conditions).

In terms of methodology we estimate a series of panel regressions of the form:

$$LS_{i,t} = \alpha_i + \beta X_{i,t-1} + LS_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where $LS_{i,t}$ are the measures of lending conditions from the BLS at time t for country i and the vector $X_{i,t}$ contains all the monetary policy, financial and macro variables. All the explanatory variables are lagged by one quarter to control for endogeneity and we also include the lagged dependent on the right hand side to control for autocorrelation. We estimate the panel regressions first using Generalized Least Squares, which allow controlling for cross-country correlation and heteroskedasticity. Since the coefficient of the lagged dependent variable is significant, GLS estimation may be biased when including fixed effects. Therefore, we resort in most of the regressions to the GMM estimator proposed by Arellano and Bond 1991 (see also Arellano 2003) which uses lags of the dependent variable as instruments. All estimations are carried out using robust standard errors. [21]

[21] The Nickel bias induced by the presence of the lagged dependent variable with the country fixed effects would converge to zero for a T sufficiently high (with the rule of thumb in the literature being more than 20 periods). In this case estimation by GLS would be unbiased in our sample. Using GMM to run the regressions as shown in Table 3 and successive tables, yields broadly similar results. In the second part of the paper, when we run the analysis during crisis times, we have less than 20 periods; however, results are robust to not including lagged credit standards (unreported results available upon request).

3. Results

We first analyze the lending conditions and standards until 2008:Q3, the date that we consider as the starting point of the crisis (Tables 2 to 5). Next, we run a similar analysis during the crisis time (Tables 6 to 8), until 2010:Q4. We also provide some robustness analysis in an Appendix.

Lending conditions and standards before the crisis

The results are reported as follows. First, we analyze the impact of short-term interest rates on overall lending conditions without any controls (Table 2). Then, we repeat similar regressions including all the control variables we discussed in the previous section and time and country fixed effects (Table 3). Table 4 shows the results of regressions where the dependent variables are the specific terms and conditions for the loans. Finally, in Table 5 we analyze the interaction of monetary policy and banking prudential policies on lending conditions and standards (LTV restrictions and bank capital stringency).

Table 2 shows that lower monetary policy rates, either measured by overnight rates or Taylor-rule residuals, imply a softening of overall lending conditions (columns 1 to 4) and of lending conditions due to bank balance sheet constraints (columns 5 to 14). The results are obtained with GLS panel estimation including the lagged lending standards as regressors to control for autocorrelation. We also include time fixed effects to control for unobservable time-varying common shocks that affect lending standards and ECB monetary policy decisions, as for example commodity and oil prices changes or expectations on euro area future GDP growth and inflation.[22]

[22] All regressions in which we introduce controls include time fixed effects. Results of the same regressions without time fixed effects are available upon request.

In the other Tables (Table 3 to 5), we include all the controls, including country fixed effects. Since the coefficient in Table 2 of the lag is positive and significant, the results of the GLS estimation can be biased and therefore we use in the following regressions the GMM estimator using lags of the dependent variable as instruments.

Table 3 shows that the results of Table 2 are robust to the inclusion of key controls as country and time fixed effects, GDP growth, inflation, long-term interest rates, current account balance, credit demand changes, and aggregate bank capital and liquidity. The estimation confirms that lower monetary policy rates (measured by Taylor-rule residuals) are followed by softer lending conditions, measured by overall lending conditions and standards but also by lending standards related to bank balance sheet factors.

All in all, the analysis shows that monetary policy rates affect changes in lending conditions related to changes in bank net worth stemming from changes in bank capital and liquidity. The results indicate that monetary policy may impact credit and liquidity risk-taking, since banks seems to soften lending conditions even when holding constant borrower credit risk. Moreover, results are robust to the inclusion in the analysis of aggregate bank liquidity and capital ratios. This suggests that low short-term rates soften lending conditions over and above the current balance sheet position of banks, thus hinting to a mechanism implying changes in risk aversion (see Borio and Zhu 2008).

Current account balance is not highly correlated with lending conditions and, if anything, current account deficits are associated with tighter lending conditions (see column 3). The coefficients of current account balance and long-term rates are generally not statistically significant, which suggest that the impact of low short-term rates on credit and liquidity risk-

taking is statistically and economically more significant than the effect of low long-term interest rates or current account deficits.

The BLS provides a qualitative indication of changes in lending conditions, therefore it is difficult to estimate the size of the impact produced by these changes. Nevertheless, looking at the information from the summary statistics of Table 1 and the coefficients of Table 3 of Taylor-rule residuals and of the key controls (like GDP), we can conclude that the impact of monetary policy is also economically significant in explaining lending conditions – as the coefficients of monetary rates, also taking into account the standard deviations, are higher in absolute terms than the coefficient of GDP, and GDP is important in explaining change in lending standards as emphasized in Ruckes (2004) and Dell'Ariccia and Marquez (2006) among others.

In Table 4 we analyze the impact of monetary policy on the specific terms and conditions of loans. It is notable that low short-term rates seem to have a significant softening impact on margins (lending rates) applied to both average and riskier loans, but also on loan volume, collateral, maturity, covenants, and LTV. These results suggest that banks tend to take higher credit risk in granting new loans in an environment of low interest rates (lower spreads to riskier marginal borrowers, covenants and collateral). As they also lengthen the maturity of loans, at least for business loans, they also seem to take higher liquidity risk.

In the last two columns of Table 4, we take a step forward in the analysis and estimate two different regressions to investigate the notion of "excessive" risk-taking – of course with the caveat that identifying excessive risk is a very difficult empirical task. We regress the changes in *loan margins applied to riskier loans* on Taylor-rule residuals. We control for the changes in lending conditions due to variations in borrowers' net worth from the BLS

(therefore holding constant borrowers' quality)[23] and for all the other controls. The coefficient of Taylor-rule residuals for the regression using lending standards for mortgage loans remains significant. This result suggests that before the onset of the financial crisis banks softened margins on mortgage loans even for borrowers that they considered riskier holding constant credit risk.[24] This result is robust to the inclusion of the relevant interest rates (the long-term rates), and also the aggregate bank capital and liquidity (therefore controlling for the more classical bank lending channel). Results therefore suggest that there was possibly some excessive risk-taking in mortgage lending before the crisis when both monetary policy and long-term rates were very low.

Finally, in Table 5 we analyze the interaction between Taylor-rule residuals and banking prudential supervision/regulation measures. We use two key policy measures, one on bank capital supervision stringency and one on restrictions on LTVs. We find some evidence that the impact of low monetary policy rates on the softening of lending standards (softening of lending conditions due to bank capital, liquidity costs or competition pressures) is reduced by a more stringent policy on either bank capital or LTV. Note that this is generally not the case with overall lending conditions (columns 1 and 4) but interestingly it holds with changes in lending standards due to *bank* balance sheet factors – notably, changes in lending conditions due to the bank liquidity position for the capital supervision measure and changes in lending conditions due to bank competition for the LTV measure. This further reinforces the interpretation that a more stringent prudential policy may be very important in reducing the

[23] Specifically, these are the lending standards tightened because of increased *Perception of risk*: changes in *General economic conditions*, in *Industry/firm outlook* and in *Risk of collateral* (for business loans) and changes in *Housing market prospects* (for mortgage loans). See Table A.1 in the Appendix, answers to Questions 2 and 9, factors C.

[24] Both coefficients remain significant if we do not include time fixed effects. Results are also robust to not including lagged credit standards as a control variable or to introducing (or not) country fixed effects (results available upon request).

incentives for the banks to increase risk-taking in an environment of low monetary policy rates.

Lending conditions and standards during the crisis

The results are reported as follows. We first analyze the impact of short-term interest rates on overall lending conditions during the crisis (Table 6) with no controls and using GLS estimation as in Table 2. Then, we use GMM and include all the controls as we have done before the crisis, reporting results with and without time fixed effects (Table 7). In the last set of estimations (Table 8) we differentiate banks by the long-term liquidity borrowed from the Euroystem as explained in Section 3.

