

Cross-border bank lending, risk aversion and the financial crisis

Cornelia Düwel

(University of Giessen)

Rainer Frey

(Deutsche Bundesbank)

Alexander Lipponer

(Deutsche Bundesbank)

**Discussion Paper
Series 1: Economic Studies
No 29/2011**

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>

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ISBN 978-3-86558-766-4 (Printversion)
ISBN 978-3-86558-767-1 (Internetversion)

Abstract

This study investigates the determinants of adjustments in the provision of cross-border loans by internationally active banks. For the period from 2002 to 2010, we look at quarterly transaction data (excluding valuation effects) on long-term loans issued by the largest 69 German banking groups to the private sector of 66 countries. We show that the parent bank's lending adjustment is based almost exclusively on supply-side determinants, in particular on bank-specific factors. However, foreign countries' demand and risk characteristics become more relevant when loans are distributed by banks' affiliates located abroad. Focusing on risk measures such as the parent bank's ratio of Tier I capital to risk-weighted assets, we find that rising risk aversion among banks curbed cross-border lending during the financial crisis, especially at a later stage following the collapse of Lehman Brothers. However, we find a threshold at around 11% of the Tier I capital ratio above which an increase in the ratio does not curb lending anymore.

Keywords: Cross-border lending, banks, financial crisis.

JEL Classification: G21, F23, F34

Non-technical summary

The paper addresses the underlying motives for German banks' long-term lending to the foreign private sector. We identify key bank and country-specific determinants which lead to adjustments in long-term cross-border lending by German banks. Our analysis also includes changes in lending strategies and an assessment of bank-specific and macroeconomic risk in view of the financial crisis. The management of risks in a severe financial crisis is not only important for the bank itself, it is also relevant for the macroeconomic stability of countries whose firms rely on loans from foreign banks.

The foreign business of German banks differs a great deal across banks. In some cases, loans are granted directly by the German parent bank to foreign firms, but large banks, in particular, often distribute loans to major foreign markets through local subsidiaries and branches. In order to account for this heterogeneity of concepts, we use a detailed data set which combines several sources of bank-specific micro- and macroeconomic data. We are the first to work at the bank level with German data on transaction-induced changes in loan provision to the foreign private sector. This allows us to distinguish between the direct channel of cross-border lending (by the German parent bank itself) and lending which is carried out by the banks' affiliates located abroad, and to disentangle the various determinants which drive loan adjustments via these two channels.

Our findings strongly support the relevance of supply factors in the provision of loans by German banking groups abroad. Bank-specific variables play a key role. First and foremost, the banks' stance vis-à-vis risk has major implications for their foreign business. An increase in risk aversion among German banks, which we can observe during the financial crisis, and especially after the collapse of Lehman Brothers, is accompanied by a reduction in the supply of cross-border loans. We show that the risk measures, such as increasing core capital ratios and tightening credit standards reported by German banks, as well as large loan interest margins between firm and interbank lending rates on the home market, have a negative impact on lending abroad. We also find that expansion of credit abroad and lending to the home private sector tend to occur in parallel, even if, after the collapse of Lehman Brothers, lending abroad was reduced more than lending to the German private sector.

Local country variables denoting broad demand and risk in foreign economies display only limited importance in overall cross-border lending of German banking groups. This confirms the assumption that German banks are strong players in financing firms on their home market, while business in other countries is conducted more as an additional activity. This outcome is supported by the fact that we see a stronger reduction in loan supply abroad than at home, particularly during the financial crisis. However, the way German banks show their presence abroad differs from bank to bank and from country to country. If a German bank maintains affiliates abroad which fulfil an important role in channeling funds to firms in foreign markets, the characteristics of these foreign economies become more relevant. In this case, foreign lending by German banks increasingly depends on macroeconomic demand, represented by fixed capital formation over GDP, as well as on risk aspects of the foreign market, which are measured eg by the volatility of the stock market index. The financing of an economy by loans of multinational banks' local affiliates may thus be more favourable for the economy than financing from a foreign parent bank far away. This might be an argument for the countries' governments to foster direct investment by foreign banks. Finally, we find evidence that during the financial crisis, internationally active banks redirected their business to especially promising or, in the case of the crisis, less shrinking markets. Cross-border lending carried out by the German parent bank suffered during the crisis in markets which grew significantly less than the average economy to which the bank supplied loans.

Nichttechnische Zusammenfassung

Die vorliegende Studie beleuchtet die Determinanten der Vergabe langfristiger Kredite deutscher Banken an den ausländischen Privatsektor. Wir identifizieren die ausschlaggebenden bank- und länderspezifischen Faktoren für Veränderungen im grenzüberschreitenden Kreditgeschäft. Die Analyse umfasst auch die in der Finanzkrise im Zuge einer Neubewertung von Risikofaktoren erfolgten strategischen Anpassungen. Das Risikomanagement in einer schweren Finanzkrise hat dabei Auswirkungen sowohl auf die Banken selbst, als auch auf die Länder, deren Unternehmen auf Kredite ausländischer Banken angewiesen sind.

Das Auslandsgeschäft deutscher Banken hängt stark von der individuellen Strategie ab. Einerseits werden Kredite direkt durch die deutsche Konzernmutter an ausländische Firmen vergeben. Andererseits versorgen vor allem große Banken wichtige Auslandsmärkte auch über Töchter und Filialen vor Ort. Um dieser Heterogenität der Geschäftsmodelle gerecht zu werden, verwenden wir einen sehr detaillierten Datensatz, der mehrere mikro- und makroökonomische Datenquellen miteinander verbindet. Es wird zudem erstmals auf rein transaktionsbedingte Veränderungen in der Vergabe langfristiger Auslandskredite abgestellt. Dabei wird zwischen dem direkten Kanal der grenzüberschreitenden Kreditvergabe durch die deutsche Mutter und dem Kreditgeschäft, das über Töchter und Filialen im Ausland abgewickelt wird, unterschieden. Damit lassen sich die unterschiedlichen Gründe für Anpassungen in beiden Kanälen bestimmen.

Unsere Ergebnisse zeigen, dass Angebotsfaktoren auf Seiten der deutschen Banken eine herausragende Rolle für die Kreditvergabe an den ausländischen Privatsektor spielen. Dabei sind insbesondere bankspezifische Charakteristika ausschlaggebend. Allem voran haben Risiken innerhalb eines Bankkonzerns großen Einfluss auf die Auslandskreditvergabe. Steigt die Risikoaversion einer Bank, wie dies vor allem während der Finanzkrise und insbesondere nach der Insolvenz von Lehman Brothers zu beobachten war, dann verringert dies die grenzüberschreitenden Kredite. Wir zeigen, dass Risikoindikatoren wie Kernkapitalquoten, verschäfte Kreditvergabestandards und höhere Zinsmargen im Inland einen negativen Einfluss auf die Auslandskreditvergabe haben. Ein weiteres Ergebnis besteht darin, dass sich das Auslandsgeschäfts zumeist parallel zur Kreditvergabe an den heimischen Privatsektor entwickelt hat, auch wenn nach der Lehman-Insolvenz die Kreditvergabe im Ausland stärker als im Inland gedrosselt wurde.

