

Bank-related loan supply factors during the crisis: an analysis based on the German bank lending survey

Barno Blaes



Discussion Paper
Series 1: Economic Studies
No 31/2011

Discussion Papers represent the authors' personal opinions and do not necessarily reflect the views of the Deutsche Bundesbank or its staff.

Editorial Board: Klaus Düllmann
Frank Heid
Heinz Herrmann

Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-0

Telex within Germany 41227, telex from abroad 414431

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax +49 69 9566-3077

Internet <http://www.bundesbank.de>

Reproduction permitted only if source is stated.

ISBN 978-3-86558-770-1 (Printversion)

ISBN 978-3-86558-771-8 (Internetversion)

Abstract

This paper analyses the role of bank-related constraints in explaining the sharp slowdown in bank lending to non-financial corporations in Germany during the recent financial crisis. We use a panel approach based on a unique data set which matches the individual responses of the banks participating in the Eurosystem's Bank Lending Survey with the corresponding micro data on loan quantities and prices. Our main finding is that bank-related supply and demand-side indicators were both important in explaining the slowdown of bank lending during the crisis years. The results suggest that the dampening impact of the bank-related restrictions was strongest from the third quarter of 2009 to the first quarter of 2010. Over this short period, more than one-third of the explained negative loan development was due to the restrictive adjustments of purely bank-related factors, such as the costs related to the bank's capital, market financing conditions and the bank's liquidity position.

Keywords: Bank Lending Survey, credit supply, panel data, financial crisis, Germany

JEL-Classification: C23, E30, E51, G21

Non-technical summary

The recent financial and economic crisis was followed by a pronounced decline in bank lending to non-financial corporations in many euro-area countries, including Germany. The serious burdens on banks imposed by crisis-induced write-downs as well as the severe drying-up of interbank money markets, which resulted in refinancing problems for numerous credit institutions, fuelled fears of a potential “credit crunch”. The main macroeconomic concern was that the quantitative restrictions on credit supply might be large enough to pose a major economic risk. However, it is not clear *a priori* whether the sharp slowdown in bank lending following the collapse of the investment bank Lehman Brothers was attributable primarily to weak loan demand caused by the marked contraction in economic activity or to a retrenchment in loan supply.

Making a clear distinction between the bank-related supply-side and other factors which explain loan dynamics is by no means straightforward. Data on aggregate lending generally used in empirical analyses reflect movements in both loan demand and loan supply, allowing therefore only limited statements on factors that underlie the observed bank lending. Hence, it is important to draw on additional sources of information, e.g. bank survey results.

Against this background, this study draws on the Eurosystem’s quarterly Bank Lending Survey (BLS) and uses the information supplied by the participating German banks to examine the relative importance of several factors underlying recent developments in loans to non-financial corporations in Germany. Our empirical findings suggest that BLS indicators make a good contribution to explaining the observed bank lending growth in the period 2003 Q1 to 2010 Q2. As regards the effects of the financial crisis (2007-09), bank-related supply and demand-side factors both prove to be important in explaining the recent strong slowdown in loan development. In the period where bank-related restrictions had the strongest dampening impact (2009 Q3 – 2010 Q1), more than one-third of the explained negative loan development was due to the restrictive adjustments of purely bank-related determinants, such as banks’ capital costs, market financing conditions and liquidity position.

Nichttechnische Zusammenfassung

Im Zuge der jüngsten Finanz- und Wirtschaftskrise gingen in vielen EWU-Ländern, darunter in Deutschland, die Buchkredite an nichtfinanzielle Unternehmen deutlich zurück. Dies führte vor dem Hintergrund der gleichzeitig beobachteten Belastungen der Banken aufgrund der krisenbedingten Abschreibungen sowie der Austrocknung des Geldmarkts mit schwerwiegenden Refinanzierungsproblemen für viele Kreditinstitute zu der Befürchtung einer möglichen Kreditklemme. Dabei bestand aus makroökonomischer Sicht die Hauptsorge darin, dass eine quantitativ bedeutende Beschränkung des Kreditangebots ein schwerwiegendes Risiko für die wirtschaftliche Entwicklung darstellen könnte. Allerdings bleibt es *a priori* unklar, ob der deutliche Rückgang der Buchkredite nach dem Zusammenbruch der Investmentbank Lehman Brothers auf die Abschwächung der wirtschaftlichen Aktivität und die damit einhergehende schwache Kreditnachfrage oder auf eine verhaltene Kreditvergabe zurückzuführen war.

Eine klare Unterscheidung zwischen den angebots- und nachfrageseitigen Erklärungsfaktoren der Kreditentwicklung ist nicht ohne weiteres möglich. Empirische Analysen der Kreditdynamik beruhen hauptsächlich auf aggregierten Variablen, die sowohl Änderungen in der Kreditnachfrage als auch im Kreditangebot widerspiegeln und folglich nur eingeschränkte Aussagen über die der beobachteten Kreditentwicklung zugrunde liegenden Faktoren ermöglichen. Deshalb ist es wichtig, zusätzliche Datenquellen heranzuziehen, wie z. B. die Ergebnisse der Bankenumfragen.

Die vorliegende Studie führt unter Einbeziehung der Angaben der am Bank Lending Survey (BLS) teilnehmenden deutschen Banken eine Analyse der relativen Bedeutung der einzelnen Determinanten der jüngsten Kreditentwicklung in Deutschland durch. Unsere Ergebnisse legen nahe, dass die im Rahmen des BLS gewonnene Information einen guten Beitrag zur Erklärung der Kreditentwicklung im Zeitraum von 2003 Q1 bis 2010 Q2 leistet. Die Studie zeigt, dass in den Krisenjahren (2007-09) sowohl die angebots- als auch die nachfrageseitigen Erklärungsfaktoren die jüngst beobachtete negative Kreditdynamik bestimmten. In der Phase des stärksten Einflusses der bankseitigen Einflussfaktoren (2009 Q3 – 2010 Q1) war mehr als ein Drittel der erklärten negativen Kreditentwicklung auf die restriktiven Anpassungen der bankseitigen Determinanten zurückzuführen, wie Eigenkapitalkosten, Finanzierungsbedingen und Liquiditätsposition.

CONTENTS

1. Introduction.....	1
2. Data and descriptive evidence.....	5
3. Model framework.....	9
4. Results.....	14
4.1. Empirical evidence.....	14
4.2. Quantitative importance of loan supply and loan demand on bank lending to non-financial corporations	16
5. Robustness analysis	19
6. Summary.....	20
References.....	22
Appendix.....	24

Lists of tables and figures

Table 1: BLS questionnaire, questions 1, 2 and 4.....	24
Table 2: BLS responses to questions 1, 2 and 4: descriptive statistics for the whole period 2002Q4-2010Q2 (<i>frequency of responses and percentages of total responses</i>).	25
Table 3: BLS responses to questions 1, 2 and 4: descriptive statistics for the crisis period 2007Q3-2009Q4 (<i>frequency of responses and percentages of total responses</i>).	26
Table 4: Loans to non-financial corporations, balanced panel (OLS, entity fixed effects, heteroscedasticity robust estimates).	27
Table 5: Loans to non-financial corporations, balanced panel (FGLS, corrected for groupwise heteroscedasticity and panel-specific AR1).....	28
Table 6: Loans to non-financial corporations, balanced panel (OLS, with entity and time fixed effects).....	29
Table 7: Loans to non-financial corporations, unbalanced panel (OLS, fixed effects, heteroscedasticity robust estimates)	30

Figure 1: Relative importance of the factors (left scale) determining bank credit standards (right scale) in Germany	6
Figure 2: Real loans to non-financial corporations: BLS banks versus aggregate series (quarter-on-quarter growth rates, as a percentage)	8
Figure 3: Factors determining the credit standards: bank-related supply factor.....	12
Figure 4: Factors determining the credit standards: the perception of risk factor.....	13
Figure 5: Explanatory contributions of the individual components to quarter-on-quarter loan growth (in percentage points)	17

BANK-RELATED LOAN SUPPLY FACTORS DURING THE CRISIS: AN ANALYSIS BASED ON THE GERMAN BANK LENDING SURVEY*

1. INTRODUCTION

The recent financial and economic crisis (2007-09) was followed by a pronounced decline in bank lending to non-financial corporations in many euro-area countries, including Germany. The serious burdens on banks due to crisis-induced write-downs as well as the severe drying-up of interbank money markets, which resulted in refinancing problems for numerous credit institutions, fuelled fears of a potential “credit crunch”. The main macroeconomic concern was that the quantitative restriction on credit supply might be large enough to pose a major economic risk.¹

However, it is not clear *a priori* whether the sharp slowdown in bank lending following the collapse of the investment bank Lehman Brothers was primarily attributable to weak loan demand caused by the marked contraction in economic activity or to a retrenchment in loan supply. Moreover, it is important to distinguish between a demand-induced decline in loan supply due to a deterioration of would-be borrowers’ creditworthiness on the one hand, and (additional) credit constraints due to bank-related factors such as a lack of available funds or shrinking capital base, i.e. purely supply-side factors, on the other.² A precise distinction between bank-related supply and demand-side factors in explaining loan developments is crucial insofar as they have different implications for monetary policy. For instance, monetary policy would respond to a negative loan *demand* shock by lowering the key policy rates in order to support both loan demand and banks’ propensity to lend (since lower interest rates lead to an increase in the value of potential borrowers’ eligible collateral). By contrast, the appropriate response to a negative bank-

* I would like to thank Fred Ramb, Christina Gerberding and Andreas Worms for very helpful suggestions. All errors are my own.

¹ For a more detailed definition of credit crunch, see Deutsche Bundesbank (2009, 2010).

² While in the first case the decline in bank lending is consequently related to weak economic performance and represents, to a certain degree, a necessary response by credit institutions to heightened credit default risks, the restriction of loan supply in the second case, i.e. due to bank-related supply factors, increases the risk of a further weakening of real activity and the banking sector, especially in a financial crisis.

related *supply* shock would be to provide liquidity support and short-term funding to banks, in order to stabilise the banking sector and maintain the flow of credit to the non-bank sector.