Table 6a shows that after the start of the crisis in 2008:Q3, low (monetary policy) short-term interest rates have softened overall lending conditions (columns 1 and 2) and tighter lending standards for firms due to bank capital and liquidity constraints (columns 5 to 12). Low monetary policy rates – by improving bank liquidity and capital – increase credit availability for both firms and households. The coefficients are always significant when including overnight rates but the results are less robust with Taylor-rule residuals.[25] In Table 7b, we carry out similar estimations with GMM and include all the control variables, which may be more important than in the period before the crisis given the large shocks occurred during the crisis. The results of Table 6 are confirmed but only for business loans. The coefficient related to overall lending conditions for mortgage loans and to lending standards for mortgages due to balance sheet factors are not significant. In Table 8a, when we do not include time fixed effects (due to the small number of observations), the coefficients of

[25] It should be noted that the number of observations after the crisis is significantly lower than in the previous regressions. This may decrease significantly the power of the estimation.

Taylor-rule residuals are significant also for lending conditions due to balance sheet factors (for business loans).

It is also interesting to note that the coefficient of total capital ratio is negative and mostly significant. This suggests that banks entering the crisis with a better capital position have softened lending conditions more.

To countervail the impact of the crisis and in particular to restore the transmission of the monetary policy in the euro area, the ECB has implemented a policy of full allotment liquidity provision to the banking sector. Moreover, the central bank has stepped up the scale of provision of long-term liquidity (longer than 3-month of maturity). In the last part of the analysis we take into account also the long-term liquidity provisions of the ECB.

In Tables 8a and 8b (with and without time fixed effects) we introduce the long-term liquidity provided by the ECB at the country level (scaled by GDP) and also the interaction between the measure of monetary rates (Taylor-rule residuals) and the central bank liquidity. The results of the estimation suggest that the impact of short-term rates is stronger for banks that borrow more the long-term liquidity provided by the ECB (those banks with hampered access to the private, wholesale markets).[26]

All in all, our results suggest that when the banking sector is facing significant liquidity constraints, lower monetary policy rates combined with access to Eurosystem long-term liquidity reduce these liquidity constraints (see the coefficient of the interaction between short-term rates and liquidity provisions), in turn softening lending standards applied by the banks. Therefore, monetary policy actions may contribute to increasing credit availability for firms and households and help to restore the transmission of monetary policy through the bank lending channel.

[26] See also Ciccarelli, Maddaloni and Peydró (2013).

4. Conclusions

Commentators and academics have since the beginning of the 2008 crisis argued that keeping monetary policy rates too low may increase banks' appetite for credit and liquidity risk due to banks' moral hazard problems. This, in turn, may increase the likelihood of a financial crisis originating by the accumulation of bank risk in the system. But once the risk in the balance sheets of banks realizes and the crisis starts, the banking sector may then need low monetary policy rates to support credit supply for firms and households – especially the banks with weaker balance sheet capacity.

In this paper we analyze some of these issues with an empirical analysis based on the euro area. We believe that our findings shed light on the impact of monetary policy on lending conditions and standards, with implications concerning the origins and development of the current crisis, but also have important forward-looking policy implications. In particular, results suggest that monetary policy rates may affect bank stability and their impact depend both on bank balance sheet strength and on banking prudential policy. Therefore, monetary policy and prudential policy are connected and influence each other. Monetary policy decisions should pay more attention to financial stability issues, while banking prudential supervision and regulation should take into account the risk-taking incentives possibly induced by low short-term interest rates.

In crisis times, we also show that monetary policy rates have an effect on lending conditions and that non-standard monetary policy measures, primarily the provision of liquidity at longer maturity, can enhance this effect.

The results may also support the need for monetary policy to lean against the wind in good times, though macro-prudential policies (for example, time-varying and counter-cyclical

LTV values or capital requirements) may alleviate this need. Moreover, if the balance sheet position of banks were stronger when entering a crisis period (for example, with higher bank capital), there would be less need for low monetary policy rates to support credit supply from banks, which otherwise could potentially foster excessive bank risk-taking in the medium term. Our results, therefore, support the new responsibilities of central banks on macro-prudential supervision and regulation, in particular the new responsibilities of the European Central Bank and of the Federal Reserve on macro-prudential policies to monitor systemic risk.

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Table 1 Summary Statistics

Panel A: Macro and financial variables

Before the start of the financial crisis	Mean	Std. Dev.	Min	Max
Overnight rates	2.80	0.79	2.02	4.05
Taylor-rule residuals	-0.12	0.76	-1.38	1.44
Interbank ratio	91.18	41.53	32.27	232.61
Total capital ratio	14.65	6.00	9.85	45.00
10-year rates	3.98	0.50	2.20	5.22
Current account balance (% of GDP)	0.58	7.39	-19.59	22.39
GDP growth	2.70	1.88	-1.86	8.08
Inflation	2.44	0.95	-0.17	4.98
Capital stringency index	5.26	1.18	3	7
Loan-to-value ratio (max value in %)	90.45	19.16	55	125
After the start of the financial crisis				
Overnight rates	1.15	1.26	0.34	4.25
Taylor-rule residuals	-0.64	1.16	-3.36	1.48
Long-term liquidity provision (%GDP)	0.11	0.12	0.00	0.57
Interbank ratio	86.68	45.46	36.07	213.58
Total capital ratio	14.50	4.04	10.00	31.00
10-year rates	4.20	1.47	2.26	12.41
Current account balance (% of GDP)	0.15	7.19	-19.59	22.96
GDP growth	-1.42	3.37	-9.84	5.44
Inflation	1.43	1.71	-2.75	5.61

Table 1, Panel A, shows the summary statistics of the macroeconomic and financial variables used in the analysis The statistics are calculated separately for the period before the start of the financial crisis (2002:Q3-2008:Q2) and after the start of the financial crisis (2008:Q3-2010:Q3) for the Euro area. The Euro area includes data for 12 Euro area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The Taylor rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The 10-year rate is the long-term government bond interest rate in each country. The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. Capital stringency is an index of stringency of capital requirements (Barth, Caprio and Levine 2006). The max Loan-to-Value ratio is the maximum ratio applied to mortgage loans in each country as reported in IMF (2011). Long-term liquidity provision is the liquidity with longer maturity (from 3-month to 1-year) provided by the Eurosystem to the banking sector of each country.See Table A.2 in the Appendix for detailed data sources.

Table 1 Summary Statistics

Panel B: Bank Lending Survey variables

Before the start of the financial crisis	Mean	Std. Dev.	Min	Max
Demand for loans				
business loans	2.02	30.53	-100	71.43
mortgage loans	3.12	45.00	-100	100
Lending conditions				
business loans	17.83	31.14	-50	100
mortgage loans	2.95	28.75	-100	100
Lending standards due to balance sheet factors				
all balance sheet factors for business loans	8.16	15.89	-25	86.67
bank capital position	12.28	19.55	-25	100
bank liquidity position	4.57	15.30	-40	80
bank market financing	7.61	20.51	-40	100
all balance sheet factors for mortage loans	4.44	14.38	-66.67	80
Terms and conditions applied to business loans				
margin on average loans	3.20	42.86	-100	100
margin on riskier loans	34.09	34.75	-50	100
size of the loan	10.18	22.01	-50	100
collateral requirement	12.91	25.85	-40	100
loan covenant	11.14	23.72	-33.33	100
maturity of the loan	6.34	23.79	-50	100
Terms and conditions applied to mortgage loans				
margin on average loans	-8.21	34.50	-100	100
margin on riskier loans	11.04	23.29	-33.33	100
collateral requirement	4.35	14.41	-40	70
Loan-to-Value ratio	4.28	23.91	-40	100
maturity of the loan	-7.18	16.53	-66.67	40
After the start of the financial crisis				
Demand for loans				
business loans	-15.40	35.28	-100	75
mortgage loans	-9.79	46.20	-100	75
Lending conditions				
business loans	23.83	35.77	-50	100
mortgage loans	19.76	30.64	-75	100
Lending standards due to balance sheet factors				
all balance sheet factors for business loans	12.78	24.54	-25	86.67
bank capital position	17.46	23.25	-25	80
bank liquidity position	5.34	27.12	-40	80
bank market financing	15.52	29.16	-40	100
all balance sheet factors for mortage loans	12.80	26.82	-60	100