Nachfrage- und Risikoentwicklungen vor Ort sind für die grenzüberschreitende Kreditvergabe deutscher Banken nur eingeschränkt relevant. Dies unterstreicht deren starke Position in Bezug auf die Finanzierung heimischer Unternehmen, während das Auslandsgeschäft eine zumeist nur ergänzende Rolle spielt. Der Rückzug von den Auslandsmärkten während der Finanzkrise bekräftigt diese Annahme. Art und Anpassung des Auslandsengagements unterscheiden sich allerdings von Bank zu Bank und von Land zu Land. Unterhält eine deutsche Bank Niederlassungen im Ausland über die sie wichtige Teile ihres Auslandsgeschäfts abwickelt, so gewinnen auch Charakteristika des jeweiligen Landes an Relevanz. Die Kreditvergabe des Konzerns reagiert dann stärker auf makroökonomische Entwicklungen (etwa gemessen an den Bruttoanlageninvestitionen), sowie auf Risikoaspekte der Länder, beispielsweise auf die Volatilität der Aktienmärkte. Die Versorgung einer Volkswirtschaft mit Krediten lokaler Niederlassungen gebietsfremder Banken ist demnach aus Sicht der Gastländer gegenüber der Finanzierung aus der Ferne durch die im Ausland befindliche Mutter der Bank vorzuziehen und kann für das Land als Argument dienen, Direktinvestitionen ausländischer Banken zu fördern. Schließlich können wir feststellen, dass international agierende Banken während der Finanzkrise ihre Möglichkeit nutzten, grenzüberschreitende Kredite teilweise umzuschichteten. Die Kreditvergabe deutscher Mutterkonzerne sank stärker in Ländern, deren Wirtschaftswachstum hinter dem durchschnittlichen Wachstum der anderen Zielländer zurückblieb, in denen die jeweilige Bank ebenfalls engagiert war.

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Cross-border bank lending, risk aversion and the financial crisis*

1 Introduction

During the financial crisis, the stability of the banking system and the provision of bank loans to the real economy attracted the particular attention of policymakers and banking supervisors. Increases in risk positions and banks' risk perception, which were triggered by the crisis, led to a change in the behavior of banks. A deleveraging process was initiated and internationally active banks accelerated the cut-back of their cross-border activities. In Germany, the adjustment of loan provision to non-financial firms as a major part of bank business moved in the center of interest. While in Anglo-Saxon countries capital market refinancing is of significant importance, German companies strongly rely on bank loans. However, besides the financing of firms at home, German banks' foreign activities have also become quite substantial and now account for nearly one-third of total loans to the non-bank private sector (see Figure 1 in the appendix). Owing to its scale, private-sector lending is highly relevant not only to German banks' profits and the risk positions but also to the financing needs of the home economy as well as - though to a smaller extent - the funding of foreign economies to which German banks supply credit. Even though banks' activities in foreign countries are in most cases relatively small in scale in comparison to the size of the respective foreign markets, decision-makers in host countries have been concerned about possible destabilizing effects of foreign bank entry. Banks' business models abroad may differ from those at home, may have other goals and a narrower scope, and thus complement a global lending strategy, rather than put the financing needs of the local economy first. These issues are highly relevant in view of the financial crisis: German banks' profits and risk positions affect the stability of the banking system. The funding of foreign economies is related to the discussion on cross-border credit rationing by multinational banks. There is little doubt that during the financial crisis, dampening macroeconomic developments and the rising uncertainties in destination countries played a role in the sharp fall in long-term loans to foreign firms. Though the worsening of the financial and macroeconomic conditions came as a shock to all banks, the reactions to the changing environment differed across German banks, as their business models and the riskiness of their balance sheet positions had been very heterogeneous before the outbreak of the crisis.

With respect to the bank-specific motivations and the driving forces to provide loans in foreign countries, the characteristics of parent banks are highly relevant as they affect both lending by the parent bank itself and by its affiliates located abroad; the corresponding mechanism relies on common funding on the bank's internal capital market. Due to the crisis' negative effects on the assessment of risk and the refinancing conditions of banks, it is therefore very likely that the adjustments in cross-border lending by German parent banks and their affiliates abroad have been the result of the deterioration in the risk position and a probably simultaneous increase in the perception and assessment of risk in cross-border activities. Although affiliates partly refinance themselves on the local market (MC GUIRE

* Cornelia Düwel, Licher Str. 66, 35394 Giessen, cornelia.duewel@wirtschaft.uni-giessen.de; Rainer Frey, Wilhelm-Epstein-Str. 14, 60431 Frankfurt, rainer.frey@bundesbank.de; Alexander Lipponer, Wilhelm-Epstein-Str. 14, 60431 Frankfurt, alexander.lipponer@bundesbank.de

The paper represents the personal opinions of the authors and does not necessarily reflect the views of the Deutsche Bundesbank. This paper has benefited from valuable comments by Carmela D'Avino, Jörg Breitung, Claudia Buch, Ulrich Grosch, Heinz Herrmann, Thomas Kick, Cordula Munzert, Winfried Rudek, Peter Tillmann and the participants of the Bundesbank Workshop on The Costs and Benefits of International Banking in Eltville on 18 October 2011. All remaining errors and inaccuracies are our own. We gratefully acknowledge financial support from the University of Giessen (C. Düwel).

AND TARASHEV (2008)), German banks' foreign offices tend to rely mostly on intragroup funding, when compared with foreign affiliates of other nationalities (MCCAULEY ET AL. (2010)). In a study on lending by affiliates of multinational banks from the EU, NAVARETTI ET AL. (2010) find that the internal capital market at least complements external sources of funding. In financially integrated areas like the EU, internal capital markets are particularly active. We shall therefore particularly focus on how parent banks' internal risk positions influence their adjustment of cross-border loans.

This paper aims at filling a gap in the analysis of (German) banks' cross-border lending by investigating on a disaggregate level the determinants for activities abroad of both the parent bank itself and of its foreign affiliates (adjusted for possible disturbances stemming from lending within the banking group; the use of unconsolidated banking group data would inflate cross-border lending figures). Compared to other studies, we put more emphasis on determining the impact of risk stemming from both the bank level and the country level, and on disentangling these effects, including the period of the financial crisis. In order to avoid distorting valuation effects, which have been especially large during the crisis, we consider only real transactions of cross-border loans, which further distinguishes our study from previous work.

Earlier research has identified several macro- and microeconomic determinants of foreign bank lending. However, these studies focused on either parent bank cross-border lending or affiliate in-country lending in order to avoid the bias produced by financial intra-bank relations. In this literature, characteristics of parent banks mostly appear as control variables for parent bank health which influences affiliate lending via the internal capital market.¹ DE HAAS AND VAN LELYFELD (2006) and (2010) find that eg lower solvency, liquidity and profitability of parent banks can lead to lower credit growth of multinational banks' subsidiaries located in Central and Eastern European countries. Concerning the influence of macroeconomic developments, the authors identify a number of pull factors (local country characteristics) and push factors (banks' home country characteristics) which impact on lending by banks' subsidiaries abroad. They thereby confirm findings by JEANNEAU AND MICU (2002) drawn from aggregate macroeconomic data on several large lending countries. This strand of literature was based on research by CALVO ET AL. (1993) and CHUHAN ET AL.(1998), who investigated the vulnerability of emerging countries arising from international financing. These papers compared and contrasted supply-side factors, such as the interest rate in the parent bank's home country, with demand variables abroad like local country risk. Analyzing different components of the Eurosystem's bank lending survey, HEMPELL AND SORENSEN (2010) recently provided evidence that banks' ability and willingness to supply loans is a crucial determinant for lending in the euro area. ATLUNBAS ET AL. (2009) mention that a bank's ability to supply loans depends on its risk position, while they focus on the effects of securitization activity on monetary transmission via the lending channel.²

We put special emphasis on analyzing both channels of cross-border lending (via the parent bank and via affiliates abroad). A multinational bank can supply loans directly by the parent bank located in the bank's home country. However, it can possibly exploit informational advantages of being closer

1 See, for example, HOUSTON AND JAMES (1998) for US banks and their national affiliates, BUCH, KOCH AND KÖTTER (2009) for identifying a productivity pecking order among German banks' foreign offices, and CAMPEDO (2002) and CETORELLI AND GOLDBERG (2008) for demonstrating monetary policy transmission channels. .