Making a clear distinction between the bank-related supply and demand-side factors in explaining loan dynamics is not straightforward, however. Data on banks' aggregate lending generally used in empirical analyses reflect movements in both loan demand and loan supply. Regressing aggregate loans to non-financial corporations on standard determinants, such as measures of overall economic activity, of firms' need for external financing and of macroeconomic risk, allows only limited statements on the relative importance of bank-related supply factors.³ To shed further light on this issue, we need to draw on additional sources of information.

Against this background, this study draws on the Eurosystem's quarterly Bank Lending Survey (BLS) and uses the information supplied by the participating German banks to examine the relative importance of several factors underlying recent developments in loans to non-financial corporations in Germany. Within this unique survey, a sample of German credit institutions are regularly asked how their lending conditions for non-financial corporations (including factors affecting movements in both loan demand and loan supply) have changed over the past three months. Furthermore, and of particular interest regarding the "credit crunch" debate, the reasons for the adjustments made to credit standards are surveyed: besides the competitive situation and banks' perception of risk (e.g. with regard to the outlook for general economic activity), response options also

³ For examples of such analyses for Germany, see Hristov, Hülsewig and Wollmershäuser (2010), or Busch, Scharnagl and Scheithauer (2010). Hristov et al. (2010) employ a panel SVAR model for the member countries of the Euro Area to analyse the macroeconomic effects of adverse loan supply shocks for the period from 2003Q1 to 2010Q2. Following Uhlig (2005) they identify the loan supply shocks by imposing sign restrictions and find that the dampening effects of loan supply shocks in Germany were predominantly relevant during 2009 and 2010. Busch et al. (2010) estimate a Bayesian VAR (with six variables) over the period from 1991Q1 to 2009Q2 and identify the loan supply shocks also by using sign restrictions. They find very strong negative effects of loan supply on loans to non-financial corporations for the three quarters following the Lehman collapse. Moon et al. (2011) suggest, however, methods of constructing error bands for impulse response functions of sign-restricted SVARs that adequately take into account the underlying uncertainty leading to error bands that can be twice as wide as in earlier studies.

cover bank-related factors such as wholesale funding costs, the liquidity situation and balance sheet constraints.

For the purpose of this analysis, we merge the BLS information with individual data on loan quantities and prices for the surveyed German banks. By controlling for the influence of demand-side factors, we are able to examine explicitly the relative contribution of bank-related supply restrictions for the strong slowdown in loans to non-financial corporations during the financial crisis period (2007-09), which is a pre-condition for making any statement on a possible “credit crunch”.

Up to now, only a few studies have been carried out using BLS data, one of the reasons for this probably being the relatively short sample period: the survey was launched only in the first quarter of 2003 (referring to the fourth quarter of 2002). To circumvent this limitation, most studies take advantage of the cross-sectional dimension of BLS data including either country-level BLS information, e.g. aggregate data both for BLS results and for bank lending (Cappiello, Kadareja, Kok Sørensen and Protopapa (2010), De Bondt, Maddaloni, Peydro and Scopel (2010), Ciccarelli, Maddaloni and Peydro (2010), Hempell and Kok Sørensen (2010)), or individual BLS responses and lending data of surveyed banks (Del Giovane, Eramo and Nobili (2010)). On the basis of a structural model suggested by Driscoll (2004), Cappiello et al. (2010) estimate a country panel (IV regression) and find significant effects of changes in loan supply (in terms of BLS credit standards) on real economic activity in the euro area for the period from 1999 Q1 to 2008 Q1. De Bondt et al. (2010) use a country panel approach (fixed effects OLS) to analyse the predictive power of BLS information content for euro-area bank lending and GDP growth for the period from 2002 Q2 to 2009 Q3. Their study suggests that the survey responses concerning corporate credit standards and conditions significantly help in explaining bank lending and real output growth in the euro area, showing a more pronounced explanatory power by a four-quarter lead. Hempell and Kok Sørensen (2010) apply the fixed effects FGLS methodology and investigate for the period from 2002 Q2 to 2009 Q4 the impact of loan supply constraints on euro-area bank lending, with a special focus on the crisis period (2007-09). Their main finding is that the financial crisis significantly impaired the banks' ability to supply loans, suggesting that supply-side factors were an important determinant of bank lending. Ciccarelli et al. (2010) embed the BLS information within a panel VAR

approach to assess the linkage between monetary policy, credit provision and the real economy for the period from 2002 Q4 to 2009 Q4. The authors show in their comprehensive analysis *inter alia* that the reduction in loan supply to non-financial corporations contributed significantly to the decline in output growth during the recent financial crisis, and argue that “there has been a credit crunch with real effects” in the euro area. Del Giovane et al. (2010) conduct their analysis based on fixed effects OLS and micro data for eleven (eight in the balanced panel) Italian BLS banks over the 2002 Q4 to 2009 Q4 period. The most important finding of their study is that the BLS indicators for both loan demand and loan supply significantly explain negative loan developments during the financial crisis and that the explanatory contribution of supply-side determinants was highest in 2008 Q4 and 2009 Q1.

The contribution of the present paper to this literature is threefold. First, it is the first study that uses the cross-sectional dimension of the BLS data set for Germany to analyse the importance of bank-related loan supply factors during the financial crisis.⁴ Second, the analysis covers a longer time period (from 2003 Q1 to 2010 Q2) as well as a broader cross-sectional dimension than previous studies: the German BLS sample consists of a balanced (unbalanced) panel of 14 (26) credit institutions. Third, it uses a “well-matched” data set in the sense that survey responses and loan data refer to the same panel of banks, thus avoiding potential mismatch errors and inaccurate interpretations of the results, which could arise if the BLS responses were simply matched to aggregate data on lending.⁵

The paper is structured as follows. Section 2 describes the main characteristics of the data used and presents some descriptive evidence. Section 3 illustrates the empirical methodology. Sections 4 and 5 present the results and discuss their robustness. Section 6 concludes.

⁴ The only other study for Germany based on individual BLS data is Hempell (2004), who attempts to gain an initial insight into the factors underlying observed loan dynamics for the sample period 2003 to 2004.

⁵ Our analysis with aggregate data on lending to non-financial corporations shows weaker significance of the BLS information.

2. DATA AND DESCRIPTIVE EVIDENCE

The Eurosystem's Bank Lending Survey, launched in 2003 Q1, provides quarterly information on banks' lending business with non-financial corporations and households.⁶ The survey is based on a number of specific questions covering information on changes in both the supply of and demand for bank loans over the past three months, so that the first set of answers refers to 2002 Q4. For the purpose of our analysis, we focus on the questions concerning banks' assessment of changes in their credit standards for non-financial corporations (BLS question 1), factors determining these changes (question 2), and the adjustments in borrowers' demand (question 4).⁷ Survey responses are qualitative and range between "tightened considerably", "tightened somewhat", "remained basically unchanged", "eased somewhat" and "eased considerably" for questions related to loan supply, and similarly, for questions related to loan demand between "increased considerably", "increased somewhat", "remained basically unchanged", "decreased somewhat" and "decreased considerably".

The banks in the German sample were selected due to their representativeness in the banking sector, i.e. by taking account of their share of the related credit markets and of the banking system's specific structure. The survey of the German BLS-banks is conducted by personal interviews in order to avoid potential inconsistencies in the survey results. Thus, despite its qualitative nature, the German BLS sample represents a unique set of data on banks' lending behaviour, motivating our analysis on the importance of bank-related supply factors in lending to non-financial corporations in Germany.

In fact, a first look at the responses to questions 1 and 2 (Figure 1) shows that the tightening of banks' credit standards that occurred from 2007 Q3 to 2009 Q1 appears to be due not only to the banks' heightened perception of risk but also, to some extent, to purely bank-related factors – the cost of funds and balance sheet constraints. By contrast, these bank-related factors had no impact on the observed standard tightening in the sec-

⁶ A detailed description of the euro-area BLS may be found in Berg et al. (2005), De Bondt et al. (2010).

⁷ For the exact wording of these questions, see Table 1 in the Appendix; the entire BLS questionnaire may be downloaded at http://www.ecb.int/stats/pdf/bls_questionnaire.pdf.

ond and third quarter of 2009. Since the fourth quarter of 2009, the bank-related factors have even been exerting an alleviating impact on credit standards, although the latter, on balance, tightened slightly (2009 Q4 and 2010 Q1) or remained basically unchanged (2010 Q2).

Figure 1: Relative importance of the factors (left scale) determining bank credit standards (right scale) in Germany⁸

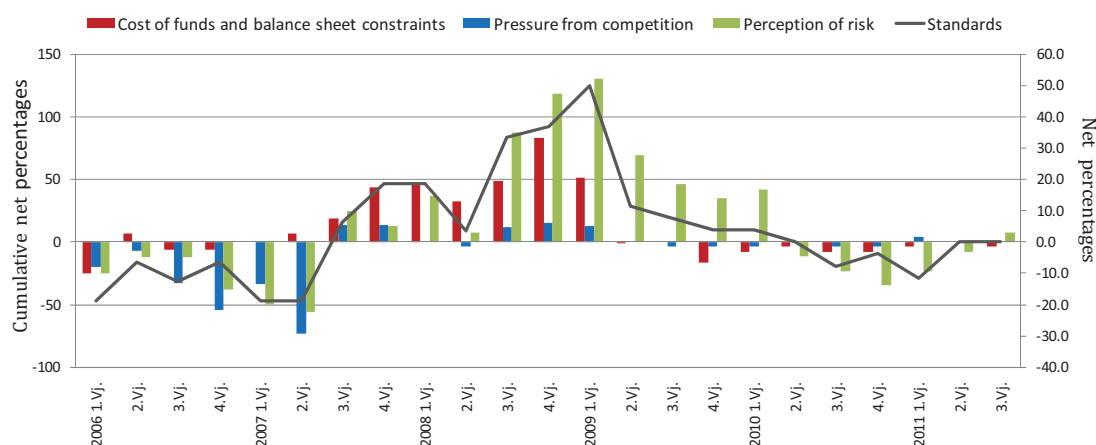


Table 2 and Table 3 give a descriptive summary of the respective survey records for the whole time period and specifically for the crisis period (2007-2009). As can be seen from these tables, the majority of banks' responses related to changes in credit standards and their determinants fell into the "remained basically unchanged" category. This indicates some reservations on the part of the surveyed banks about adjusting their credit standards. Answers reporting "somewhat" tightening or easing of credit standards and standards' determinants are, by comparison, less frequently recorded, while survey responses indicating "considerable" tightening or easing are very uncommon. In the case of