Table 1, Panel B shows the summary statistics of the variables from the Bank Lending Survey (BLS) that are used in the analysis. The statistics for lending conditions and lending standards due to balance sheet factors are calculated separately for the periods before the start of the financial crisis (2002:Q4-2008:Q3) and after the start of the financial crisis (2008:Q4-2010:Q4) for the Euro area. The demand for loans is the net percentage of banks that have answered that the demand for business or mortgage loans has increased (Question 4 and 13 of the BLS). Lending conditions is the net percentage of banks reporting a tightening of credit standards for the approval of loans or credit lines to enterprises and households in the BLS. They are the answers to Questions 1 and 8 of the survey. Lending standards due to balance sheet factors is the net percentage of banks reporting a tightening of credit standards due to costs of funds and balance sheet constraints (bank capital, liquidity and market financing) for loans or credit lines to enterprises and households (they are the answers to Questions 2 and 9 of the BLS). The values for the terms and conditions applied to business and mortgage loans are the net percentage of banks reporting a tightening of the corresponding loan condition (they are the answers to Questions 3 and 11 of the BLS). See the appendix for the relevant questions from the survey and Berg et al. (2005) for a detailed description of the survey.

Table 2

Impact of monetary policy before the crisis

	Lending conditions				Lending standards due to balance sheet factors									
					Business loans								Mortgage loans	
	Business Loans		Mortgage Loans		All factors		Bank capital position		Bank liquidity position		Bank market financing		All factors	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Overnight rates *t-1*	12.52		7.17		5.60		3.38		5.40		6.87		3.18	
	[7.09]***		[6.44]***		[7.94]***		[3.77]***		[8.09]***		[6.26]***		[7.34]***	
Taylor-rule residuals *i,t-1*		10.05		6.08		4.24		2.45		4.45		5.73		2.50
		[5.92]***		[5.39]***		[6.09]***		[3.00]***		[7.07]***		[5.50]***		[6.26]***
Lagged dependent *i,t-1*	0.65	0.71	0.64	0.66	0.62	0.63	0.63	0.64	0.58	0.60	0.60	0.62	0.65	0.64
	[16.58]***	[18.92]***	[16.22]***	[16.72]***	[15.00]***	[14.84]***	[17.44]***	[17.75]***	[12.79]***	[13.50]***	[13.16]***	[13.22]***	[14.93]***	[14.03]***
Country fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Time fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Wald statistic	495.97	489.04	418.19	370.46	482.56	395.22	351.39	344.8	461.5	415.5	310.83	286.25	436.88	359.08
# of observations	276	276	276	276	276	276	276	276	276	276	276	276	276	276
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 2 shows the results of GLS panel regressions where the dependent variable *lending conditions* (columns 1 to 4) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 5 to 14) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. See Table A.1 in the Appendix for details of the BLS questions. The overnight rate is the quarterly average of the daily overnight rate (EONIA). The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002:Q4-2008:Q3. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. All the panel regressions include standard errors allowing heteroscedasticity, autocorrelation of order one and time-invariant correlation across countries.

Table 3

Impact of monetary policy before the crisis

	Lending conditions		Lending standards due to balance sheet factors				
			Business loans				Mortgage loans
	Business loans	Mortgage loans	All factors	Bank capital position	Bank liquidity position	Bank market financing	All factors
	1	2	3	4	5	6	7
Taylor-rule residuals *i,t-1*	24.46	11.16	5.15	7.39	5.13	6.39	7.86
	[4.26]***	[2.28]**	[2.08]**	[2.37]**	[2.38]**	[1.82]*	[1.91]*
Interbank ratio *i,t-1*	-0.003	-0.11	-0.001	0.04	0.01	-0.06	0.04
	[0.07]	[3.01]***	[0.04]	[1.44]	[0.24]	[1.13]	[1.83]*
Total capital ratio *i,t-1*	-0.70	-0.11	-0.02	-0.06	0.12	0.18	0.26
	[2.01]**	[0.38]	[0.12]	[0.40]	[1.16]	[0.88]	[2.07]**
Demand for loans *i,t-1*	-0.14	-0.09	-0.03	-0.03	-0.05	0.00	0.03
	[3.57]***	[2.40]**	[0.64]	[0.45]	[1.25]	[0.04]	[1.79]*
Current account balance *i,t-1*	0.03	-0.33	-0.31	-0.19	-0.47	-0.15	0.04
	[0.06]	[0.78]	[1.77]*	[0.88]	[1.85]*	[0.72]	[0.25]
10 -year rate *i,t-1*	-6.97	3.87	2.48	-2.57	7.60	2.98	6.12
	[1.01]	[0.47]	[0.93]	[0.58]	[4.25]***	[0.90]	[1.18]
GDP growth *i,t-1*	0.27	-2.27	-0.02	-0.35	0.05	0.35	-0.71
	[0.33]	[1.67]*	[0.04]	[0.45]	[0.06]	[0.41]	[0.77]
Inflation *i,t-1*	6.09	-2.92	0.99	-0.67	0.69	3.27	0.64
	[2.60]***	[1.38]	[1.17]	[0.42]	[0.57]	[1.97]**	[0.16]
Lagged dependent *i,t-1*	0.33	0.31	0.47	0.51	0.41	0.47	0.27
	[4.78]***	[3.60]***	[8.51]***	[9.01]***	[5.44]***	[6.01]***	[3.18]***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes
# of observations	264	264	264	264	264	264	252
# of countries	12	12	12	12	12	12	12

Table 3 shows the results of a GMM dynamic panel estimation where the dependent variable *lending conditions* (columns 1 and 2) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 3 to 7) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. See Table A.1 in the Appendix for details of the BLS questions. The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002:Q4-2008:Q3. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Table 4