2 A recent study by CETORELLI AND GOLDBERG (2011) draws on characteristics of the aggregate banking sector of a country in order to identify reasons for the cross-border loan reduction of the countries' banks in the course of the financial crisis. They find that the larger the pre-crisis dollar-vulnerability of a country's banking system, the lower was its post-crisis lending growth to emerging economies by parent banks and (to a lesser extent) by affiliates. However, the authors cannot analyze different reactions of banks from the same country, as they use aggregate data from BIS reporting countries.

to customers if it opens up affiliates (subsidiaries and branches) in host countries and thus serves local demand for loans and demand in adjacent or close-by countries. According to DE HAAS AND VAN HOREN (2011), detailed information on the local market plays a crucial role for banks' success abroad. If, however, foreign economies are not served by any in-country presence, overall local demand factors may not be very relevant and the loan allocation may depend more on deal/borrower-specific factors. This may apply, for instance, to syndicated loans or loans to multinational companies (see PEEK AND ROSENGREN (2000) and BUCH (2000), who also points out that regulatory changes on the EU level have rendered banks' foreign country presence within the EU obsolete in many cases). By considering parent as well as affiliate lending, we make sure that we do not exclude certain business models from the analysis (those which rely more on cross-border than local lending). This issue has been pointed out by PEEK AND ROSENGREN (2000) in a descriptive study on cross-border lending to Latin American countries. The authors emphasize the necessity of considering all channels of foreign bank lending, as they find that cross-border loan growth of foreign parent banks is reduced in times of crisis while foreign bank subsidiaries have a stabilizing impact on the lending behavior. On an aggregate level, BUCH (2000) empirically investigates the relevance of macroeconomic factors of destination countries for German banks' cross-border lending and confirms that the impact of these variables depends on the lending bank group entity, which may either be the banks' headquarters or the banks' subsidiaries and branches located abroad. One of the key concerns of our paper will be to investigate whether lending by German banks' affiliates located abroad reacts in a different way to a change in micro- and macroeconomic conditions than does cross-border lending by the parent bank itself, in particular during the financial crisis. However, we do not examine the impact of rescue measures on the lending patterns of German banks' foreign affiliates in view of the financial crisis, an aspect that is taken up in a related research project by BUCH, KOCH AND KÖTTER (2011) or in another project focusing on banks in the UK by ROSE AND WIELADEK (2011)

Overall, our findings reveal that bank-specific supply-side factors are the key determinants of cross-border lending, while local macroeconomic characteristics are less important. Better performing and more diversified banks are more likely to extend credit abroad. Rising levels of risk aversion among parent banks - measured in several ways - play a crucial role for downward adjustments in long-term loans abroad, both by the parent bank itself and by its affiliates. Higher risk aversion has a negative impact on lending to foreign firms as came to light during the financial crisis following the collapse of Lehman Brothers. In addition, cross-border lending carried out directly by the parent bank was shifted away from countries whose economic growth suffered most during the crisis. Macroeconomic characteristics of potential destination countries play overall a limited role in the adjustment of German banks' cross-border loans. However, they do become more relevant if, in addition to direct credit allocation by the German parent bank itself, the bank carries out a significant part of its business through the channel of affiliates located abroad. If this is the case, the macroeconomic indicators for external financing need and general economic risk in destination countries are both relevant to loan adjustments. The financing of an economy by loans of multinational banks' local affiliates may thus be more favourable for the economy than financing from a foreign parent bank far away. This might be an argument for the countries' governments to foster direct investment by foreign banks.

The paper is organized as follows. Section 2 describes the data, section 3 describes our empirical model. In section 4 we discuss the results and section 6 concludes. In section 5 we provide several robustness checks for data selection and regression analysis.

2 Data

2.1 Sample definition

We base our analysis on data that combine several micro and macro datasets in a unique way. To identify the various possible factors influencing German banks' foreign lending, we include four basic sets of variables: first, bank-specific micro data describing supply-side issues; second, general supply-side factors relying on German macroeconomic variables; third, macroeconomic variables capturing primarily the foreign demand side; and, fourth, foreign country risk factors.

We restrict our loan transaction data at the bank level to long-term private-sector loans, ie loans with an original maturity of more than one year, and we consider only countries which do not host important financial centers. Long-term loans account for more than 85% of German banks' total cross-border lending and hence represent a major part of their cross-border lending activity. Lending to financial centers is widely driven by financial deals with special purpose entities as well as by banks' proprietary trading in portfolio instruments, etc. Short-term lending additionally includes trade financing. We do not aim to explain the latter types of financial transaction and therefore exclude them from our analysis. Furthermore, as cross-border long-term loans to the private sector consist almost entirely of firm loans, this focus allows us to analyze an important and rather strictly defined business model of the bank.³

Starting with the largest 100 German banks and then selecting a subsample by excluding promotional banks and foreign-owned banks produces a sample of 69 banks. Owing to a number of bank mergers in the period under review, which we handle by backward integration, we have to include figures for 140 banks overall.⁴ Figure 2 in the appendix depicts the dynamics between 2002 and 2010 of total and long-term cross-border loans vis-à-vis the foreign private sector, which we cover by our selection of banks. As a further reduction of complexity - partly driven by the availability of macroeconomic data - we selected 100 countries with the largest amounts of German cross-border loans outstanding. This selection of banks and countries still covers roughly 90% with regard to German banks' total cross-border lending to the non-bank private sector. Hence, the complexity of the analysis is reduced without any loss of generality of the results. As for Serbia and Montenegro, which split in 2006, most explanatory variables only exist for the former union, we take these countries as one for the purpose of this analysis. Furthermore, for the reasons mentioned above, we restrict our analysis to foreign private-sector loans to countries that do not host important financial centers. For the classification of offshore financial centers we make use of the definition of the Financial Stability Forum, the predecessor of today's Financial Stability Board, published in 2000 and in addition we exclude the UK and the US from our sample since they represent large financial hubs for German banks.⁵ This reduces the number of countries in our sample to 66. Overall, our sample then covers close to 40% of total German bank lending to the foreign private sector. Table 4 in the appendix contains the list of selected countries, the number of German banks in our sample which supply cross-border loans to these countries (as of December 2009) as well as the total volume of their exposure.

3 See Figure 1 for the development of overall private sector loans of German banks and Figure 2 for the development of long-term versus total cross-border loans to the foreign private sector by the German banks used in this study.

4 For specific banks that transferred a large proportion of their foreign business to another bank within the same group but outside Germany, all subsequent observations following such an event were dropped in order to handle these drastic changes in the reports on cross-border operations, which cannot be explained by our general model.

5 However, we conduct a robustness check in section 5 of the paper, which includes the two countries in the analysis. For the complete list of countries defined as financial centers, see Table 4.