⁸ A positive value of the standards and their determinants indicates that the sum of the percentage of restrictive responses exceeds the sum of the percentage of expansionary responses (net percentage). Cumulative net percentages for the determinants of bank credit standards represent for the determinant summarised as "Cost of funds and balance sheet constraints" the sum of the net percentages for the factors "costs related to bank's capital position", "bank's ability to access market financing", and "bank's liquidity position"; for the determinant summarised as "Pressure from competition" the sum of the net percentages for the factors "competition from other banks", "competition from non-banks", and "competition from market financing"; for the determinant summarised as "Perception of risk" the sum of the net percentages for the factors "expectations regarding general economic activity", "industry or firm-specific outlook", and "risk on the collateral demanded".

loan demand, about half of survey records fall into the “remained basically unchanged” category. The remainder of the answers are distributed between “decreased somewhat” (24 percent) and “increased somewhat” (18 percent). The extreme response categories “decreased considerably” and “increased considerably” are uncommon here, too. With respect to survey responses during the financial crisis period (2007-2009), Table 3 shows that the survey answers related to standards and their determinants shifted towards more negative categories: the percentage of “tightened somewhat” responses increased. At the same time, we observe that the survey responses related to loan demand (question 4) now have a higher share in positive answer categories. Overall, the descriptive evidence based on the BLS data suggests that the bank-related, e. g. purely supply-side, factors worsened during the financial crisis (2007-2009), whereas the changes observed on the demand side (if we additionally account for risk perception of banks as a demand-induced adjustment in banks’ lending) are not quite clear.⁹

For our econometric panel analysis, we merge the individual banks’ responses to the above BLS-questions with individual data on lending amounts and loan rates for the surveyed German banks. Data on banks’ lending amounts are drawn from the German monthly balance sheet statistics and represent the end-of-quarter values of stocks adjusted for statistical changes.¹⁰ The banks’ lending rates are calculated as the volume-weighted averages across all maturities and are drawn from the MFI interest rate statistics. Moreover, as a further micro-level variable, we include each bank’s “capital to assets ratio” (defined as a ratio between bank capital and total assets) as a measure of possible

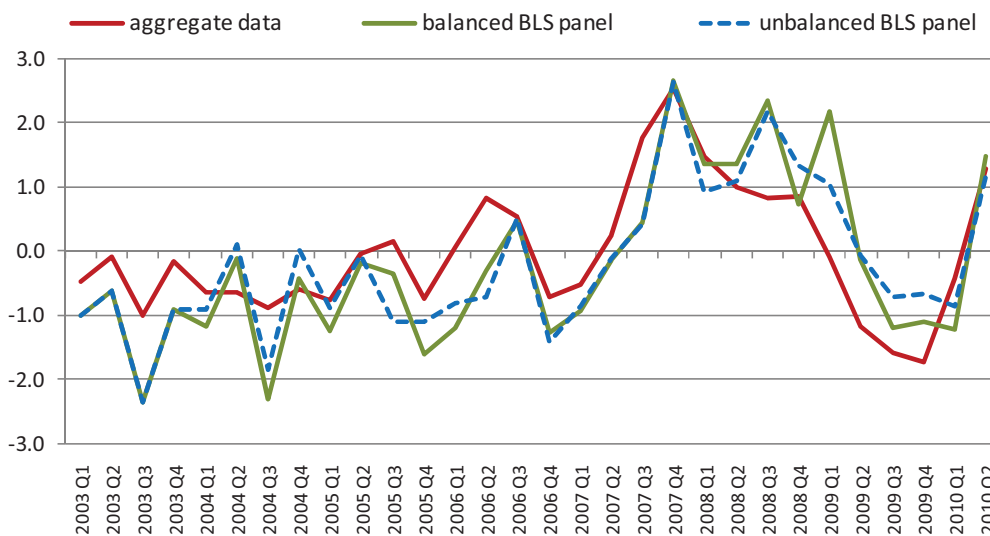
⁹ Note that banks’ perception of risk is generally treated as an indicator for banks’ willingness to lend depending on the degree of uncertainty about the creditworthiness of the borrowers and on banks’ expectations regarding general economic activity. See for exact wording of this question Table 1 in the Appendix.

¹⁰ Alternatively, we also conducted our analysis based on the new lending business data drawn from the MFI interest rate statistics. However, the usefulness of this data source as an indicator of the flow of funds to the private sector is limited by the fact that its reporting scheme is tailored towards the specific needs of the interest rate statistics (see Deutsche Bundesbank (2006), pp. 26-27). Hence, it is not surprising that estimations based on these data provide unclear results for the key parameters or worsen their significance (in this context see also Deutsche Bank (2010)).

lending constraints on the banks in the analysis, which serves as a control variable and brings additional variation in cross-sectional dimension.¹¹

The current German BLS sample consists of 29 banks, of which 12 were included for the first time in January 2008 to make the sample more representative. As one of the purposes of our analysis is to analyse the crisis-related changes in bank lending behaviour, in our preferred variant we balance the panel and come up with 14 German BLS banks which have been taking part in the BLS without interruption since it was launched in January 2003. Alternatively, and as a cross-check, we conduct our analysis using unbalanced panel data for 26 banks (3 of 29 banks do no business with non-financial corporations). Using a broader cross-sectional dimension allows us to circumvent potential limits deriving from the shortness of the BLS sample period.

Figure 2: Real loans to non-financial corporations: BLS banks versus aggregate series (quarter-on-quarter growth rates, as a percentage)



¹¹ The effect of “capital to assets ratio” is a priori unknown, depending on whether this variable describes the short-term balance sheet adjustments or the longer-term balance sheet adjustments. In the case of short-term adjustments – that could be generally made via a shortening of the asset side (i.e. total assets) – we would expect a negative sign. In the case of longer-term adjustments we would expect a positive sign, since a better “capital to assets ratio” has an encouraging effect on future bank lending.

As shown in Figure 2, the quarter-on-quarter growth rates of loans to non-financial corporations for German BLS banks (balanced and unbalanced panel) are somewhat more volatile than the corresponding series for the total banking system. This is due, in particular, to the fact that large banks are fairly overrepresented in the German BLS sample.¹²

As data on bank lending rates are only available from January 2003 onwards, the analysis is carried out for the period from the first quarter of 2003 to the second quarter of 2010, providing a total of 378 (467) observations in the balanced (unbalanced) panel.

3. MODEL FRAMEWORK

In our preferred specification, the panel econometric analyses are carried out for a balanced panel of 14 banks, applying a fixed effects OLS method, which helps to account for the unobserved variation among the banks.¹³ To examine the determinants of these banks' lending to non-financial corporations, we estimate an equation of the following general form:

$$(1) \quad \Delta Loans_{it} = \alpha_i + \beta(L) BLS_{it} + \gamma(L) X_{(i)t} + \varepsilon_{it},$$

where the variable $\Delta Loans_{it}$ is the first difference of the logarithm of real loans to non-financial corporations for bank i in period t . BLS_{it} denotes a set of BLS indicators for loan supply and loan demand for bank i in period t , $X_{(i)t}$ is a vector with additional explanatory macro and micro control variables, comprising the first difference of logarithmic real GDP ($\Delta \ln$ of real GDP), the first difference of logarithmic real insolvency claims ($\Delta \ln$ of real insolvency claims) as a macroeconomic risk factor, the "capital ratio" (defined as the

¹² For this reason, the findings of this paper should only be carefully transferred to the total banking system, which consists of more than 2000 credit institutions with many small (seemingly stabilised-acting) banks. Nevertheless, the insights gained from our analysis make a valuable contribution to a better understanding of the determinants of aggregate bank lending to non-financial corporations in Germany.

¹³ The fixed effects OLS method assumes that differences across units (here, banks) can be captured by allowing differences in the constant term, each of which is treated as an unknown parameter, to be estimated. For a more detailed description of the fixed effects method, see Greene (2003), pp. 283-293.

ratio between the bank capital and total assets of bank i in period t), as well as the spread between the costs of bank loan financing and the costs of alternative sources of financing for the enterprises (defined as the difference between lending rates of bank i in period t in business with non-financial corporations and the (aggregate) return on corporate bonds in period t).

Since the information content of the BLS indicators is qualitative, they are included in our specifications as dummy variables.¹⁴ Thus, for our baseline model, specification equation (1) can be rewritten as:

$$(2) \quad \begin{aligned} \Delta Loans_{it} = & \alpha_i + \beta_1(L) Standards \ tightened_{it} + \beta_2(L) Standards \ eased_{it} \\ & + \beta_3(L) Demand \ decreased_{it} + \beta_4(L) Demand \ increased_{it} \\ & + \gamma(L) X_{(i)t} + \varepsilon_{it}, \end{aligned}$$

where, for instance, $Standards \ tightened_{it}$ takes the value 1 if bank i reports a tightening of its credit standards in period t (response categories “tightened considerably” and “tightened somewhat”; see also footnote 9) and 0 otherwise; or $Demand \ decreased_{it}$ takes the value 1 if bank i reports a decrease in its borrowers’ demand in period t (response categories “decreased considerably” and “decreased somewhat”) and 0 otherwise. The expected signs are negative for β_1 , β_3 and positive for β_2 , β_4 .

In order to check whether the extent to which changes in loan supply and loan demand on the dependent variable have changed during the crisis period, we extend our specification in equation (2) by additionally taking into account the interaction terms between the BLS indicators and a crisis dummy. Following the literature (e.g. Del Giovane et al. (2010), Hempell and Kok Sørensen (2010)), we define the latter from the third quarter of 2007 to the fourth quarter of 2009. The crisis dummy takes the value of 1 for all quarters in the crisis period and 0 otherwise.

¹⁴ As the extreme survey response categories are very uncommon (see descriptive statistics in Section 2), the dummies for the surveyed BLS variables are defined for each adjustment direction in the survey records (e.g. standards “tightened” versus standards “remained basically unchanged” or standards “eased”), and not for each possible answer category (e.g. standards “tightened considerably” versus standards “tightened somewhat”, “remained basically unchanged”, “eased somewhat” or “eased considerably”).