Impact of monetary policy on terms and conditions applied to loans

	Business Loans						Mortgage Loan					Margin on riskier loans	
	Margin on average loans	Margin on riskier loans	Size of the loan	Collateral requirement	Loan covenant	Maturity of the loan	Margin on average loans	Margin on riskier loan	Collateral requirement	Loan-to-Value ratio	Maturity of the loan	Business loans	Mortgage loans
	1	2	3	4	5	6	7	8	9	10	11	12	13
Taylor-rule residuals *i, t-1*	14.17	9.10	5.63	4.44	7.39	10.05	4.95	4.38	2.96	4.38	-0.56	7.57	9.30
	[3.93]***	[3.10]***	[2.59]***	[1.91]*	[2.60]***	[5.06]***	[1.72]*	[1.76]*	[2.28]**	[1.75]*	[0.24]	[1.57]	[2.81]***
Interbank ratio *i, t-1*	0.08	0.05	0.03	0.04	0.08	0.09	-0.08	-0.07	-0.06	-0.09	-0.04	0.06	-0.06
	[1.09]	[1.40]	[1.04]	[1.27]	[1.45]	[1.25]	[2.04]**	[0.98]	[1.99]**	[1.22]	[0.80]	[1.41]	[1.18]
Total capital ratio *i, t-1*	-0.03	0.27	0.15	0.23	-0.08	0.26	-0.01	-0.34	0.14	-0.26	-0.298	-0.41	-0.40
	[0.08]	[0.76]	[0.70]	[1.24]	[0.20]	[0.86]	[0.04]	[2.60]***	[2.20]**	[1.03]	[0.96]	[0.97]	[1.86]*
Demand for loans *i, t-1*	-0.03	-0.06	-0.04	-0.049	-0.11	-0.03	-0.06	-0.03	-0.03	-0.09	-0.10	0.00	-0.04
	[0.56]	[1.14]	[2.08]**	[0.84]	[2.47]**	[0.55]	[2.00]**	[0.84]	[1.24]	[3.83]***	[3.51]***	[0.01]	[1.12]
Current account balance *i, t-1*	-0.27	-0.48	-0.48	-0.566	-0.38	-0.22	0.41	0.28	0.07	0.04	-0.08	-0.66	0.23
	[0.78]	[1.33]	[2.36]**	[2.11]**	[0.98]	[0.60]	[0.46]	[0.84]	[0.24]	[0.15]	[0.21]	[2.73]***	[0.74]
10-year rate *i, t-1*	13.70	8.63	4.41	3.12	1.77	2.57	11.31	7.43	2.53	2.63	4.39	-2.79	-0.18
	[3.21]***	[2.66]***	[1.33]	[0.98]	[0.48]	[0.93]	[2.91]***	[2.42]**	[1.54]	[0.94]	[1.70]*	[0.32]	[0.02]
GDP growth *i, t-1*	-2.88	-2.66	-2.07	-0.12	-2.42	-1.60	-1.36	-1.94	-1.60	-2.82	0.86	-0.03	-0.44
	[2.10]**	[1.82]*	[2.09]**	[0.11]	[1.72]*	[2.22]**	[0.71]	[2.42]**	[2.92]***	[1.80]*	[1.15]	[0.01]	[0.38]
Inflation *i, t-1*	9.65	10.20	6.16	6.121	3.70	6.25	6.20	4.61	0.85	-2.14	2.38	6.81	-0.29
	[3.49]***	[3.64]***	[3.39]***	[3.68]***	[1.92]*	[2.26]**	[2.20]**	[2.09]**	[1.30]	[1.49]	[1.94]*	[2.50]**	[0.09]
General economic conditions *i, t-1*												0.10	0.01
												[1.60]	[0.07]
Industry/firm outlook *i, t-1*												0.05	
												[0.79]	
Risk of collateral *i, t-1*												0.11	
												[0.94]	
Housing market prospects *i, t-1*													0.16
													[3.19]***
Lagged regressor *i, t-1*	0.49	0.39	0.44	0.62	0.42	0.41	0.52	0.49	0.38	0.44	0.24	0.17	0.35
	[9.16]***	[5.25]***	[4.71]***	[6.81]***	[4.55]***	[5.86]***	[6.29]***	[6.34]***	[4.96]***	[4.00]***	[3.73]***	[1.76]*	[5.18]***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
# of observations	264	264	264	264	264	264	264	264	264	264	264	264	264
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 4 shows the results of a GMM dynamic panel estimation where the dependent variable is the net percentage of banks in each country reporting a tightening of the terms and conditions for approving loans or credit lines to enterprises (columns 1 to 6) and to households for house purchase (columns 7 to 11) in the Euro area Bank Lending Survey (BLS). They are the answers to Questions 3 and 10 of the BLS. The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. In columns 12 and 13 the dependent variable is the net percentage of banks reporting a tightening of terms and conditions for riskier business and mortgage loans. In these regressions the additional controls are: the net percentage of banks reporting a tightening of credit standards due to general economic conditions, industry/firm outlook and risk of collateral (for business loans) and to housing market prospects and general economic conditions (for mortgage loans). These controls are the answers to Questions 2 and 9 of the BLS related to "C - Perception of risk". See Table A.1 of the Appendix for details of the BLS questions. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002:Q4-2008:Q3. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Table 5

Interaction between monetary policy, max Loan-to-Value and capital stringency index

	Mortgage loans			Business loans		
	Lending conditions	Balance sheet factors	Bank competition	Lending conditions	Bank capital position	Bank liquidity position
	1	2	3	4	5	6
Taylor-rule residuals *i,t-1*	9.52	-20.03	-29.96	3.01	14.02	22.89
	[0.30]	[1.09]	[1.73]*	[0.20]	[1.92]*	[3.93]***
(TR-residual * max LTV) *i,t-1*	3.21	15.17	16.93			
	[0.20]	[1.67]*	[1.99]**			
Capital stringency *i,t-1*				-49.00	2.49	39.04
				[1.27]	[0.14]	[3.60]***
(TR-residual * Capital stringency) *i,t-1*				14.77	-4.53	-11.67
				[1.30]	[0.81]	[3.81]***
Interbank ratio *i,t-1*	-0.04	0.03	-0.07	0.012	0.037	-0.015
	[0.52]	[1.67]*	[0.73]	[0.30]	[1.19]	[0.61]
Total capital ratio *i,t-1*	0.25	0.24	-0.17	-0.62	-0.05	0.00
	[0.86]	[2.36]**	[0.39]	[1.94]*	[0.30]	[0.00]
Demand for loans *i,t-1*	-0.01	0.06	-0.03	-0.01	-0.06	-0.04
	[0.18]	[3.08]***	[0.84]	[0.12]	[1.57]	[0.98]
10 -year rate *i,t-1*	-17.87	0.82	10.43	-12.81	-1.01	12.21
	[0.22]	[0.06]	[0.28]	[1.65]*	[0.27]	[3.75]***
Current account balance *i,t-1*	-0.02	-0.01	0.32	0.04	-0.19	-0.40
	[0.04]	[0.05]	[0.72]	[0.07]	[0.85]	[1.66]*
GDP growth *i,t-1*	-4.09	-0.94	-2.63	-1.19	0.10	0.26
	[2.67]***	[1.27]	[2.11]**	[1.33]	[0.18]	[0.32]
Inflation *i,t-1*	-1.67	-6.83	-10.31	-0.05	0.66	5.50
	[0.19]	[1.18]	[1.78]*	[0.01]	[0.23]	[4.19]***
Lagged dependent i,t-1	0.25	0.17	0.37	0.35	0.50	0.37
	[4.16]***	[1.66]*	[5.39]***	[4.24]***	[9.75]***	[4.57]***
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
# of observations	242	242	242	264	264	264
# of countries	11	11	11	12	12	12

Table 5 shows the results of a GMM dynamic panel estimation where the dependent variable in columns 1 to 3 is the net percentage of banks in each country reporting a tightening of lending conditions and of lending standards due to balance sheet factors and bank competition for mortgage loans in the Euro area Bank Lending Survey (BLS). They are the answers to Questions 8 and 9 of the BLS. In columns 4 to 6 the dependent variable is the net percentage of banks reporting a tightening of lending conditions and of lending standards due to bank capital and to bank liquidity position for business loans. They are the answers to Questions 1 and 2 of the BLS. The max LTV is the maximum Loan-to-Value ratio applied to mortgage loans in each country as reported in IMF (2011). Capital stringency is an index of stringency of capital requirements (Barth, Caprio and Levine, 2006). The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratios and the total capital ratios are the median of these measures from the sample of Euro area banks reported in Bankscope. The 10-year rate is the long-term government bond interest rate in each country. The current account balance is the current account surplus/deficit for each euro area country divided by nominal GDP. The demand for loans is the net percentage of banks in the BLS answering that the demand for business or mortgage loans has increased (Question 4 and 13 of the BLS). See Table A.1 in the Appendix for details of the BLS questions. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain). The panel regressions are estimated over the period 2002:Q4-2008:Q3. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are robust.