2.2 Micro data

Micro data on German banks' cross-border lending transactions stem from monthly statistics on the external positions of German banks.⁶ All German parent banks, their affiliates (subsidiaries and branches) abroad as well as subsidiaries of foreign banks operating in Germany are covered in the statistics.⁷ The data allow us to analyze German banks' foreign assets and liabilities by asset category, maturity, country, sector and currency. The dataset also enables us to separate transaction-based changes from price or exchange rate-related changes of the stock figures collected. Therefore, we can draw on effective transaction changes of long-term loans to the private sector on the parent level, on the affiliate level, and for the level of the consolidated group. We can thus calculate the importance of loans distributed by affiliates abroad relative to loans supplied directly from Germany. Hence, we can additionally work out the relevance of the funding channel for firms abroad (directly by the parent bank vs. via affiliates). In this way, we also obtain a measure of the relative intensity of a German bank's presence abroad and its impact on lending to the respective foreign country.⁸

In Figure 2 in the appendix, we plot the development of standard stock data for cross-border private-sector loans issued by German banks versus the development of the series based on transactions. The graph shows that the stock of German banks' cross-border loans would have developed at a higher level since 2002 if devaluation effects had not occurred. While the purely transaction-induced dynamics are roughly similar to those of the actual stock series over a large part of the sample period, we observe a considerable devaluation of loans since 2009, which is definitely an outcome of the financial crisis. Thus, our approach also yields an accurate assessment of the effects of the financial crisis on cross-border lending.

This data set has been supplemented by information on the German parent banks from the monthly balance sheet statistics and the yearly profit and loss account statements. For the risk assessment of individual parent banks, our data set has been augmented using non-official, confidential banking supervision data. All micro data used in this analysis are collected by the Deutsche Bundesbank.

2.3 Macro data

For the macro variables, we have added data from the IMF's International Financial Statistics (IFS) and World Economic Outlook (WEO). Additional data come from the German balance of payments statistics (Deutsche Bundesbank). Market data are from Bloomberg and Datastream. Aggregate data on the general perception of credit standards for long-term private-sector loans by German banks are taken from the German part of the Bank Lending Survey (BLS) to complete the picture. All variables are quarterly data expressed in real terms. For more details on specific variables, especially their original frequency and some summary statistics, see Tables 2 and 3 in the appendix.

⁶ For a detailed description, see FIORENTINO, KOCH AND RUDEK (2010).

⁷ In contrast to branches, subsidiaries have their own legal status. The activities of subsidiaries located abroad are reported by the German parent bank if it is the majority shareholder. There are no exemption limits for the reports.

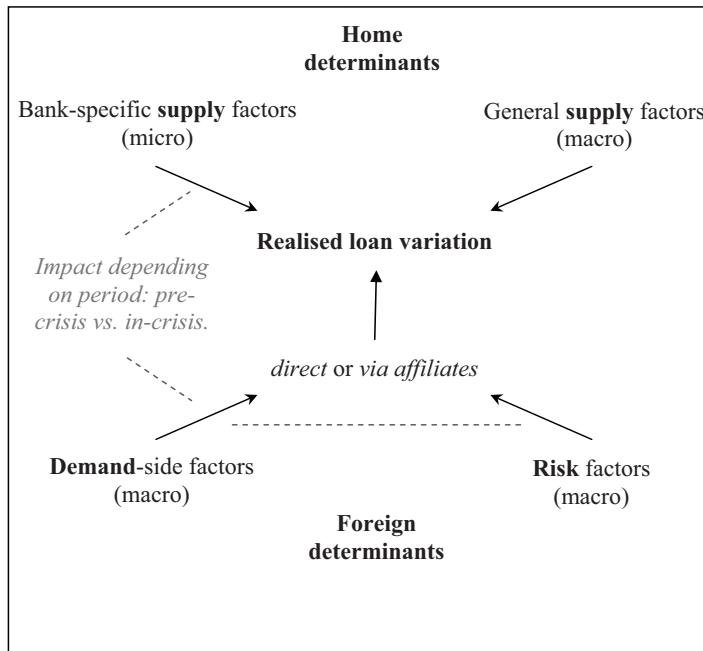
⁸ We only observe the overall volume of loans issued in a country by all German banks' foreign affiliates. The data on the consolidated group do not allow us to distinguish between affiliates located in the destination country itself and affiliates which supply loans to a country but are located in a different (possibly adjacent) foreign country. This view on the data, however, accounts for the fact that banks often create an affiliate »hub« in one country and then serve customers in surrounding countries from there, instead of opening up affiliates in every single market of interest. These »hubs« are then specialized for monitoring markets and issuing loans in a certain region, such as Latin America or Eastern Europe.

3 Empirical model

3.1 Estimation approach

In focusing on the realized volume of private-sector long-term loans, we observe an equilibrium of supply *and* demand for this type of lending or we observe demand *or* supply if rationing occurs on one side. We therefore evaluate the relevance of both supply and demand-side factors to determine the driving forces behind cross-border lending.

As explained above, supply and demand-side factors are best described by four sets of variables which are illustrated in the figure below. Supply-side determinants rely on bank-specific micro data and on macroeconomic data related to the bank's home country. On the demand side, we have to rely on macro data, as no information on the loan recipient is available. We distinguish between variables which indicate the foreign country's demand for bank loans, and factors representing macroeconomic risk abroad. If a German bank is present abroad in the form of affiliates, the activity level in the respective countries is probably greater and is based on more detailed information on local conditions. We then expect that the country's demand and risk factors play a larger role.



The complexity of the issue requires the estimation of at least three equations to isolate the effects of the different factors. First, we concentrate on the impact of all variables on the variation in loans realized by the bank as a whole. We account for presence in foreign countries in the form of affiliates. This provides us with an overview of the factors relevant for bank lending behavior abroad. Thus, we can write the following equation to estimate the transactions in long-term loans to the private sector abroad:

$$\Delta l_{ikt} = \alpha_0 + \alpha_1 Bank_{it-1} + \alpha_2 GenHome_{t-1} + \alpha_3 FrgnDemand_{kt-1} + \alpha_4 FrgnRisk_{kt-1} + \alpha_5 Affiliate_{ikt-1} + \eta_i + \gamma_k + \varepsilon_{ikt} \quad (1)$$

with

- $i = 1, \dots, N$. N being the number of banks in the sample, $k = 1, \dots, K$, K the number of foreign countries, and $t = 1, \dots, T$ the time period covered,
- Δl_{ikt} are the real volumes of transactions in long-term loans to the private sector from bank i to country k at time t ,
- $Bank_{it-1}$ is a vector of bank (i)-specific supply factors,
- $GenHome_{t-1}$ are general macroeconomic supply factors related to the home country,
- $FrgnDemand_{kt-1}$ are demand factors in foreign country k ,
- $FrgnRisk_{kt-1}$ are risk factors in foreign country k ,
- $Affiliate_{ikt-1}$ is the amount of business carried out in country k by affiliates located abroad as a share of total long-term loan allocation of bank i to country k at time $t - 1$. This *Affiliate relevance* variable can vary between 0 and 1,⁹
- η_i stands for bank fixed effects,
- γ_k are country fixed effects, and
- ε_{ikt} is the idiosyncratic error.

In our second specification, we focus on the two different channels through which a foreign country's demand and risk may affect cross-border lending. For this purpose, we interact the macroeconomic demand and risk variables with our variable representing the relevance of affiliates in granting loans to the private sector of a certain country. This leads to the following equation.

$$\begin{aligned} \Delta l_{ikt} = & \alpha_0 + \alpha_1 Bank_{it-1} + \alpha_2 GenHome_{t-1} + \alpha_3 FrgnDemand_{kt-1} + \alpha_4 FrgnRisk_{kt-1} + \\ & \alpha_5 Affiliate_{ikt-1} + \alpha_6 FrgnDemand_{kt-1} \times Affiliate_{ikt-1} + \alpha_7 FrgnRisk_{kt-1} \times Affiliate_{ikt-1} + \\ & \eta_i + \gamma_k + \varepsilon_{ikt} \end{aligned} \quad (2)$$

The estimated coefficients α_3 and α_4 measure the impact of foreign demand and risk factors on lending via the direct lending channel from the parent bank to the foreign private sector, while α_6 and α_7 indicate the differing relevance of the foreign country's macroeconomic determinants for the indirect lending channel via affiliates (under consideration of their relative importance).