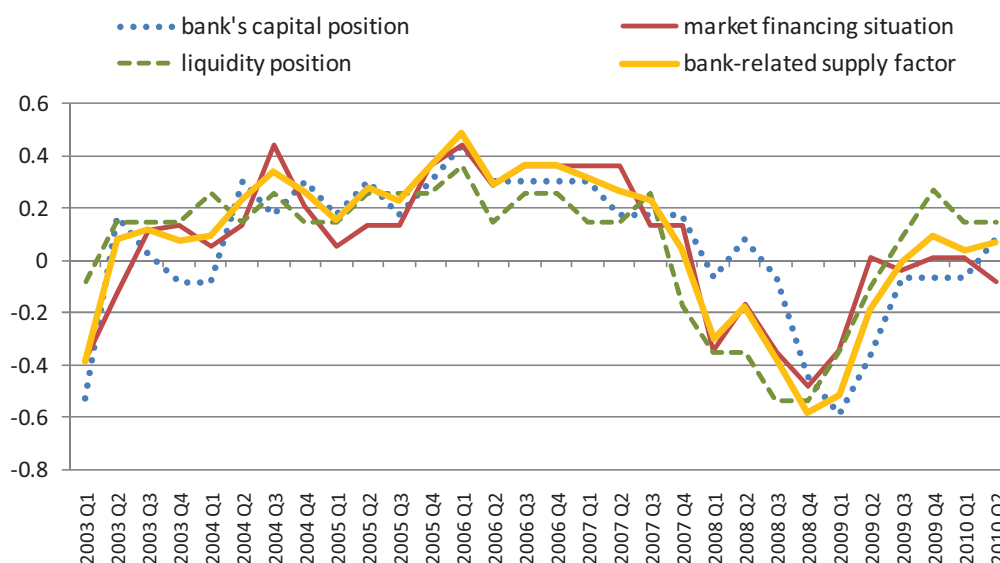
As we are specifically interested in identifying the contribution of pure supply-side determinants to the slowdown in loans to non-financial corporations following the Lehman Brothers collapse, we furthermore extend our specification in equation (2) by using the BLS information about the reasons for the adjustments made to their credit standards (BLS questionnaire, question 2). As described in Section 2, BLS banks have three response categories: (1) *cost of funds and balance sheet constraints* with detailed answers of banks on their capital position, ability to access market financing or liquidity situation – i.e. bank-related determinants; (2) *pressure from competition* coming from other banks, non-banks or market financing; and (3) *banks' perception of risk* with regard to expectations of economic activity, industry and firm-specific outlook or risk on the collateral demanded (see Table 1). In order to limit the number of explanatory variables, we extract common factors based on the principal component method proposed by Stock and Watson (2002) to summarise all records within each response option in a single variable, which accounts for the largest variation in the underlying data. This is as a linear combination of the original variables weighted with the set of scoring coefficients.¹⁵ The data on hand allowed the extraction of two factors, one linked to the *bank-related determinants* of credit standards, which we label as a bank-related supply factor, and another related to the *banks' perception of risk* – perception of risk factor. Factor extraction from survey data concerning the *pressure from competition* proved not to be useful as the respective survey answers show little variation because they include a large number of responses in the “remained basically unchanged” category (see descriptive statistics in Table 2).

Against the background of the “credit crunch” debate, the bank-related supply factor is of prime interest. As can be seen in Figure 3, the bank-related supply factor captures the dynamics of the underlying variables well. As is to be expected, this factor gains in importance with the outbreak of the financial crisis in the third quarter of 2007, reflecting the deterioration of banks' wholesale funding opportunities and banks' growing need for write-downs, reaching its maximum impact on credit standards in the third and fourth quarters of 2008, i.e. when the U.S. investment bank Lehman Brothers collapsed. Subse-

¹⁵ Alternatively, we conducted our analysis with (unweighted) means of the original variables instead of factors. However, the estimation results proved to be less significant.

quently, however, the importance of the purely supply-side factor quickly recedes, evidently following support by the governmental stimulus measures and the rapid monetary and liquidity policy response of the Eurosystem. It crosses the zero line in 2009 Q2, but does not attain its pre-crisis level by the end of our sample period – 2010 Q2.

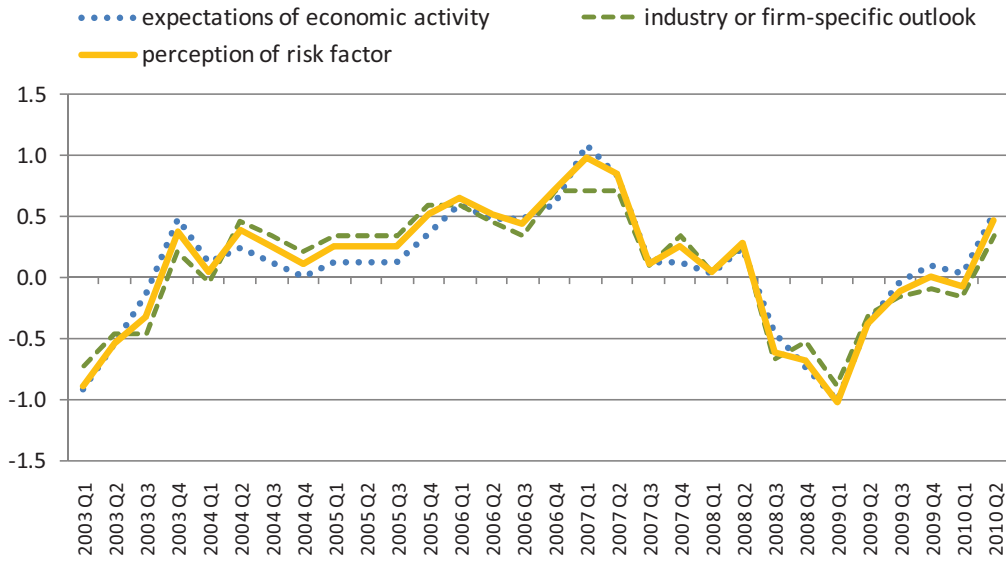
Figure 3: Factors determining the credit standards: bank-related supply factor¹⁶



The perception of risk factor summarises the dynamics of the underlying variables well, too (see Figure 4). Since economic developments were still positive up until then, the perception of risk factor on credit standards becomes negative only in 2008 Q2, reaching its lowest value in 2009 Q1 (the sharpest tightening in credit standards since the onset of the financial crisis). Afterwards, the factor moves slowly toward the positive values, indicating an easing effect on credit standards, and regains its pre-crisis level in the following quarters.

¹⁶ Negative values indicate a tightening effect on credit standards, while positive values denote an easing effect.

Figure 4: Factors determining the credit standards: the perception of risk factor¹⁷



The good properties of the extracted factors justify their use as additional explanatory variables.¹⁸ Under this extension, equation (2) can be rewritten as follows:

$$\begin{aligned}
 \Delta Loans_{it} = & \alpha_i + \beta_1(L) Standards\ tightened_{it} + \beta_2(L) Standards\ eased_{it} \\
 & + \beta_3(L) Demand\ decreased_{it} + \beta_4(L) Demand\ increased_{it} \\
 (3) \quad & + \beta_5(L) Perception\ of\ risk\ factor_{it} + \beta_6(L) Bank\text{-}related\ supply\ factor_{it} \\
 & + \gamma(L) X_{(i)t} + \varepsilon_{it},
 \end{aligned}$$

Moreover, in our analysis we investigate the crisis-induced changes in the impact of the extracted bank-related supply and the perception of risk factors by interacting them with the crisis dummy defined as above.

¹⁷ Negative values indicate a tightening effect on credit standards, while positive values denote an easing effect.

Note that the survey responses concerning risk on the collateral demanded could not be involved in the extraction of the “perception of risk” factor because they impaired the required statistical properties of the extracted factor.

¹⁸ The statistical properties of the extracted factors are measured based on the Kaiser-Meyer-Olkin (KMO) and Measure of Sampling Adequacy (MSA) values, each of which measures the sampling adequacy of factor extraction analysis.

4. RESULTS

4.1. EMPIRICAL EVIDENCE

The results of the fixed effects OLS estimation (six alternative specification variants) are shown in Table 4 in the Appendix. In seeking an appropriate model specification and the optimal lag structure, the general-to-specific principle was adopted.

As can be seen from Table 4, most of the coefficients are significant, have the expected sign and are broadly comparable among the different specifications used. In our baseline specification (column 1), the coefficient of *Standards tightened_{it}*, for instance, indicates that a tightening of credit standards by the BLS banks in period t leads to a decline of 1.36 percentage points in the quarter-on-quarter growth rate of loans to non-financial corporations in period $t+3$ (i.e. after three quarters). The estimated impact of this variable on lending does not vary significantly (between -1.36 and -1.03 percentage points) among the six specifications. The coefficients of the other BLS variables included in our baseline model specification (*Standards eased_{it}*, *Demand decreased_{it}* and *Demand increased_{it}*) show similar properties. As regards the control variables (the growth rate of real GDP, the growth rate of real insolvency claims as well as a spread variable), their estimated coefficients are likewise highly significant in all specification variants. In particular, the coefficient of the growth rate of real GDP has the expected positive sign, while an increase in the growth rate of real insolvency claims (as a proxy for decreased creditworthiness of would-be borrowers) and in the spread (indicating less attractiveness of financing through bank loans) have the expected negative impact on bank lending growth.