Table 6

Impact of monetary policy after the crisis

	Lending conditions				Lending standards due to balance sheet factors									
					Business loans								Mortgage loans	
	Business Loans		Mortgage Loans		All factors		Bank capital position		Bank liquidity position		Bank market financing		All factors	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Overnight rates *t-1*	8.51		3.54		2.98		2.05		2.59		3.79		4.79	
	[7.45]***		[3.96]***		[4.22]***		[2.89]***		[2.56]**		[3.68]***		[9.10]***	
Taylor-rule residuals *i,t-1*		1.00		0.36		0.78		1.39		0.47		1.58		2.69
		[0.69]		[0.45]		[1.77]*		[1.62]		[0.53]		[1.90]*		[6.91]***
Lagged dependent *i,t-1*	0.50	0.70	0.62	0.67	0.54	0.67	0.55	0.58	0.61	0.68	0.60	0.68	0.44	0.53
	[9.35]***	[10.75]***	[13.17]***	[12.96]***	[8.46]***	[10.71]***	[9.64]***	[10.02]***	[8.21]***	[9.90]***	[8.42]***	[9.89]***	[6.83]***	[10.51]***
Country fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Time fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Wald statistic	877.95	232.15	211.83	174.76	583.41	210.06	237.17	189.93	216.39	146.29	164.83	134.27	132.02	154.71
# of observations	108	108	108	108	108	108	108	108	108	108	108	108	108	108
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 6 shows the results of GLS panel regressions where the dependent variable *lending conditions* (columns 1 to 4) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 5 to 14) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. See Table A.1 in the Appendix for details of the BLS questions. The overnight rate is the quarterly average of the daily overnight rate (EONIA). The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2008:Q4-2010:Q4. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. All the panel regressions include standard errors allowing heteroscedasticity, autocorrelation of order one and time-invariant correlation across countries.

Table 7a

Impact of monetary policy after the crisis (without time fixed effects)

	Lending conditions				Lending standards due to balance sheet factors									
					Business loans								Mortgage loans	
	Business loans		Mortgage loans		All factors		Bank capital position		Bank liquidity position		Bank market financing		All factors	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Overnight rates *t-1*	16.56		3.37		4.40		4.59		5.61		6.74		3.02	
	[5.74]***		[1.27]		[1.95]*		[2.01]**		[1.66]*		[3.00]***		[0.73]	
Taylor-rule residuals *i,t-1*		16.56		3.37		4.40		4.59		5.61		6.74		3.02
		[5.74]***		[1.27]		[1.95]*		[2.01]**		[1.66]*		[3.00]***		[0.73]
Interbank ratio *i,t-1*	-0.06	-0.06	0.19	0.19	0.05	0.05	0.08	0.08	0.01	0.01	-0.01	-0.01	0.15	0.15
	[0.45]	[0.45]	[2.66]***	[2.66]***	[0.99]	[0.99]	[1.86]*	[1.86]*	[0.12]	[0.12]	[0.10]	[0.10]	[1.48]	[1.48]
Total capital ratio *i,t-1*	-1.34	-1.34	-0.63	-0.63	-1.76	-1.76	-1.61	-1.61	-1.54	-1.54	-2.52	-2.52	-0.53	-0.53
	[2.23]**	[2.23]**	[1.00]	[1.00]	[3.62]***	[3.62]***	[3.06]***	[3.06]***	[3.23]***	[3.23]***	[4.27]***	[4.27]***	[0.86]	[0.86]
Demand for loans *i,t-1*	0.19	0.19	0.04	0.04	0.06	0.06	0.08	0.08	0.03	0.03	0.05	0.05	0.29	0.29
	[2.19]**	[2.19]**	[0.83]	[0.83]	[0.90]	[0.90]	[1.56]	[1.56]	[0.30]	[0.30]	[0.83]	[0.83]	[3.28]***	[3.28]***
Current account balance *i,t-1*	-0.40	-0.40	-1.06	-1.06	-0.16	-0.16	-0.84	-0.84	-0.02	-0.02	-0.03	-0.03	-0.04	-0.04
	[2.46]**	[2.46]**	[5.03]***	[5.03]***	[0.58]	[0.58]	[2.04]**	[2.04]**	[0.04]	[0.04]	[0.05]	[0.05]	[0.09]	[0.09]
10 -year rate *i,t-1*	0.58	0.58	-0.78	-0.78	1.95	1.95	-3.58	-3.58	2.98	2.98	5.61	5.61	-9.94	-9.94
	[0.17]	[0.17]	[0.21]	[0.21]	[0.60]	[0.60]	[1.37]	[1.37]	[0.91]	[0.91]	[1.30]	[1.30]	[2.94]***	[2.94]***
GDP growth *i,t-1*	0.35	1.31	0.66	0.86	-0.33	-0.07	-1.08	-0.82	-1.25	-0.92	-0.84	-0.45	-1.08	-0.91
	[0.34]	[1.32]	[0.48]	[0.58]	[0.35]	[0.07]	[1.53]	[1.08]	[1.48]	[1.11]	[0.75]	[0.42]	[0.99]	[0.73]
Inflation *i,t-1*	-1.90	6.53	3.08	4.79	3.95	6.19	3.66	6.00	4.46	7.31	1.69	5.11	5.94	7.47
	[0.70]	[2.90]***	[0.88]	[1.93]*	[1.30]	[2.41]**	[1.31]	[2.96]***	[1.59]	[3.56]***	[0.65]	[1.96]*	[1.40]	[2.86]***
Lagged dependent *i,t-1*	0.14	0.14	0.40	0.40	-0.23	0.23	-0.02	-0.02	0.19	0.19	0.28	0.28	0.36	0.36
	[0.99]	[0.99]	[3.59]***	[3.59]***	[1.80]*	[1.80]*	[0.14]	[0.14]	[2.15]**	[2.15]**	[2.10]**	[2.10]**	[4.34]***	[4.34]***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
# of observations	84	84	84	84	84	84	84	84	84	84	84	84	84	84
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 7a shows the results of a GMM dynamic panel estimation where the dependent variable *lending conditions* (columns 1 and 2) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 3 to 7) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. The overnight rate is the quarterly average of the daily overnight rate (EONIA). The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). See Table A.1 in the Appendix for details of the BLS questions. The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2008:Q4-2010:Q4. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Table 7b

Impact of monetary policy after the crisis

	Lending conditions		Lending standards due to balance sheet factors				
			Business loans				Mortgage loans
	Business Loans	Mortgage loans	All factors	Bank capital position	Bank liquidity position	Bank market financing	All factors
	1	2	3	4	5	6	7
Taylor-rule residuals *i,t-1*	18.30	4.70	2.74	3.99	7.07	3.27	4.20
	[5.46]***	[0.99]	[0.80]	[2.29]**	[1.31]	[0.69]	[1.17]
Interbank ratio *i,t-1*	-0.11	0.12	0.05	0.05	0.09	0.00	0.17
	[1.04]	[1.15]	[0.90]	[0.87]	[1.21]	[0.05]	[1.65]*
Total capital ratio *i,t-1*	-1.09	-0.10	-1.90	-1.38	-2.34	-2.03	-0.71
	[1.98]**	[0.13]	[3.39]***	[1.47]	[3.94]***	[2.84]***	[0.87]
Demand for loans *i,t-1*	0.21	0.04	0.06	0.08	0.02	0.07	0.29
	[2.21]**	[0.61]	[0.88]	[1.49]	[0.26]	[1.26]	[2.92]***
Current account balance *i,t-1*	-0.48	-1.15	-0.24	-0.93	-0.09	0.39	-0.24
	[2.25]**	[4.06]***	[1.16]	[2.24]**	[0.25]	[1.31]	[0.59]
10 -year rate *i,t-1*	0.63	-3.99	4.52	-2.21	5.83	10.30	-12.53
	[0.19]	[0.96]	[0.95]	[0.48]	[1.42]	[1.67]*	[3.64]***
GDP growth *i,t-1*	3.03	2.43	0.54	0.52	-2.27	3.49	-1.16
	[1.24]	[0.78]	[0.32]	[0.41]	[2.30]**	[1.20]	[0.35]
Inflation *i,t-1*	8.55	4.86	6.56	7.33	7.24	7.87	6.92
	[3.25]***	[2.02]**	[2.68]***	[2.29]**	[3.47]***	[4.14]***	[1.66]*
Lagged dependent *i,t-1*	0.06	0.40	-0.27	-0.02	0.18	0.39	0.39
	[0.57]	[3.08]***	[2.07]**	[0.12]	[2.06]**	[2.92]***	[4.71]***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes
# of observations	84	84	84	84	84	84	84
# of countries	12	12	12	12	12	12	12