In our third specification, we try to capture the impact of the financial crisis on the adjustment of long-term loans abroad. In particular, we are interested in the effect of the crisis on bank-specific factors as well as on the relevance of demand and risk factors in the destination countries. We interact all regressors from the second specification with a crisis dummy ($Crisis_{t-1}$). This dummy variable marks the period of the financial crisis and equals 1, if $t \geq 2007Q3$, and 0 otherwise. Within the financial crisis, we additionally distinguish time periods before and after the collapse of Lehman

⁹ It also equals 0 if bank i does not supply any loans at all to country k (either by the parent bank or by affiliates located abroad). The quality of the results remains unchanged in a robustness check which, for the assessment of the affiliate relevance, excludes banks that do not supply any loans at all to country k .

Brothers as this event marks a turning point in banks' positions and strategies. Thus for a final specification of our estimation, we shall split the crisis dummy variable into two, one shall equal 1 if $2007Q3 \leq t \leq 2008Q2$ and the other shall equal 1 if $t \geq 2008Q3$.

All explanatory variables are lagged by one quarter in order to avoid simultaneity problems. We do not include the lagged dependent variable as a regressor. In spite of many other studies which aim at explaining loan provision, we do not operate with stock or growth data which would require including the lagged dependent variable on the right hand side. Instead, we explain the amount of transactions of long-term loans, for which there is no reason why, a priori, it should depend on the amount of transactions realized in previous periods. We confirmed this fact by testing the relevance of the lagged dependent variable as a regressor: it turns out to be insignificant. According to the F-tests, all groups of variables are, in their respective specifications, jointly significant. All regressions cover the time period from 2003Q3 to 2010Q4. For each bank-country combination, we observe, on average, a period of roughly 30 quarters.

3.2 Explanatory variables

3.2.1 Bank-specific and general supply-side determinants

The use of macro data has a rather long tradition in the explanation of cross-border capital flows, while the consideration of bank-specific micro data has only been taken up more recently. ATLUNBAS ET AL. (2009) perceive the major relevance of bank-specific variables as a phenomenon that has arisen over the past few years as a result of financial innovation, financial integration and an increase in market funding. Our study places strong emphasis on the importance of bank characteristics for loan adjustment abroad. The vector of bank-specific supply factors, *Bank*, consists of five variables: the parent bank's *Change in core capital ratio*, the parent bank's *Interest income over equity*, its *Capital market activity*, *Bank size*, and its long-term lending to the domestic private sector (*Lending at home*).

Risk aspects have an extraordinary high relevance in the assumed profit maximization of a bank. However, not only the profit-risk trade-off of every single deal counts. It is the composition of the portfolio of assets with their potentially correlated risks, against the background of the specific strategy of the bank, which tips the scales. For this reason, a bank has to consider its overall risk position when it engages in new activities. This aspect may be especially relevant for exposures abroad, where less information about the local markets and firms may render deals more risky than at home. Therefore, we assume that an increase in the level of risk aversion of a parent bank, measured by a positive *Change in core capital ratio*, goes hand in hand with reduced lending to foreign firms.

The core capital ratio which we use here is calculated by setting a bank's Tier I capital in relation to its risk-weighted assets. The minimum regulatory requirement for the core capital ratio is 4%. The mean ratio reported by the banks in our sample amounts to 9%, which is clearly above a critical value (see Table 3). There are only three observational points in our sample where banks have reported a core capital ratio below 5%, and there is no observation below the minimum ratio of 4%. All banks in our sample are thus sufficiently capitalized, which makes it possible to interpret upward changes in the core capital ratio as driven by banks' risk aversion. The core capital ratio can be used to measure the level of capitalization of a bank within the CAMEL profile.¹⁰ Other measures not including risk-weighted assets (Tier I capital to total assets, equity to total assets, etc.) are also being used in the

¹⁰ CAMEL stands for Capitalization, Asset Quality, Management, Earnings and Liquidity.

literature to assess capitalization (see the discussion by KICK, KOETTER AND POGHOSYAN (2010)). For example, BUCH, KOCH AND KÖTTER (2009) find that banks with a higher ratio of Tier I capital to total assets are less likely to open up affiliates in foreign countries. Once abroad however, their activities seem to be more stable. We specifically rely on risk-weighted assets as in our opinion they best mirror the risk incorporated in a parent bank's balance sheet total.¹¹ The larger the core capital of a bank relative to its risk-weighted assets, the higher is its level of risk aversion, *ceteris paribus*.

We focus on the *Change in core capital ratio* of a bank as a measure of increasing risk aversion. However, we will also show that if a bank's core capital ratio is already at a very high level, the effect of an increasing risk aversion on the provision of loans is smaller. This corresponds to the idea that banks with large core capital ratios might increase their ratio to signal stability to the market (KICK AND KOETTER (2007)). We measure this effect by introducing the *level of the core capital ratio* as well as the *interaction between the level and change of the core capital ratio* as additional regressors in a variation of the first regression specification.

A bank with relatively high *Interest income over equity* may have an efficient system of screening firms and assessing other markets and may hence look for additional opportunities like lending abroad. Moreover, parent banks which have been very successful in generating interest income in the past have a larger financial scope and can therefore afford to take more risks and provide more loans to firms abroad. We therefore expect this variable's impact to be positive in the regressions. Several measures for the profitability of a parent bank have turned out to be significant in earlier studies on lending abroad by affiliates (BUCH, KOCH AND KÖTTER (2009); DE HAAS AND VAN LELYFELD (2006) and (2010)). They find a positive and significant impact of parent bank performance on loan growth of affiliates. In this analysis, we not only evaluate the role of parent banks' interest generating performance measured by *Interest income over equity* for lending which is done by affiliates, but also employ this variable as a determinant of parent bank lending itself as we look at the change in loans granted by both.¹²

Diversification of strategic activities reduces banks' dependency on specific types of business. We therefore suspect that banks with more diversified portfolios provide more stability in their provision of loans. Moreover, this variable captures the share of capital market activity and thus a bank strategy that goes beyond traditional lending on the home market. Therefore, we include *Capital market activity*, which is defined as the amount of security claims to total assets of the parent bank, in the vector of bank-specific supply factors.¹³ The expected influence on cross-border lending by more diversified parent banks is positive.

We use two variables to measure the information stance and a bank's possibilities of gathering information about foreign markets. First, we include *Bank size* for which an increase proxies for a reduction in relative information costs. Especially in times of crisis, informational asymmetries might play a large role. It is possible that, due to a relative informational advantage, larger banks are more steady in their provision of loans abroad, which would imply a positive sign in the regressions. In line with OLIVERO, LI AND JEON (2011), we measure the size of a bank as the amount of total assets of the bank which exceeds the average balance sheet total of all banks at the respective observational point in

¹¹ In a study on the implications of monetary policy on German bank lending, EHRMANN ET AL. (2001) also point out that capitalization of banks should be measured considering risk-weighted assets.

¹² We use the average ratio of interest income to equity over the past four quarters in order to assess the performance of a bank over a longer period of time, and thus avoid issues of reverse causality.