In specification 2 (column 2, Table 4), the “capital to assets ratio” (defined as the ratio between the bank capital and total assets of bank i in period t) is included in the estimation equation as a further control variable in addition to the variables already included in specification 1. This modification does not change the explanatory contribution of the BLS indicators or of the other control variables. The negative sign of the capital to assets ratio could be explained by the balance sheet relationship: short-term balance sheet ad-

justments are generally made via the assets side, i.e. via total assets. Accordingly, the capital to assets ratio increases if total assets fall, which implies declining loan growth.¹⁹

Specification 3 (column 3, Table 4) allows us to investigate whether the impact of the BLS supply and demand indicators was different during the crisis years. The results of this estimation suggest that the impact of both a tightening and an easing of standards on credit growth rates was significantly more pronounced during the crisis years than in the years before and after the crisis. By contrast, the adjustment effects of the BLS demand indicator in the crisis years do not differ from those in the non-crisis years. Similar results are also obtained in the alternative model specification variants used as a robustness check (see Tables 4 to 6 in the Appendix).²⁰

The remaining specification variants (columns 4 to 6, Table 4) include the bank-related supply and perception of risk factors extracted from the answers to question 2 and thus allow us to address the importance of bank-related determinants of loan supply.²¹ Columns 4 to 6 (Table 4) show the estimated impact of these factors on the loan developments of the BLS banks.²² The results suggest that the perception of risk factor has a considerable dampening effect on loan growth (lagged by two quarters) and that this effect does not differ significantly in the crisis years from the effect in the non-crisis years. By contrast, the impact of the bank-related supply factor on loan growth appears to be significantly stronger in the crisis than in the non-crisis years. The estimated average effect over

¹⁹ Note that the lagged effect of “capital to assets ratio”, intended to capture longer-term bank balance sheet adjustments, turned out to be insignificant.

²⁰ A detailed description of the additional analyses carried out as a robustness control can be found in Section 5.

²¹ The simultaneous incorporation of the standards as well as their determinants in the estimation equation is vindicated by the fact that the adjustments of credit standards are not explained exclusively by the determining factors regularly listed in the BLS questionnaire. That is the reason why “other factors” determining the standards are also surveyed in the BLS, although the responses of the participating banks to this option are voluntary and therefore very unbalanced. Since the impact of the BLS standards and their determinants on loan developments largely remains robust in the alternative model variants (see robustness check in Section 5), too, the problem of possible high multicollinearity does not appear to be important here.

²² It should be noted that, in order to simplify the interpretation of the estimation results, the extracted factors were multiplied by (-1) so that a higher value now indicates a tightening impact on credit standards.

all the years is insignificant here. Furthermore, it is interesting that the estimated negative impact of the bank-related supply factor during the crisis appears with a time lag of four quarters.

The time lag in the impact of the bank-related supply factor is largely consistent with the estimated effects of the standards tightening (*Standards tightened*) which, according to the estimates, occurs with a time lag of three quarters. The lagged impact of the credit standards and their determining factors on loan developments in the crisis years is compatible with the observed sequential deleveraging by the banks. This shows that the increase in banks' capital ratios via the assets side of their balance sheets, which became necessary in the wake of the escalating financial crisis, was initially undertaken by the banks not through the reduction of loans to the private sector, but instead via the reduction of other asset items (external assets, interbank assets, equities and other variable-interest securities).²³ Second, the lag can also be explained by the credit lines agreed in the previously concluded contracts. It is quite conceivable that, in times of poorer access to bank loans, enterprises make greater use of credit lines agreed before the restrictive adjustments of standards.

Comparable results with regard to the effects of the bank-related supply and perception of risk factors are also obtained in the alternative model variants as part of the robustness check (see Tables 5 to 7 in the Appendix).

4.2. QUANTITATIVE IMPORTANCE OF LOAN SUPPLY AND LOAN DEMAND ON BANK LENDING TO NON-FINANCIAL CORPORATIONS

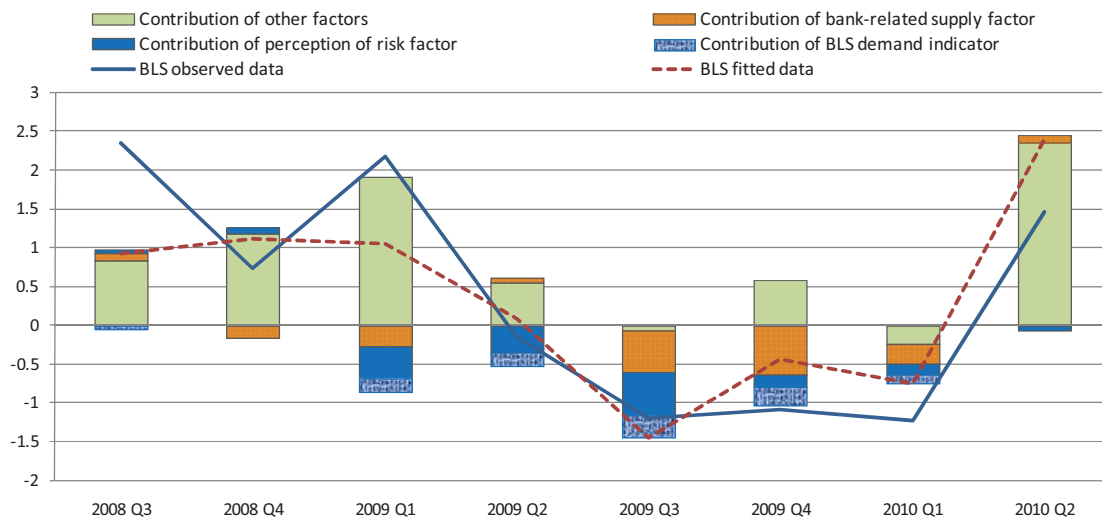
This subsection investigates the importance of the bank-related supply-side factor relative to other BLS indicators during the recent financial crisis. The following analysis is based on the results discussed in Section 4.1 (column 6, Table 4).

To analyse the relative importance of the bank-related supply factor, the fitted values of the dependent variable during the crisis years are broken down into their individual explanatory components. In other words, we investigate which percentage of the ex-

²³ See also Deutsche Bundesbank (2009), pp. 15-32.

plained loan development is due to the bank-related supply factor, the perception of risk factor, the BLS demand indicator and other remaining right-hand variables.²⁴ Figure 5 shows this breakdown as a bar chart. As can be seen from this chart, a dampening impact of the bank-related supply factor does not emerge until 2008 Q4, which marks the outbreak of the financial crisis in Europe (owing to the estimated lag of four quarters, this reflects the tightening of the bank-related supply factor in the fourth quarter of 2007). The share of the bank-related supply factor in the explained model variation remains rather small until the second quarter of 2009, however. In the three following quarters (third quarter of 2009 to the first quarter of 2010), the relative explanatory contribution of the bank-related supply-side factor is much larger and lies at least between 35% and 40%. This means that more than one-third of the explained negative loan development in these quarters is due to the restrictive adjustments of purely bank-related determinants, such as banks' capital costs, market financing conditions and liquidity position.

Figure 5: Explanatory contributions of the individual components to quarter-on-quarter loan growth (in percentage points)



The relative explanatory contribution of the perception of risk factor likewise appears to have become more important in the crisis years. The greatest dampening effect

²⁴ It should be noted that the other remaining right-hand variables summarise all those influences that cannot be assigned unambiguously to the loan demand or to the bank-related supply side. It is conceivable that variables such as the spread and/or GDP may therefore capture part of the demand or supply-side effects, which (have to) remain unidentified.

on loan developments is observed in the third quarter of 2009. When assessing the relative importance of this factor, it should nevertheless be noted that, although the variables on which this factor is based (expectations regarding general economic activity as well as industry or firm-specific outlook) represent the determinants of the BLS credit standards, they primarily describe influences that characterise the demand side. The perception of risk factor accounts for between 10% and 39% of the explained model variation in the 2009 Q1 to 2010 Q1 period.

The dampening impact of the BLS demand indicator on the loan developments of the BLS banks is comparatively small in the crisis years. The contribution to the explained model variation varies between 14% and 20%. Here, it should be noted that the BLS demand indicator is only one of the variables in the approach to describe the demand-side influences behind developments in BLS banks' lending to non-financial corporations. It is therefore conceivable that its explanatory contribution is also captured partly by other variables (e.g. by the growth rate of real GDP, growth rate of real insolvency claims and perception of risk factor).

In summary, the analyses in this section indicate that the observed negative credit dynamics of the crisis years can be attributed to both demand-side as well as purely bank-side determinants, while the relative importance of these factors changed over time. The dampening impact of the bank-related supply factor on lending was thus at its greatest in the third and fourth quarters of 2009 and amounted to roughly -0.5 and -0.6 percentage points, respectively. In annualised terms, the figures are between -2.0 and -2.4 percentage points, respectively. Furthermore, the analysis shows that the explained negative loan growth in the fourth quarter of 2009 was due (for the first time) more to the bank-related supply factor than to demand-side BLS indicators.

Overall, the findings obtained in our paper concerning determinants of BLS banks' lending appear plausible, especially given the fact that the German BLS sample consists predominantly of large banks which were faced with stronger supply-side constraints during the crisis (compared with the smaller banks) owing to their greater need for write-downs and more severely restricted wholesale funding opportunities.

5. ROBUSTNESS ANALYSIS

In this section, we analyse the robustness of the results presented in Table 4 to changes in some of the key assumptions. As an initial robustness check, a Breusch and Pagan Lagrangian multiplier test for random effects was conducted. We tested whether the method used to account for the unobserved variation among the individual banks (entity fixed effects estimator) is justified. The null hypothesis was rejected with 0.998% probability. The entity fixed effects estimator is therefore warranted.

With small data sets (as in the current case) and in the presence of heteroscedasticity and/or serial correlation, the efficiency of the estimated parameters, i.e. their closeness to the “true” parameters, is subject to doubt in the OLS approach. If the above-mentioned assumptions are violated (according to the tests, heteroscedasticity and weak serial autocorrelation are present in the data), the application of feasible GLS (FGLS) is recommended as an alternative approach. However, the quality of FGLS with small data sets is also not without its problems. Although the FGLS model enables the efficient parameters to be estimated, the resulting standard errors are often not reliable. Reed and Ye (2009) show in their Monte Carlo study that with small panel data sets either FGLS or OLS may prove to be more suitable depending on whether one is more interested in efficient parameters or reliable confidence bands. As we are equally interested in both, we re-estimated the model specifications based on a variant of FGLS which accounts for heteroscedasticity as well as the possible panel-specific autocorrelation structure of the error terms. Furthermore, in order to also incorporate the unobserved variation of the banks (entity fixed effects) into the FGLS estimation (which is proven to be important), the model is extended by including dummy variables for the individual banks.²⁵ Table 5 reports the outcome of this estimation which is broadly similar to the results of our preferred model variant.