Table 7b shows the results of a GMM dynamic panel estimation where the dependent variable *lending conditions* (columns 1 and 2) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 3 to 7) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). See Table A.1 of the Appendix for details of the BLS questions. The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2008:Q4-2010:Q4. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Table 8a

Impact of monetary policy and liquidity operations after the crisis (without time fixed effects)

	Lending conditions				Lending standards due to balance sheet factors									
					Business loans								Mortgage loans	
	Business loans		Mortgage loans		All factors		Bank capital position		Bank liquidity position		Bank market financing		All factors	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Taylor-rule residuals *i,t-1*	16.13	16.18	5.06	2.38	5.04	3.08	5.42	1.49	3.82	1.57	0.22	-1.00	0.39	1.36
	[5.01]***	[3.84]***	[2.19]**	[0.89]	[2.06]**	[1.13]	[1.56]	[0.38]	[1.53]	[0.61]	[0.09]	[0.31]	[0.10]	[0.25]
Long-term liquidity i,t-1	62.99	62.75	46.03	65.18	6.77	18.03	65.61	93.65	45.89	62.29	0.38	6.07	-10.82	-17.30
	[3.14]***	[2.62]***	[1.39]	[2.05]**	[0.25]	[0.47]	[1.43]	[2.96]***	[1.16]	[1.52]	[0.01]	[0.17]	[0.27]	[0.40]
(TR residuals * LT liquidity) i,t-1		-0.33		23.91		16.94		34.76		19.11		9.37		-7.93
		[0.03]		[2.71]***		[1.80]*		[3.70]***		[1.74]*		[0.84]		[0.63]
Interbank ratio *i,t-1*	-0.05	-0.05	0.05	0.07	0.08	0.10	0.03	0.07	0.05	0.07	0.19	0.20	0.06	0.05
	[0.40]	[0.40]	[0.99]	[1.48]	[1.84]*	[2.28]**	[0.48]	[1.01]	[0.56]	[0.85]	[2.20]**	[2.16]**	[0.85]	[0.71]
Total capital ratio *i,t-1*	-1.85	-1.85	-2.31	-2.29	-2.37	-2.40	-1.95	-1.90	-2.71	-2.70	-0.84	-0.81	-0.42	-0.43
	[2.57]**	[2.57]**	[3.82]***	[3.93]***	[2.99]***	[2.94]***	[3.47]***	[3.83]***	[3.38]***	[3.42]***	[1.23]	[1.15]	[0.90]	[0.91]
Demand for loans *i,t-1*	0.21	0.21	0.06	0.07	0.06	0.07	0.04	0.05	0.07	0.07	-0.12	-0.12	-0.08	-0.08
	[2.42]**	[2.42]**	[0.97]	[1.16]	[1.19]	[1.32]	[0.43]	[0.62]	[1.17]	[1.40]	[1.55]	[1.52]	[1.09]	[1.15]
Current account balance *i,t-1*	-0.24	-0.24	-0.20	-0.13	-0.92	-0.89	0.14	0.25	0.40	0.46	-1.13	-1.10	-0.20	-0.24
	[1.18]	[1.35]	[0.65]	[0.43]	[1.92]*	[1.88]*	[0.37]	[0.66]	[1.18]	[1.42]	[4.52]***	[4.25]***	[0.47]	[0.52]
10 -year rate *i,t-1*	-0.60	-0.59	1.85	0.43	-2.47	-3.42	1.25	-0.56	6.86	5.81	0.50	0.19	-5.36	-5.13
	[0.15]	[0.15]	[0.58]	[0.17]	[0.98]	[1.39]	[0.36]	[0.21]	[1.38]	[1.23]	[0.14]	[0.05]	[1.50]	[1.44]
GDP growth *i,t-1*	1.90	1.90	-0.75	-0.75	-1.68	-1.75	-0.87	-0.85	0.21	0.30	0.61	0.64	-1.39	-1.45
	[1.41]	[1.43]	[0.85]	[0.87]	[2.02]**	[2.27]**	[1.07]	[1.05]	[0.15]	[0.22]	[0.42]	[0.44]	[1.37]	[1.52]
Inflation *i,t-1*	6.62	6.61	7.11	8.31	5.99	6.75	8.22	9.94	6.33	7.15	4.02	4.34	6.55	6.30
	[2.37]**	[2.27]**	[2.64]***	[3.25]***	[3.09]***	[3.72]***	[3.24]***	[4.62]***	[1.99]**	[2.09]**	[1.45]	[1.41]	[2.57]**	[2.21]**
Lagged dependent *i,t-1*	0.10	0.10	-0.16	-0.19	-0.08	-0.10	0.16	0.12	0.35	0.34	0.32	0.32	0.16	0.16
	[0.94]	[0.93]	[1.17]	[0.95]	[0.53]	[0.65]	[1.78]*	[1.61]	[2.04]**	[1.90]*	[3.60]***	[3.51]***	[1.79]*	[1.81]*
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no
# of observations	84	84	84	84	84	84	84	84	84	84	84	84	84	84
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 8a shows the results of a GMM dynamic panel estimation where the dependent variable *lending conditions* (columns 1 and 2) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 3 to 7) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. Long-term liquidity is the central bank liquidity borrowed at the long-term operations (3-month to 1-year) from the banking sector of each country divided by GDP. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). See Table A.1 for details of the BLS questions. The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2008:Q4-2010:Q4. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Table 8b