¹³ We take the average capital market activity over the past four quarters to better assess the bank's strategy.

time.¹⁴

In addition, more information about a foreign market can also be acquired by the local presence of affiliates. We therefore consider the relevance of affiliates to distributing loans to a certain country. We calculate this *Affiliate relevance* variable as the percentage of loans granted by affiliates located abroad in total long-term loans provided by a bank to a certain country. The expected impact of presence abroad in the form of affiliates is therefore positive. By empirical checks, we can rule out that affiliates are per se more relevant in large foreign countries.¹⁵

Our bank-specific supply factors include a measure of real change in long-term lending by the parent bank to the bank's home country private sector, *Lending at home*. The relationship between lending to the foreign private sector and *Lending at home* is a priori unclear. From earlier studies on bank lending to the German private sector, we know that real lending growth is positively related to stronger economic activity at home (DEUTSCHE BUNDES BANK (2009)). Banks could then either, at least partly, trade-off lending abroad against lending at home, and seek investment opportunities outside their home country only if economic activity at home is weak. If this were the case, we would expect a negative coefficient. Or, banks could extend their credit allocation simultaneously at home and abroad following increasing demand for loans at home and, possibly, increasing profits on banks' balance sheets which allow the banks to take more risks abroad. This interpretation would indicate a positive relationship between *Lending at home* and the dependent variable, lending abroad.

In addition to bank-specific supply-side variables, we consider two general supply factors related to the bank's home country, here Germany, denoted by *GenHome* in the regression specification. Such macroeconomic determinants of a bank's home country already have some tradition in the literature on international bank lending. The *Home interest margin* is a prominent representative of these determinants, which are often referred to as (external) push factors, in contrast to (internal) pull factors representing macroeconomic characteristics of the foreign country to which the bank lends (JEAN-NEAU AND MICU (2002)). The *Home interest margin* is calculated as the average bank-wide interest margin of the lending rate over interbank refinancing costs in Germany (for details, see Table 2); hence it is the interest margin which can be realized on the home market. It is possible to interpret this variable in two ways. On the one hand, it can be seen as a measure of banks' risk perception: the higher the margin is, the less banks are willing to offer loans. On the other hand, it describes potential profitability of lending in the home country. In this interpretation, the margin represents opportunity costs, which a bank has to consider when it lends abroad rather than at home. In either case, we expect this variable to have a negative impact on cross-border lending.

We add a measure of broad risk perception present within the German banking sector to complete this picture. Assessments of credit standards which are set for long-term loans by German banks are reported to the Bank Lending Survey (BLS). A rising indicator means that credit standards have been tightened. We expect tightening credit standards to represent increasing risk sentiment among German banks and, therefore, a lower willingness to lend. From sub-categories of the BLS, we know that such tightening can be due to banks requiring more collateral when issuing loans or the fact that they are concerned about their refinancing costs. We therefore include the BLS sub-category of *Tightening credit standards* as a result of a worsening of the *bank's liquidity position* as an additional measure of the bank's risk position. The expected impact on lending activities is negative.

¹⁴ Thus, it can be avoided that the results are distorted by a pure scale effect, since it might be the case that large banks in general carry out large loan transactions.

¹⁵ The correlation between foreign country real GDP and affiliate relevance amounts to no more than about 7%.

3.2.2 Foreign country demand and risk

The vector *FrgnDemand* combines three variables which measure the demand for bank loans in potential destination countries and the attractiveness for foreign banks to provide loans abroad. We use fixed capital formation relative to a destination country's GDP to proxy for changes in the demand for bank loans. As firms expand their business to reap additional profits, they require funding for their investments. We therefore expect *Fixed capital formation over GDP* of foreign countries to have a positive effect on cross-border lending, as foreign banks seek to profit from increasing demand for bank loans.¹⁶

Internationally active banks have the possibility of directing their supply of loans to especially promising markets. As a consequence, their provision of loans to one country is not independent from market developments which occur in other destinations where the bank is active. We therefore assume that the provision of loans to one country suffers if its economic development lags behind the economic growth experienced in other countries to which the respective bank supplies loans. In order to capture this effect, we introduce the variable *Other countries' real GDP growth relative to local*, which is bank-, country- and time-specific. On the basis of a similar approach by DE HAAS AND VAN LELYFELD (2010), we compute this regressor as the weighted average of real GDP growth measures found in all countries (except the country in question) to which the respective bank supplies loans, relative to real GDP growth observed in the respective country. As weights, we use the volume of lending to a country relative to the bank's total cross-border loans.

We complete our approximation of loan demand in foreign countries by a measure of *Bilateral trade openness*. This variable contains the share of imports from Germany in total imports of a country. It addresses the effect of international trade on cross-border lending. First, this variable measures the degree to which the economy of the foreign country is interconnected with German firms. Trade relationships can reduce potential informational asymmetries between the lending and borrowing countries and can encourage the provision of loans. This interpretation of the variable *Bilateral trade openness* is supported by the fact that short-term loans and thus trade credit are excluded from the analysis. We expect a positive effect of *Bilateral trade openness* on cross-border lending.¹⁷

However, the attractiveness of foreign markets for German banks does not only depend on the market potential but also on related risks. Besides traditional demand indicators, we expect country-risk factors, combined in the vector of regressors *FrgnRisk*, to have a significant impact on the cross-border lending activities of German banks.

Business cycle risk, or the stability of the financial market, is reflected, for instance, in the national *Stock market volatility*. We expect stock market volatility to have a negative impact on lending to the local private sector. In addition, the stability of a country and its economy may also be assessed by the sustainability of its government borrowing. Therefore, we include in our estimations a rough proxy for

¹⁶ We believe that fixed capital formation is a better way to capture loan demand, especially from non-bank firms, than GDP growth. A four-quarter average of fixed capital formation over GDP is used in order to better assess market potential. We also do not rely on lending by domestic banks (line 22d of the IFS statistics) as a proxy for loan demand. First, this variable does not capture any lending activities by other foreign banks. Second, likely competition in lending between local and foreign banks could distort the accuracy of the variable as a proxy for demand.

¹⁷ Many studies include Foreign Direct Investment (FDI) flows as explanatory variables for cross-border lending (e.g. BUCH (2000)). We find that FDI is highly correlated with bilateral trade. We therefore agree with JEANNEAU AND MICU (2002) and do not include both factors in the regressions. As a large part of bilateral trade is closely related to FDI, because it stems from intra-firm trade of multinational firms, we decided to concentrate on bilateral trade figures as an explanatory variable.

this aspect in the form of the ratio of general government *Liabilities over GDP*.¹⁸ During the financial crisis, the indebtedness of countries received growing attention as an indicator of macroeconomic risk. The expected impact of *Liabilities over GDP* on cross-border lending is therefore negative. Nevertheless, a positive relationship between a country's external debt and cross-border lending to its private sector is possible if economic growth is mainly fueled by extensive government spending.

Exchange rate volatility is another variable that signals risk on the macro-level, although this measure takes up issues incorporated in stock market volatility and the government liabilities ratio, too. The level to which exchange rate volatility indicates macroeconomic risk could be blurred by the maintenance of exchange rate regimes (JEANNEAU AND MICU (2002)). However, as foreign lending is partially undertaken in local currency in the absence of a complete currency hedge, there is a direct risk to a creditor stemming from exchange rate volatility. We therefore include this variable in our set of risk measures. On the aggregate level, BUCH (2000) has already found a negative impact of exchange rate volatility on cross-border lending by German banks' headquarters. We shall test this result with our disaggregate data.