Furthermore, we also addressed the potential problem of an omitted variable bias. The non-inclusion of relevant information in the explanation of the left-hand variable can

²⁵ On the possibilities of modelling fixed effects, see for instance Stock and Watson (2007), pp. 356-360.

lead to biased estimation parameters, with some right-hand variables being over or underestimated or even being estimated with the wrong sign. In order to estimate the explanatory power of the BLS indicators correctly, the macro variables in equations 2 and 3 were replaced by a complete set of time dummies. These estimates were conducted using OLS including both entity (i.e. bank) and time (i.e. quarters) fixed effects. In doing so, we capture the unobserved variation in both the cross-sectional dimension (variation between banks) and the longitude dimension (variation in time). As can be seen in Table 6, a similar set of results is found in this variant, too.

Finally, as a further robustness check, the exercise was repeated with the unbalanced BLS data set. As many banks in the unbalanced panel were not included in the survey until the first quarter of 2008, a separate analysis of the crisis effects on individual variables is not easily possible (since the “non-crisis years” are not available as a reference category for many banks). For that reason, attention should be confined to the specifications in which the effects of the crisis are not explicitly investigated. The results of this estimation alternative are shown in Table 7. Here, again, we get broadly comparable results.

All in all, the results in all four estimation variants (Table 4 to Table 7) turn out to be consistent: the estimates of the key parameters do not change significantly across the model variants, indicating the robustness of the results presented in Section 4.

6. SUMMARY

The main aim of this paper was to exploit the cross-sectional dimension of the confidential BLS data for Germany to analyse the importance of bank-related factors in bank lending to non-financial corporations during the recent financial crisis (2007-09). The use of micro data on lending quantities and prices enabled us to conduct our analysis with a well-matched data set in the sense that survey responses and loan data refer to the same panel of banks, thus avoiding potential mismatch errors and inaccurate interpretations of the results, which could arise if BLS responses were matched to aggregate data on lending.

In sum, our empirical findings suggest that BLS indicators make a significant contribution to explaining the observed bank lending in the period from the first quarter of 2003 to the second quarter of 2010, although the relative explanatory power of the individual BLS indicators varies over time. In particular, both bank-related supply and demand-side factors proved to be important in explaining the strong slowdown in lending following the Lehman Brothers collapse. The relative explanatory contribution of the bank-related supply factor remained small until the second quarter of 2009 and increased markedly afterwards, reaching values of between at least 35% and 40% in the third and fourth quarters of 2009 and in the first quarter of 2010. This means that during this period more than one-third of the explained negative loan development was due to the restrictive adjustments of purely bank-side determinants, such as banks' capital costs, market financing conditions and liquidity position. Furthermore, our analysis indicates that the dampening impact of the bank-related supply factor on loan developments occurred with a time lag of several quarters (precisely one year after the Lehman shock). This is consistent with the evidence that deleveraging of banks occurred initially not through loans to the private sector but through other asset positions. All in all, the key results of this analysis proved to be robust to changes in the model specification and the estimation method.

It should be noted that our results are based on a sample with a disproportionately high percentage of larger credit institutions. Owing to the heightened need for write-downs and the more severely restricted wholesale funding options of these banks, our study is likely, if anything, to have overestimated the importance of bank-related factors for lending of the banking sector.

REFERENCES

- Berg, J., A. van Rixtel, A. Ferrando, G. de Bondt, et al. (2005), The bank lending survey for the euro area, ECB Occasional Paper No 23, European Central Bank.
- Busch, U., Scharnagl, M. and J. Scheithauer (2010), Loan supply in Germany during the financial crisis, Discussion Paper Series 1: Economic Studies No 5/2010, Deutsche Bundesbank.
- Cappiello, L., A. Kadareja, C. Kok Sørensen and M. Protopapa (2010), Do bank loans and credit standards have an effect on output? A panel approach for the Euro Area, Working Paper Series No 1150, European Central Bank.
- Ciccarelli, M., A. Maddaloni and J.-L. Peydro (2010), Trusting the Bankers: A New Look at the Credit Channel of Monetary Transmission, Working Paper Series No 1228, European Central Bank.
- De Bondt, G., A. Maddaloni, J.-L. Peydro and S. Scopel (2010), The euro area Bank Lending Survey matters: empirical evidence for credit and output growth, Working Paper Series No 1160, European Central Bank.
- Del Giovane, P., G. Eramo and A. Nobili (2010), Disentangling demand and supply in credit developments: a survey-based analysis for Italy, Working Paper No 764, Banca d'Italia.
- Deutsche Bundesbank (2006), New lending business according to the MFI interest rate statistics, Monthly Report, July 2006.
- Deutsche Bundesbank (2009), Developments in lending to the German private sector during the global financial crisis, Monthly Report, September 2009.
- Deutsche Bundesbank (2010), Germany in the financial and economic crisis, Monthly Report, October 2010.
- Deutsche Bank (2010), Understanding bank lending surveys, Deutsche Bank Global Markets Research, June 2010.
- Driscoll, J.C. (2004), Does bank lending affect output? Evidence from the US states, *Journal of Monetary Economics* **51**, pp. 451-471.
- Greene, W. H. (2003), *Econometric Analysis*, New York Prentice Hall.
- Hempell, H. S. (2004), New bank lending survey of the Eurosystem: interpretation and use of first results for Germany, *Journal of Business Cycle Measurement and Analysis* **1(3)**, pp. 387-408.
- Hempell, H. S. and C. Kok Sørensen (2010), The impact of supply constraints on bank lending in the euro area - crisis induced crunching?, Working Paper Series No 1262, European Central Bank.

- Hristov, N., Hülsewig, O. and T. Wollmershäuser (2010), Loan supply shocks during the financial crisis: Evidence for the Euro Area, CESifo Working Paper No 3395.
- Moon, H. R. , Schorfheide, F., Grnaziera, E. and M. Lee (2011), Inference for VARs identified with sign restrictions, Working Paper No 11-20, Federal Reserve Bank of Philadelphia.
- Reed, R. W. and H. Ye (2009), Which panel data estimator should I use?, *Applied Economics* **1-16**.
- Stock, J. H. and M. W. Watson (2007), Introduction to Econometrics, Boston, San Francisco, New York, Pearson / Addison Wesley.
- Uhlig, H. (2005), What are the effects of monetary policy on output? Results from an agnostic identification procedure, *Journal of Monetary Economics* **52**, pp. 381-419.

APPENDIX

Table 1: BLS questionnaire, questions 1, 2 and 4.

	1="Tightened considerably"	2="Tightened somewhat"	3="Remained basically unchanged"	4="Eased somewhat"	5="Eased considerably"
1. 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?					
2. 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 (as described in question 1)?	1="Contributed considerably to tightening"	2="Contributed somewhat to tightening"	3="Contributed to basically unchanged standards"	4="Contributed somewhat to easing"	4="Contributed considerably to easing"
2.A. Costs of funds and balance sheet constraints					0="Not applicable (NA)"
- Costs related to your bank's capital position					
- Your bank's ability to access market financing					
- Your bank's liquidity position					
2.B. Pressure from competition					
- Competition from other banks					
- Competition from non-banks					
- Competition from market financing					
2.C. Perception of risk					
- Expectations regarding general economic activity					
- Industry or firm-specific outlook					
- Risk on the collateral demanded					
4. Over the past three months, how has the demand for loans or credit lines to enterprises changed at your bank, apart from normal seasonal fluctuations?	1="Decreased considerably"	2="Decreased somewhat"	3="Remained basically unchanged"	4="Increased somewhat"	4="Increased considerably"

Table 2: BLS responses to questions 1, 2 and 4: descriptive statistics for the whole period 2002Q4-2010Q2 (frequency of responses and percentages of total responses).

	1="Tightened/ decreased con- siderably"	2="Tightened/ decreased somewhat"	3="Remained basically un- changed"	4="Eased/ increased some- what"	5="Eased/ increased con- siderably"	Total observations
1. Credit standards	2 0.46%	53 12.21%	362 83.41%	17 3.92%	0 0.00%	434 100.0%
2.A. Costs of funds and balance sheet constraints						
Your bank's capital position	2 0.46%	42 9.68%	390 89.63%	1 0.23%	0 0.00%	435 100.0%
Your ability to access market financing	7 1.66%	34 8.08%	373 88.60%	7 1.66%	0 0.00%	421 100.0%
Your liquidity position	8 1.85%	14 3.24%	391 90.51%	18 4.17%	1 0.23%	432 100.0%
2.B. Pressure from competition						
Competition from other banks	0 0.00%	6 1.50%	353 88.03%	41 10.22%	1 0.25%	401 100.0%
Competition from non-banks	0 0.00%	2 0.53%	368 97.87%	6 1.60%	0 0.00%	376 100.0%
Competition from market financing	0 0.00%	1 0.26%	382 99.48%	1 0.26%	0 0.00%	384 100.0%
2.C. Perception of risk						
Expectations regarding economic activity	12 2.76%	66 15.21%	326 75.12%	29 6.68%	1 0.23%	434 100.0%
Industry or firm-specific outlook	11 2.54%	68 15.70%	334 77.14%	20 4.62%	0 0.00%	433 100.0%
Risk on the collateral demanded	2 0.46%	46 10.67%	382 88.63%	1 0.23%	0 0.00%	431 100.0%
4. Loan demand	5 1.15%	102 23.50%	243 55.99%	80 18.43%	4 0.92%	434 100.0%

Table 3: BLS responses to questions 1, 2 and 4: descriptive statistics for the crisis period 2007Q3-2009Q4 (frequency of responses and percentages of total responses).

	1="Tightened/ decreased considerably"	2="Tightened/ decreased somewhat"	3="Remained basically un- changed"	4="Eased/ increased some- what"	5="Eased/ increased considerably"	Total observations
1. Credit standards	1	25	110	4	0	140
2.A. Costs of funds and balance sheet constraints		17.86%	78.57%	2.86%	0.00%	100.0%
Your bank's capital position	0	14	126	0	0	140
Your bank's ability to access market financing	3	19	117	0	0	139
Your bank's liquidity position	5	11	121	1	1	139
2.B. Pressure from competition		7.91%	87.05%	0.72%	0.72%	100.0%
Competition from other banks	0	1	118	11	0	130
Competition from non-banks	0	0	127	1	0	128
Competition from market financing	0	0	115	0	0	115
2.C. Perception of risk		0.00%	100.00%	0.00%	0.00%	100.0%
Expectations regarding general economic activity	4	31	98	7	0	140
Industry or firm-specific outlook	4	28	103	4	0	139
Risk on the collateral demanded	0	12	127	0	0	139
4. Loan demand	3	18	83	34	2	140
		12.86%	59.29%	24.29%	1.43%	100.0%

Table 4: Loans to non-financial corporations, balanced panel (OLS, entity fixed effects, heteroscedasticity robust estimates).