Impact of monetary policy and liquidity operations after the crisis

	Lending conditions				Lending standards due to balance sheet factors									
					Business loans								Mortgage loans	
	Business Loans		Mortgage Loans		All factors		Bank capital position		Bank liquidity position		Bank market financing		All factors	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Taylor-rule residuals *i,t-1*	20.03	20.33	4.38	1.05	3.28	0.48	7.62	3.42	4.63	1.87	10.90	9.91	2.69	3.43
	[5.29]***	[4.04]***	[1.31]	[0.33]	[1.23]	[0.19]	[1.40]	[0.60]	[1.08]	[0.43]	[2.21]**	[1.98]**	[0.77]	[0.79]
Long-term liquidity i,t-1	70.49	69.45	31.96	48.59	-29.42	-21.03	72.83	92.92	29.05	44.81	88.65	90.90	12.57	9.31
	[2.06]**	[1.98]**	[0.90]	[1.26]	[0.89]	[0.51]	[1.75]*	[2.30]**	[0.78]	[1.17]	[1.82]*	[1.73]*	[0.36]	[0.25]
(TR residuals * LT liquidity) i,t-1		-2.02		27.70		21.37		35.68		22.44		7.25		-5.55
		[0.18]		[3.34]***		[2.79]***		[3.61]***		[2.05]**		[0.56]		[0.45]
Interbank ratio *i,t-1*	-0.11	-0.12	0.06	0.09	0.06	0.09	0.11	0.14	0.00	0.02	0.10	0.10	0.10	0.09
	[1.14]	[1.15]	[1.05]	[1.27]	[1.15]	[1.63]	[1.47]	[1.67]*	[0.03]	[0.16]	[0.82]	[0.81]	[1.13]	[1.16]
Total capital ratio *i,t-1*	-1.47	-1.48	-2.58	-2.55	-2.21	-2.24	-2.70	-2.63	-2.45	-2.39	-0.30	-0.24	-0.60	-0.62
	[2.70]***	[2.64]***	[3.67]***	[3.63]***	[1.99]**	[1.99]**	[3.96]***	[3.71]***	[2.63]***	[2.61]***	[0.40]	[0.29]	[0.91]	[0.88]
Demand for loans *i,t-1*	0.22	0.22	0.05	0.07	0.06	0.06	0.03	0.04	0.07	0.09	-0.17	-0.17	-0.11	-0.11
	[2.42]**	[2.40]**	[0.81]	[1.00]	[1.13]	[1.32]	[0.36]	[0.55]	[1.16]	[1.40]	[1.76]*	[1.77]*	[1.30]	[1.34]
Current account balance *i,t-1*	-0.39	-0.40	-0.38	-0.28	-1.11	-1.06	0.00	0.14	0.21	0.30	-1.10	-1.08	-0.29	-0.32
	[1.68]*	[1.82]*	[1.62]	[1.22]	[2.26]**	[2.16]**	[0.01]	[0.33]	[0.67]	[1.00]	[3.61]***	[3.47]***	[0.71]	[0.73]
10 -year rate *i,t-1*	-1.82	-1.75	3.94	2.19	0.37	-0.94	2.85	1.25	9.21	7.86	-9.50	-9.82	-12.11	-11.93
	[0.45]	[0.45]	[0.93]	[0.53]	[0.10]	[0.27]	[0.67]	[0.29]	[1.70]*	[1.41]	[2.02]**	[1.90]*	[2.03]**	[1.99]**
GDP growth *i,t-1*	3.53	3.52	-0.57	-0.51	-0.81	-0.87	-2.09	-1.98	2.55	2.79	3.58	3.68	-1.99	-2.04
	[1.52]	[1.52]	[0.36]	[0.32]	[0.62]	[0.65]	[2.23]**	[2.27]**	[0.85]	[0.92]	[1.08]	[1.11]	[0.81]	[0.83]
Inflation *i,t-1*	9.21	9.17	7.06	8.40	6.21	7.10	8.32	9.98	8.32	9.34	9.87	10.19	6.23	6.07
	[3.18]***	[2.96]***	[2.69]***	[3.10]***	[2.27]**	[2.36]**	[3.28]***	[4.46]***	[3.82]***	[4.20]***	[2.66]***	[2.47]**	[1.62]	[1.46]
Lagged dependent *i,t-1*	0.05	0.05	-0.22	-0.26	-0.09	-0.12	0.15	0.11	0.32	0.31	0.29	0.29	0.19	0.19
	[0.52]	[0.49]	[1.11]	[0.81]	[0.70]	[0.92]	[1.67]*	[1.45]	[2.11]**	[1.96]*	[2.98]***	[2.79]***	[3.39]***	[3.68]***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
# of observations	84	84	84	84	84	84	84	84	84	84	84	84	84	84
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Table 8b shows the results of a GMM dynamic panel estimation where the dependent variable *lending conditions* (columns 1 and 2) is the net percentage of banks in each country reporting a tightening of credit standards in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS. The dependent variable *lending standards due to balance sheet factors* (columns 3 to 7) is the net percentage of banks reporting a tightening of credit standards in the BLS due to the factor in the headings (for business loans: all balance sheet factors, bank capital position, bank liquidity position and bank market financing. For mortgage loans: all balance sheet factors). They are the answers to Questions 2 and 9 of the BLS. The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. Long-term liquidity is the central bank liquidity borrowed at the long-term operations (3-month to 1-year) from the banking sector of each country divided by GDP. The interbank ratio and the total capital ratio are the medians by country of these measures from the sample of Euro area banks reported in Bankscope. The demand for loans is the net percentage of banks answering in the BLS that the demand for business or mortgage loans has increased (Questions 4 and 13 of the BLS). See Table A.1 for details of the BLS questions. The current account balance is the current account surplus/deficits for each euro area country divided by nominal GDP. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2008:Q4-2010:Q4. The test statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust.

Figure 1: Lending standards and demand for loans

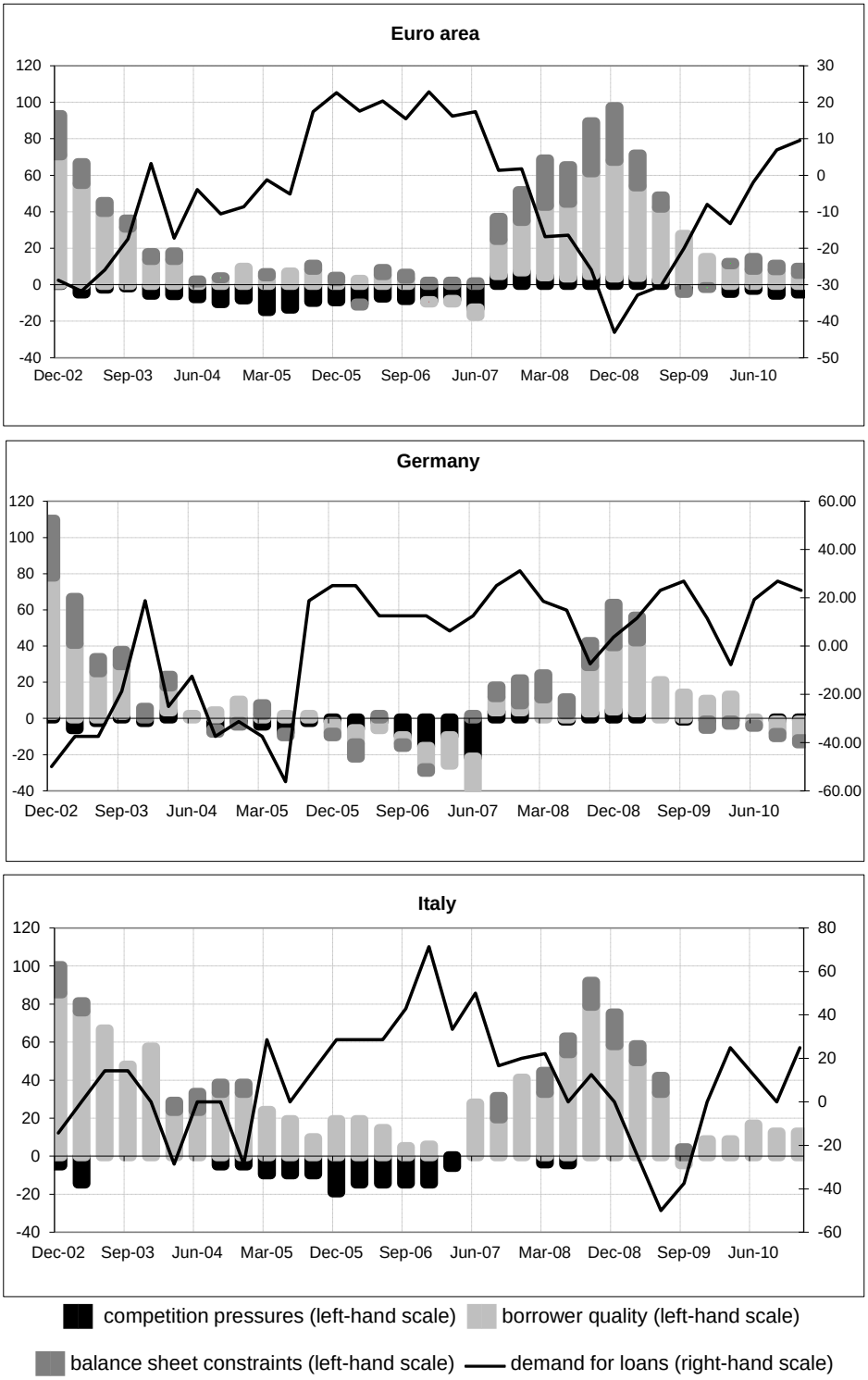

Figure 1 plots the lending standards and the demand for loans in the Euro area, in Germany and in Italy as reported in the Bank Lending Survey. The responses refer to business (non-financial corporations) loans. *Competition pressure* is the average of the responses to the questions referring to competition factors affecting the decision to change lending standards (bank, non-bank and market financing competition). *Balance sheet constraints* is the average of the responses to the questions referring to balance sheet factors affecting the decision to change lending standards (capital position, liquidity position and market financing conditions). *Borrower quality* is the average of the responses to the questions referring to borrower risk factors affecting the decision to change lending standards (economic outlook and borrower specific risks). They are the answers to Questions 2 and 4 of the BLS.