Table 1: Summary of main variables considered and expected signs

Variable	Expected sign
<i>Foreign demand and risk</i>	
<i>Foreign demand</i>	
Fixed capital formation over GDP	+
Other countries' real GDP growth relative to local	-
Bilateral trade openness	+
<i>Foreign Risk</i>	
Stock market volatility	-
Exchange rate volatility	-
Liabilities over GDP	+ / -
<i>Supply-side factors</i>	
<i>Bank level</i>	
Relative bank size	+
Capital market activity	+
Interest income over equity	+
Change in core capital ratio	-
Core capital ratio change x level	+
Lending at home	+ / -
Affiliate relevance	+
<i>Aggregate level</i>	
Home interest margin	-
Tightening of credit standards	-

18 The variable is averaged over four quarters in order to match the dimension in which we proxy for demand.

4 Results

We present the regression results of our analysis in Tables 5 and 6. Columns (1a) and (1b) contain the baseline model. It assesses the overall relevance of micro- and macroeconomic factors to banks' decisions to adjust long-term loans to firms abroad. In Column (2) we take into account that macroeconomic developments of destination countries determine lending in different ways depending on the two different channels (via the parent bank or via affiliates located abroad). We show that the relevance of the bank's affiliates for distributing loans in a country has an impact on country-specific demand factors. The regression specification in Column (3) investigates how the financial crisis influences the effects of supply- and demand-side factors on cross-border lending. Finally, Column (4) separates the effects of the financial crisis both before and after the collapse of Lehman Brothers.

4.1 Predominant role of supply-side factors

Our estimation results suggest that supply-side factors are the crucial determinants of the realized variation in long-term loans. Our baseline regression, reported in Columns (1a) and (1b) of Table 5 reveals that, overall, German banks' adjustment of long-term loans to firms abroad barely responds to credit demand conditions in the destination countries.

Supply-side factors play the predominant role in the allocation of long-term loans to firms abroad and the internal risk position of a parent bank turns out to be highly relevant. All variables which indicate an increase in the level of a parent bank's risk aversion are significant and show the expected signs. As expected, we find a negative relationship between rising core capital ratios (*Change in core capital ratio*) and the dependent variable. Hence, if the core capital ratio of a parent bank is increasing, less credit is provided abroad. This finding coincides with the implications for a bank's risk aversion within the CAMEL profile: a high degree of capitalization, measured by a large core capital ratio, stands for a high degree of risk aversion for the bank concerned. Furthermore, *Tightening credit standards due to the bank's liquidity position*, as measured by the BLS, lead to a reduction in cross-border lending by German banks.

In Column (1b), we enlarge upon the role of the core capital ratio, defined as Tier I capital over risk-weighted assets, by adding the level of the ratio as well as the interaction term between change and level to the right-hand side of the regression. The resulting pattern reveals that the *level of the core capital ratio* by itself does not play a significant role in the adjustment of long-term loans. The corresponding coefficient is insignificant, while the estimated influence of the *change in the core capital ratio* remains negatively significant. However, the negative effect of rising core capital ratios on lending becomes smaller, the larger the level of the core capital ratio is (the interaction term is positive and significant). This finding supports the idea that a bank with a high level of core capital ratio might rather conduct a stable loan supply policy and an additional rise in the ratio cannot be interpreted as an increase in its risk aversion. Computations of the average marginal effects at different levels of the core capital ratio (not reported) suggest that there is a threshold at around 11% (the mean ratio in our sample amounts to about 9%, see Table 3) above which an increase in the ratio does not curb lending anymore.

Our baseline regression results show, furthermore, that banks which have been generating larger amounts of interest income relative to their equity capital, and which therefore have a larger financial scope, can afford to take more risks and provide more long-term loans to firms abroad. The

estimated coefficient of *Interest income over equity* is positive and significant, which confirms our interpretation. Moreover, diversified strategic activities of the parent bank have a positive impact on a bank's long-term loans to the private sector abroad. Our variable *Capital market activity* is positive and significant, as expected.

Furthermore, the variable *Home interest margin* is negative and significant. We considered two interpretations for this variable. There could be a certain trade-off between supplying loans to the home market compared with the foreign market. The other line of argument sees in the interest margin an overall market perception of the risk of long-term loans to the private sector. The larger the interest margin, the higher the premium that banks charge in a more risky environment. Considering the significantly positive relationship between lending abroad and *Lending at home*, the second interpretation turns out to be more accurate, as there does not seem to be any significant trade-off between banks' long-term loan allocation abroad and at home.

Macroeconomic demand and risk in destination countries play only a very small role in the adjustments of long-term private sector loans by German banks. *Fixed capital formation over GDP*, which indicates the increasing need for external financing of the foreign economy, is insignificant, just like *Other countries' real GDP growth relative to local*, other countries being those to which the respective bank supplies loans as well. *Bilateral trade openness* has no effect on the overall lending of a bank. Moreover, an increasing risk in general macroeconomic developments of the destination country does not negatively affect overall credit supply by German banks: *Stock market volatility* is insignificant. The poor performance of the exchange rate volatility as an indicator of risk might be due to our lack of information on the currency in which loans are provided, which, in turn, might depend on the way lending activities are distributed between the parent bank and an affiliate located abroad. We can detect a positive impact of a country's indebtedness on cross-border lending (*Liabilities over GDP*). While this result is, at first glance, surprising, it shows that increasing external debt is not foremost perceived as an indicator of macroeconomic risk. It is therefore possible that governments stimulate economic growth by extensive spending, inducing an expansion in production, thereby increasing firms' demand for loans from both local and foreign banks.

While the bank's overall lending hardly reacts to macroeconomic conditions in destination countries, we can detect a fostering impact of presence abroad in the form of affiliates. The estimated coefficient of the *Affiliate relevance* variable is positive and significant, while another possible measure for lower informational asymmetries, the *Bank size*, is insignificant. Presence abroad allows local contact with customers and seems to provide the bank with better information than administrative instruments such as extensive screening routines which large banks often have at their disposal.

Overall, these results show that German banks' business model of supplying long-term loans to firms is different abroad from the situation at home. While higher GDP growth in Germany is a key signal that banks issue more long-term loans to domestic firms (DEUTSCHE BUNDES BANK (2009)), German banks do not seem to react to business cycle developments in other countries. It is therefore probable that in general the bank's activities abroad depend more on factors linked to a specific borrower and/or deal. They do not satisfy the financing needs of a broad range of firms in the foreign country.¹⁹

19 In comparison, we tested in unreported regressions whether lending by local banks in the different countries is, on aggregate, related to proxies for local demand and risk. We were able to confirm that local banks' lending to the private sector across the countries reacts to demand and risk factors similar to those to which domestic bank lending reacts in Germany. Hence, German bank lending to these countries does indeed differ from the behavior of local banks.

4.2 Demand and country risk impact through foreign affiliates

The impact of foreign country-specific demand and risk on lending gains momentum when we distinguish the two channels through which the loans are provided to foreign firms. In the second regression reported in Column (2) of Table 5, we show that the size of the impact of macroeconomic demand and risk factors on long-term cross-border lending to foreign firms is closely linked to a German bank's degree of presence in a foreign country in the form of affiliates. At the same time, supply-side factors remain important.

We focus on the interpretation of interaction terms between demand and risk variables and *Affiliate relevance* to find out how the impact of macroeconomic demand and risk factors depends on the channels of cross-border lending. Most foreign country-specific factors become significant when they are conditioned on the relevance of affiliates in providing loans to the specific country. We can detect different reactions to macroeconomic demand and risk across the two different channels through which loans can be supplied.

More specifically, local *Fixed capital formation over GDP* fosters long-term loan allocation to the foreign country concerned along with a growing importance of German banks' affiliates for credit allocation. While local affiliates which serve a certain foreign country react to this country's economic development (the overall effect of *Fixed capital formation over GDP* for increasing *Affiliate relevance* is positive), the German parent bank does not adjust loans. The same is true for *Bilateral trade openness*. It positively affects cross-border lending with the growing importance of affiliate presence abroad. This result could hint to the fact that affiliates reduce asymmetric information problems which might otherwise curb lending.