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$
$\Delta \ln$ of real GDP (-2)	0.407*** (0.130)	0.411*** (0.125)	0.367** (0.146)	0.380*** (0.121)	0.355** (0.129)	0.345** (0.132)
$\Delta \ln$ of real insolvency claims (-2)	-0.010*** (0.0030)	-0.009*** (0.0029)	-0.010** (0.0033)	-0.009*** (0.0029)	-0.008*** (0.0027)	-0.009*** (0.0031)
Spread	-0.722*** (0.208)	-0.818*** (0.233)	-0.677** (0.236)	-0.859*** (0.233)	-0.867*** (0.228)	-0.770** (0.269)
Standards tightened (-3)	-1.361** (0.570)	-1.230** (0.515)	-0.189 (0.573)	-1.086** (0.468)	-1.034** (0.464)	-0.283 (0.440)
Standards eased (-2)	1.892** (0.769)	1.772** (0.745)	1.356** (0.613)	1.437 (0.911)	1.473 (0.910)	0.718 (0.548)
Demand decreased (-4)	-0.963*** (0.204)	-0.985*** (0.211)	-0.881*** (0.288)	-0.853*** (0.257)	-0.891*** (0.257)	-0.809** (0.323)
Demand increased (-1)	1.444** (0.487)	1.529*** (0.502)	0.863 (0.578)	1.345** (0.499)	1.449** (0.534)	0.790 (0.586)
Standards tightened/Crisis (-3)			-2.126*** (0.590)			-1.346** (0.611)
Standards eased/Crisis (-2)			4.185*** (0.646)			4.628*** (0.512)
Demand decreased/Crisis (-4)			-0.103 (0.842)			0.176 (0.975)
Demand increased/Crisis (-1)			1.552 (0.977)			1.632 (0.927)
Capital ratio		-0.528** (0.225)				
Perception of risk factor (-2)				-0.372** (0.153)	-0.368 (0.258)	-0.511** (0.211)
Bank-related supply factor (-4)				-0.223 (0.261)	0.144 (0.213)	0.0658 (0.226)
Perception of risk factor/Crisis (-2)					-0.0353 (0.359)	0.245 (0.318)
Bank-related supply factor/Crisis (-4)					-0.977*** (0.244)	-0.859*** (0.241)
Constant	-0.615*** (0.152)	1.445 (0.838)	-0.617*** (0.161)	-0.748*** (0.166)	-0.715*** (0.182)	-0.734*** (0.200)
Observations	378	378	378	378	378	378
R-squared	0.121	0.133	0.148	0.132	0.154	0.175
Number of banks	14	14	14	14	14	14
T	30	30	30	30	30	30

*** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses.

Table 5: Loans to non-financial corporations, balanced panel (FGLS, corrected for groupwise heteroscedasticity and panel-specific AR1)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$
$\Delta \ln$ of real GDP (-2)	0.393** (0.162)	0.439*** (0.165)	0.393** (0.164)	0.378** (0.163)	0.402** (0.163)	0.402** (0.164)
$\Delta \ln$ of real insolvency claims (-2)	-0.006** (0.0025)	-0.006*** (0.0025)	-0.006** (0.0025)	-0.006*** (0.0024)	-0.006** (0.0025)	-0.006** (0.0024)
Spread	-0.518*** (0.181)	-0.653*** (0.191)	-0.602*** (0.195)	-0.678*** (0.188)	-0.735*** (0.188)	-0.771*** (0.198)
Standards tightened (-3)	-1.172*** (0.403)	-1.125*** (0.428)	-0.299 (0.562)	-1.025** (0.422)	-1.004** (0.419)	-0.339 (0.609)
Standards eased (-2)	1.859*** (0.669)	1.800*** (0.665)	1.514** (0.676)	1.226* (0.687)	0.974 (0.703)	0.639 (0.709)
Demand decreased (-4)	-0.786*** (0.304)	-0.685** (0.313)	-0.641* (0.340)	-0.675** (0.312)	-0.608* (0.310)	-0.499 (0.347)
Demand increased (-1)	1.166*** (0.318)	1.256*** (0.336)	0.779* (0.434)	1.069*** (0.328)	1.168*** (0.332)	0.705 (0.445)
Standards tightened/Crisis (-3)			-1.835** (0.774)			-1.280 (0.820)
Standards eased/Crisis (-2)			3.679 (3.062)			4.303 (3.118)
Demand decreased/Crisis (-4)			-0.458 (0.691)			-0.143 (0.702)
Demand increased/Crisis (-1)			1.055* (0.618)			1.139* (0.637)
Capital ratio		-0.459** (0.199)				
Perception of risk factor (-2)				-0.408** (0.172)	-0.616*** (0.231)	-0.647*** (0.232)
Bank-related supply factor (-4)				-0.210 (0.140)	0.120 (0.156)	0.0376 (0.154)
Perception of risk factor/Crisis (-2)					0.323 (0.320)	0.363 (0.320)
Bank-related supply factor/Crisis (-4)					-1.118*** (0.257)	-1.015*** (0.262)
Constant	-0.627 (0.567)	1.571 (1.142)	-0.502 (0.485)	-0.648 (0.540)	-0.797 (0.519)	-0.695 (0.468)
Observations	378	378	378	378	378	378
Number of banks	14	14	14	14	14	14
T	30	30	30	30	30	30
chi ²	116.1	115.0	135.7	122.5	148.8	166.4

*** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses.

Table 6: Loans to non-financial corporations, balanced panel (OLS, with entity and time fixed effects)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$
Standards tightened (-3)	-1.213** (0.526)	0.179 (0.741)	0.194 (0.738)	-1.023** (0.451)	-0.920* (0.470)	-0.0525 (0.561)
Standards eased (-2)	1.673*** (0.497)	1.072** (0.487)	1.036** (0.451)	1.361** (0.619)	1.448* (0.678)	0.776 (0.630)
Demand decreased (-4)	-0.722** (0.303)	-0.643 (0.425)	-0.753** (0.315)	-0.697** (0.311)	-0.684* (0.328)	-0.643 (0.432)
Demand increased (-1)	1.351** (0.535)	1.289 (0.756)	1.442** (0.541)	1.278** (0.527)	1.398** (0.570)	1.325 (0.805)
Standards tightened/Crisis (-3)		-2.557*** (0.787)	-2.573*** (0.725)			-1.589* (0.819)
Standards eased/Crisis (-2)		3.565*** (0.811)	3.566*** (0.810)			3.821*** (0.915)
Demand decreased/Crisis (-4)		-0.426 (0.798)				-0.231 (1.022)
Demand increased/Crisis (-1)		0.299 (0.978)				0.260 (0.968)
Perception of risk factor (-2)				-0.302 (0.185)	-0.169 (0.238)	-0.254 (0.240)
Bank-related supply factor (-4)				-0.174 (0.260)	0.322 (0.255)	0.240 (0.259)
Perception of risk factor/Crisis (-2)					-0.214 (0.313)	-0.0896 (0.337)
Bank-related supply factor/Crisis (-4)					-1.134*** (0.283)	-0.977*** (0.293)
Constant	-0.858 (0.968)	-0.278 (1.142)	-0.305 (1.037)	-0.0311 (1.260)	-0.998 (1.255)	-1.072 (1.323)
Observations	378	378	378	378	378	378
R-squared	0.208	0.226	0.225	0.214	0.238	0.248
Number of banks	14	14	14	14	14	14
T	30	30	30	30	30	30

*** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses.

Table 7: Loans to non-financial corporations, unbalanced panel (OLS, fixed effects, heteroscedasticity robust estimates)

	(1)	(2)	(3)
VARIABLES	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$	$\Delta \ln(\text{loan})$
$\Delta \ln$ of real GDP (-2)	0.264** (0.113)	0.279** (0.113)	0.256** (0.110)
$\Delta \ln$ of real insolvency claims (-2)	-0.007*** (0.0021)	-0.007*** (0.0021)	-0.006*** (0.0021)
<i>Spread</i>	-0.657*** (0.206)	-0.761*** (0.228)	-0.789*** (0.227)
Standards tightened (-3)	-1.243** (0.450)	-1.123** (0.404)	-0.920** (0.410)
Standards eased (-2)	1.397* (0.683)	1.323* (0.648)	1.069 (0.811)
Demand decreased (-4)	-0.861*** (0.185)	-0.876*** (0.192)	-0.777*** (0.216)
Demand increased (-1)	1.576*** (0.405)	1.637*** (0.413)	1.516*** (0.402)
Capital ratio		-0.619** (0.225)	
Perception of risk factor (-2)			-0.277* (0.157)
Bank-related supply factor (-4)			-0.467 (0.357)
Constant	-0.702*** (0.187)	1.707* (0.830)	-0.863*** (0.203)
Observations	467	467	467
R-squared	0.109	0.122	0.122
Number of banks	26	26	26
T	30	30	30

*** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses.

The following Discussion Papers have been published since 2010:

Series 1: Economic Studies

01	2010	Optimal monetary policy in a small open economy with financial frictions	Rossana Merola
02	2010	Price, wage and employment response to shocks: evidence from the WDN survey	Bertola, Dabusinkas Hoerberichts, Izquierdo, Kwapil Montornès, Radowski
03	2010	Exports versus FDI revisited: Does finance matter?	C. M. Buch, I. Kesternich A. Lipponer, M. Schnitzer
04	2010	Heterogeneity in money holdings across euro area countries: the role of housing	Ralph Setzer Paul van den Noord Guntram Wolff
05	2010	Loan supply in Germany during the financial crises	U. Busch M. Scharnagl, J. Scheithauer
06	2010	Empirical simultaneous confidence regions for path-forecasts	Òscar Jordà, Malte Knüppel Massimiliano Marcellino
07	2010	Monetary policy, housing booms and financial (im)balances	Sandra Eickmeier Boris Hofmann
08	2010	On the nonlinear influence of Reserve Bank of Australia interventions on exchange rates	Stefan Reitz Jan C. Ruelke Mark P. Taylor
09	2010	Banking and sovereign risk in the euro area	S. Gerlach A. Schulz, G. B. Wolff
10	2010	Trend and cycle features in German residential investment before and after reunification	Thomas A. Knetsch