Sources: European Central Bank, Bundesbank and Banca d'Italia

Figure 2: Taylor-rule residuals and lending standards due to balance sheet factors

Panel A: Taylor-rule residuals and cross-country volatility

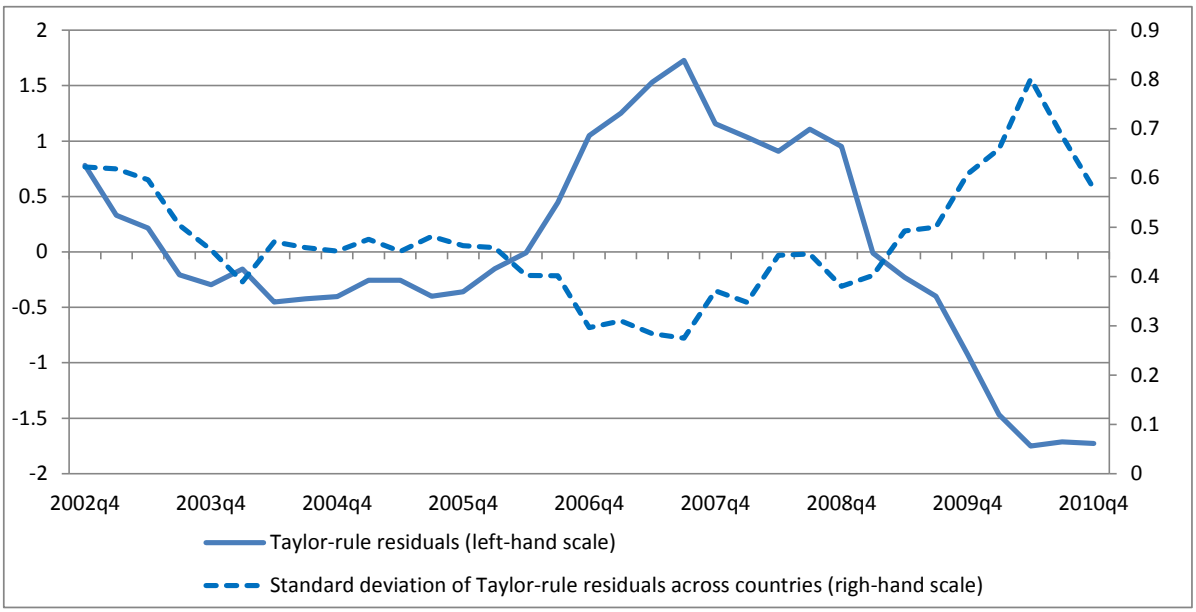

Figure 2 shows the Taylor-rule residuals for the Euro area and the cross-country volatility of Taylor-rule residuals. Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation. The residuals are estimated separately for each country in the Euro area, and a weighted average is calculated using country GDP. The residuals are calculated for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

Appendix

Table A1: The Bank Lending Survey

Question of the Survey		Definition of variables used in the analysis	Measures
Lending conditions and standards		**Lending conditions for:**	**Net percentage** is equal to the difference between the sum of banks answering "tightened considerably" and "tightened somewhat" and the sum of banks answering "eased somewhat" and "eased considerably" in percentage of the total number of banks.
Over the past three months, how have your bank's credit standards as applied to the approval of loans…	or credit lines to enterprises changed? (Q1)	business loans	
	to households for house purchase changed? (Q8)	mortgage loans	
Factors affecting lending conditions			
Q2**:** Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises?	**A Costs of funds and balance sheet constraints** A1 Costs related to your bank's capital position. A2 Your bank's ability to access market financing. A3 Your bank's liquidity position.	**Lending standards due to balance sheet factors** for business loans is equal to the average of the net percentage for A1, A2, and A3	**Net percentage** is equal to the difference between the sum of the banks answering "contributed considerably to tightening" and "contributed somewhat to tightening" and the sum of the banks answering "contributed somewhat to easing" and "contributed considerably to easing" in percentage of the total number of banks
	B Pressure from competition		
	C Perception of risk		
Q9**:** Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans to households for house purchase?	**A Costs of funds and balance sheet constraints**	**Lending standards due to balance sheet factors** for mortgage loans is equal to the net percentage for A	
	B Pressure from competition		
	C Perception of risk		
Terms and conditions for loans			
Q3**:** Over the past three months, how have your banks's conditions and terms for approving loans or credit lines to enterprises changed?	**A Price**	**Margins on average loans** **Margins on riskier loans**	**Net percentage** is equal to the difference between the sum of the banks answering that they have tightened each specific condition and and the sum of the banks answering that they have eased the same condition in percentage of the total number of banks
	B Other conditions and terms	**Size of the loan or credit line** **Collateral requirements** **Loan covenants** **Maturity of the loan**	
Q10**:** Over the past three months, how have your banks's conditions and terms for approving loans to households for house purchase changed?	**A Price**	**Margins on average loans** **Margins on riskier loans**	
	B Other conditions and terms	**Collateral requirements** **Loan-to-value ratio** **Maturity of the loans**	
Demand for loans			
Over the past three months, how has the demand for loans…	or credit lines to enterprises changed at your bank, apart from seasonal fluctuations? (Q4)	**Demand for loans**	**Net percentage** is equal to the difference between the sum of banks answering that the demand has increased and the sum of banks answering that the demand has decreased in percentage of the total number of banks
	to households (for house purchase) changed at your bank, apart from normal seasonal fluctuations? (Q13)		

Sources: ECB and national central banks. See http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for a full description of the survey
Note: Q* indicate the number of that question in the Bank Lending Survey
Note on confidentiality: some of the data are not publicly available, in particular the complete panel of responses from the BLS at the country level

APPENDIX

Table A.2 Data, sources and transformations

Definition	*Source*	*Sample*	*Transformation*
Overnight (EONIA) rates	ECB: Euro Interbank Offered Rate	2002:Q4-2010:Q4	Quarterly average of daily rates
Taylor-rule residuals	ECB and authors' calculation	2002:Q4-2010:Q4	Residual of a panel regression of EONIA rates on GDP growth and inflation
Interbank ratio	Bankscope	2002:Q4-2010:Q4	Median value by country
Total capital ratio	Bankscope	2002:Q4-2010:Q4	Median value by country
10-year rates	Thomson Financial Datastream	2002:Q4-2010:Q4	Quarterly average of daily national government bond yields
Current account balance	Eurostat	2002:Q4-2010:Q4	Percentage of nominal GDP by country
GDP growth	Eurostat	2002:Q4-2010:Q4	Annual growth of real GDP
Inflation	Eurostat	2002:Q4-2010:Q4	Quartely average of monthly inflation rates
Capital stringency index	Barth, Caprio and Levine (2006)	2002-2008	Annual index by country
Loan to value (LTV) ratio	IMF (2011)	2002-2008	Maximum ratio by country, annual index
Long-term liquidity provision (3-month to 1-year maturity)	ECB	2008:Q3-2010:Q4	Liquidity outstanding over nominal GDP by country

Note on confidentiality: the EONIA rates are not publicly available