11	2010	What can EMU countries' sovereign bond spreads tell us about market perceptions of default probabilities during the recent financial crisis?	Niko Dötz Christoph Fischer
12	2010	User costs of housing when households face a credit constraint – evidence for Germany	Tobias Dümmler Stephan Kienle
13	2010	Extraordinary measures in extraordinary times – public measures in support of the financial sector in the EU and the United States	Stéphanie Marie Stolz Michael Wedow
14	2010	The discontinuous integration of Western Europe's heterogeneous market for corporate control from 1995 to 2007	Rainer Frey
15	2010	Bubbles and incentives: a post-mortem of the Neuer Markt in Germany	Ulf von Kalckreuth Leonid Silbermann
16	2010	Rapid demographic change and the allocation of public education resources: evidence from East Germany	Gerhard Kempkes
17	2010	The determinants of cross-border bank flows to emerging markets – new empirical evidence on the spread of financial crisis	Sabine Herrmann Dubravko Mihaljek
18	2010	Government expenditures and unemployment: a DSGE perspective	Eric Mayer, Stéphane Moyon Nikolai Stähler
19	2010	NAIRU estimates for Germany: new evidence on the inflation-unemployment trade-off	Florian Kajuth
20	2010	Macroeconomic factors and micro-level bank risk	Claudia M. Buch Sandra Eickmeier, Esteban Prieto

21	2010	How useful is the carry-over effect for short-term economic forecasting?	Karl-Heinz Tödter
22	2010	Deep habits and the macroeconomic effects of government debt	Rym Aloui
23	2010	Price-level targeting when there is price-level drift	C. Gerberding R. Gerke, F. Hammermann
24	2010	The home bias in equities and distribution costs	P. Harms M. Hoffmann, C. Ortseifer
25	2010	Instability and indeterminacy in a simple search and matching model	Michael Krause Thomas Lubik
26	2010	Toward a Taylor rule for fiscal policy	M. Kliem, A. Kriwoluzky
27	2010	Forecast uncertainty and the Bank of England interest rate decisions	Guido Schulte Guido Schulte Frankenfeld
01	2011	Long-run growth expectations and “global imbalances”	M. Hoffmann M. Krause, T. Laubach
02	2011	Robust monetary policy in a New Keynesian model with imperfect interest rate pass-through	Rafael Gerke Felix Hammermann
03	2011	The impact of fiscal policy on economic activity over the business cycle – evidence from a threshold VAR analysis	Anja Baum Gerrit B. Koester
04	2011	Classical time-varying FAVAR models – estimation, forecasting and structural analysis	S. Eickmeier W. Lemke, M. Marcellino

05	2011	The changing international transmission of financial shocks: evidence from a classical time-varying FAVAR	Sandra Eickmeier Wolfgang Lemke Massimiliano Marcellino
06	2011	FiMod – a DSGE model for fiscal policy simulations	Nikolai Stähler Carlos Thomas
07	2011	Portfolio holdings in the euro area – home bias and the role of international, domestic and sector-specific factors	Axel Jochem Ute Volz
08	2011	Seasonality in house prices	F. Kajuth, T. Schmidt
09	2011	The third pillar in Europe: institutional factors and individual decisions	Julia Le Blanc
10	2011	In search for yield? Survey-based evidence on bank risk taking	C. M. Buch S. Eickmeier, E. Prieto
11	2011	Fatigue in payment diaries – empirical evidence from Germany	Tobias Schmidt
12	2011	Currency blocs in the 21 st century	Christoph Fischer
13	2011	How informative are central bank assessments of macroeconomic risks?	Malte Knüppel Guido Schulte frankenfeld
14	2011	Evaluating macroeconomic risk forecasts	Malte Knüppel Guido Schulte frankenfeld
15	2011	Crises, rescues, and policy transmission through international banks	Claudia M. Buch Catherine Tahmee Koch Michael Koetter
16	2011	Substitution between net and gross settlement systems – A concern for financial stability?	Ben Craig Falko Fecht

17	2011	Recent developments in quantitative models of sovereign default	Nikolai Stähler
18	2011	Exchange rate dynamics, expectations, and monetary policy	Qianying Chen
19	2011	An information economics perspective on main bank relationships and firm R&D	D. Hoewer T. Schmidt, W. Sofka
20	2011	Foreign demand for euro banknotes issued in Germany: estimation using direct approaches	Nikolaus Bartzsch Gerhard Rösl Franz Seitz
21	2011	Foreign demand for euro banknotes issued in Germany: estimation using indirect approaches	Nikolaus Bartzsch Gerhard Rösl Franz Seitz
22	2011	Using cash to monitor liquidity – implications for payments, currency demand and withdrawal behavior	Ulf von Kalckreuth Tobias Schmidt Helmut Stix
23	2011	Home-field advantage or a matter of ambiguity aversion? Local bias among German individual investors	Markus Baltzer Oscar Stolper Andreas Walter
24	2011	Monetary transmission right from the start: on the information content of the eurosystem's main refinancing operations	Puriya Abbassi Dieter Nautz
25	2011	Output sensitivity of inflation in the euro area: indirect evidence from disaggregated consumer prices	Annette Fröhling Kirsten Lommatzsch
26	2011	Detecting multiple breaks in long memory: the case of U.S. inflation	Uwe Hassler Barbara Meller

27	2011	How do credit supply shocks propagate internationally? A GVAR approach	Sandra Eickmeier Tim Ng
28	2011	Reforming the labor market and improving competitiveness: an analysis for Spain using FiMod	Tim Schwarzmüller Nikolai Stähler
29	2011	Cross-border bank lending, risk aversion and the financial crisis	Cornelia Düwel, Rainer Frey Alexander Lipponer
30	2011	The use of tax havens in exemption regimes	Anna Gumpert James R. Hines, Jr. Monika Schnitzer
31	2011	Bank-related loan supply factors during the crisis: an analysis based on the German bank lending survey	Barno Blaes

Series 2: Banking and Financial Studies

01	2010	Deriving the term structure of banking crisis risk with a compound option approach: the case of Kazakhstan	Stefan Eichler Alexander Karmann Dominik Maltritz
02	2010	Recovery determinants of distressed banks: Regulators, market discipline, or the environment?	Thomas Kick Michael Koetter Tigran Poghosyan
03	2010	Purchase and redemption decisions of mutual fund investors and the role of fund families	Stephan Jank Michael Wedow
04	2010	What drives portfolio investments of German banks in emerging capital markets?	Christian Wildmann
05	2010	Bank liquidity creation and risk taking during distress	Berger, Bouwman Kick, Schaeck
06	2010	Performance and regulatory effects of non-compliant loans in German synthetic mortgage-backed securities transactions	Gaby Trinkaus
07	2010	Banks' exposure to interest rate risk, their earnings from term transformation, and the dynamics of the term structure	Christoph Memmel
08	2010	Completeness, interconnectedness and distribution of interbank exposures – a parameterized analysis of the stability of financial networks	Angelika Sachs
09	2010	Do banks benefit from internationalization? Revisiting the market power-risk nexus	C. M. Buch C. Tahmee Koch, M. Koetter

10	2010	Do specialization benefits outweigh concentration risks in credit portfolios of German banks?	Rolf Böve Klaus Düllmann Andreas Pfingsten
11	2010	Are there disadvantaged clienteles in mutual funds?	Stephan Jank
12	2010	Interbank tiering and money center banks	Ben Craig, Goetz von Peter
13	2010	Are banks using hidden reserves to beat earnings benchmarks? Evidence from Germany	Sven Bornemann, Thomas Kick Christoph Memmel Andreas Pfingsten
14	2010	How correlated are changes in banks' net interest income and in their present value?	Christoph Memmel
01	2011	Contingent capital to strengthen the private safety net for financial institutions: Cocos to the rescue?	George M. von Furstenberg
02	2011	Gauging the impact of a low-interest rate environment on German life insurers	Anke Kablau Michael Wedow
03	2011	Do capital buffers mitigate volatility of bank lending? A simulation study	Frank Heid Ulrich Krüger
04	2011	The price impact of lending relationships	Ingrid Stein
05	2011	Does modeling framework matter? A comparative study of structural and reduced-form models	Yalin Gündüz Marliese Uhrig-Homburg
06	2011	Contagion at the interbank market with stochastic LGD	Christoph Memmel Angelika Sachs, Ingrid Stein

07	2011	The two-sided effect of financial globalization on output volatility	Barbara Meller
08	2011	Systemic risk contributions: a credit portfolio approach	Klaus Düllmann Natalia Puzanova
09	2011	The importance of qualitative risk assessment in banking supervision before and during the crisis	Thomas Kick Andreas Pfingsten
10	2011	Bank bailouts, interventions, and moral hazard	Lammertjan Dam Michael Koetter
11	2011	Improvements in rating models for the German corporate sector	Till Förstemann
12	2011	The effect of the interbank network structure on contagion and common shocks	Co-Pierre Georg
13	2011	Banks' management of the net interest margin: evidence from Germany	Christoph Memmel Andrea Schertler
14	2011	A hierarchical Archimedean copula for portfolio credit risk modelling	Natalia Puzanova

Visiting researcher at the Deutsche Bundesbank

The Deutsche Bundesbank in Frankfurt is looking for a visiting researcher. Among others under certain conditions visiting researchers have access to a wide range of data in the Bundesbank. They include micro data on firms and banks not available in the public. Visitors should prepare a research project during their stay at the Bundesbank. Candidates must hold a PhD and be engaged in the field of either macroeconomics and monetary economics, financial markets or international economics. Proposed research projects should be from these fields. The visiting term will be from 3 to 6 months. Salary is commensurate with experience.

Applicants are requested to send a CV, copies of recent papers, letters of reference and a proposal for a research project to:

Deutsche Bundesbank
Personalabteilung
Wilhelm-Epstein-Str. 14

60431 Frankfurt
GERMANY