Conversely, the loan adjustment realized by the German parent bank also takes business cycle movements in alternative destination countries into account. The estimated coefficient of the non-interacted part of *Other countries' real GDP growth relative to local* is negative and significant. This result signals that cross-border lending can, within the direct channel, be directed to destinations in which market developments are most promising. Within the indirect channel (lending via affiliates), this is not the case, as can be concluded from the insignificant coefficients estimated for the same variable taking into account presence abroad in the form of affiliates (see variable *Other countries' real GDP growth relative to local x Affiliate relevance*).

Turning again to the indirect channel of cross-border lending, we find that affiliates abroad not only realize the opportunities stemming from loan demand on the respective market. They also take into account the country's risk situation to a larger extent than direct lending from the German parent bank does. Loans are more likely to be reduced in countries where the overall macroeconomic risk situation is worsening. This is demonstrated by the outcome of significantly negative coefficients when the *Affiliate relevance* variable is interacted with the *Stock market volatility*. Again, we do not find any negative influence of a country's external debt or exchange rate volatility on the acquisition of cross-border loans.

The second regression specification allows us to make the outcome from our baseline estimation more precise. The positive impact of a larger *Affiliate relevance* in destination countries, which we detected in our baseline regression specification, does not stem from the share of loans per se which is handed out via affiliates, but is linked to a better perception of local macroeconomic demand and risk in the case of local presence. This conclusion is drawn from the fact that several interaction

terms between *Affiliate relevance* and the variables indicating macroeconomic risk and demand in destination countries are significant, while the remaining coefficient of *Affiliate relevance* turns out to be insignificant.

With regard to the parent bank's supply factors, the results from the baseline specification still hold: banks whose degree of risk aversion increases (measured by the *Change in core capital ratio*) and which have been less successful in generating interest income in the past (i.e. have lower *Interest income over equity*) are less likely to extend credit abroad. Banks which have more diversified strategic activities (i.e. are more active on capital markets) are more likely to raise their supply of long-term loans to the foreign private sector. Increasing risk in the German home economy (indicated by a large *Home interest margin*) has a negative effect on cross-border lending, while *Lending at home* and abroad generally go in the same direction.

We thus conclude that German banks satisfy, to some extent, the external financing needs of those foreign countries' economies to which they supply a relevant share of their overall loan volume via affiliates. The more business is conducted through offices in foreign countries, the more these affiliates behave like local banks in the market in question. Of course, the local presence of a German bank in the form of affiliates is in itself an indication of its deep interest in the given market.

4.3 The impact of the financial crisis on determinants of cross-border loans

The third and fourth specifications of our model (see Table 6) investigate the impact of the financial crisis on the relevance of the determinants of cross-border lending. The results presented in Column bloc (3) are based on the interaction of explanatory variables with one crisis dummy, as specified in the empirical model (see Section 3). In Column bloc (4), we present the results from the last specification of our model, which splits the crisis into two sub-periods to capture potentially different behavior before and after the collapse of Lehman Brothers.

The results in Table 6 should be read in the following way: In Column bloc (3) »Crisis«, Column (3/1) presents the estimated coefficient for the respective variable listed, without interaction with the crisis dummy, thus capturing the period before the crisis. Column (3/2) reports the estimated coefficient of the variable interacted with one single crisis dummy (which equals 1 from 2007Q3 onwards). In Column bloc (4) »pre- vs. post-Lehman«, Column (4/1) reports the coefficient for the respective variable estimated in the last specification of the model. Column (4/2) contains the variables interacted with the pre-Lehman crisis dummy (which equals 1 from 2007Q3-2008Q2). Finally, Column (4/3) reports the estimated coefficient of the variable interacted with the post-Lehman crisis dummy (equaling 1 from 2008Q3 onwards).

By interacting the explanatory variables with only one dummy over the crisis period (Column bloc(3)), we are already able to gain some insight into the way the financial crisis changed the relevance of determinants for cross-border lending. However, the bank-specific and macroeconomic conditions at an early stage of the crisis differed substantially from the situation after the turning point marked by the collapse of Lehman Brothers. With the insolvency of Lehman Brothers, risk perception changed, since a major international financial company went into bankruptcy and this had not been prevented by a government bailout. The insolvency of the investment bank triggered a sharp increase in volatility on the capital markets as well as a wave of writedowns in balance sheets and a deterioration in the parent banks' risk positions. Therefore, splitting the crisis into two sub-periods incorporating two crisis dummies enables us to better assign the effects to a certain phase of the crisis.

The volume of German banks' cross-border loans shrank significantly during the financial crisis. We observe a significant reduction in German banks' cross-border lending activities starting with the third quarter of 2008 (see Figure 1). Our results suggest that both supply and demand factors were responsible for this development. With respect to the bank-specific supply-side factors, during the crisis banks became more careful in extending their credit abroad. We find that the negative impact of a *rising core capital ratio* on the supply of cross-border loans, implying a parent bank's stronger risk aversion, acutally stems from the second crisis period (see Column 4/3). By splitting the crisis period into two stages, one before and one after the collapse of Lehman Brothers, we learn that the far-reaching event of the investment bank's collapse led to cross-border loan supply suffering from rising levels of risk aversion among banks. Further indicators of the banks' stance vis-à-vis risk do not loose relevance during the financial crisis. The negative impact on cross-border lending of *Tightening credit standards due to liquidity position* reported by the banks in the Bank Lending Survey does not significantly change during the financial crisis. The relevant indicator reported in the Bank Lending Survey turns out to be negative and significant (Column 3/1 and 4/1), while the interactions with all crisis dummies are insignificant. Likewise, banks' general risk perception, measured by the *Home interest margin*, continues to affect cross-border lending negatively throughout the whole crisis period.

There is a mitigating effect of *Bank size* on the reduction of long-term loans during the crisis. According to this finding, larger banks were more likely to stabilize their business abroad during the first stage of the crisis, ie in the run-up to the collapse of Lehman Brothers (see second figure for *Bank size (relative)* in Column bloc (4)). This might be due to large banks disposing of more resources to counterbalance growing losses at the time from the subprime crisis. This allowed them to conduct a weaker adjustment in their loan portfolios.

With regard to local macroeconomic determinants, the interaction with a crisis dummy in Column bloc (3) reveals the trade-off which internationally active banks face and which results in adjustment processes, especially in times of distress. The first set of estimated coefficients on macroeconomic variables interacted with the crisis dummy may be interpreted as the impact on the parent banks' cross-border lending (the direct channel). The interaction term between the crisis dummy and the variable *Other countries' real GDP growth relative to local* is negative and significant (Column 3/2). This means that the potential of parent banks to redirect their lending to the most promising markets or, as during the crisis, to markets in which the economic downturn is less pronounced, becomes most obvious during the crisis. During this period of distress, credit allocation to one country suffered increasingly if it grew more slowly than the average of all other countries to which the bank supplied loans as well; interestingly, no such reaction can be found for lending channeled via affiliates (see variable *Other countries' real GDP growth relative to local x Affiliate relevance*).

As the previous results (see section 4.2) already suggested, there are significant differences in the impact of macroeconomic demand and risk variables on cross-border lending via the direct and the indirect channel. *Stock market volatility* continues to play a negative role for lending during the crisis, the more loans are distributed by affiliates located abroad (*Stock market volatility x Affiliate relevance* in Column bloc 3). At the same time, the direct channel of cross-border loans does not react to large stock market fluctuations, an indicator of risk. Conversely, lending via the direct channel decreased to a greater extent in response to a higher *Exchange rate volatility* during the first crisis period before the fall of Lehman Brothers (see Column 4/2 for *Exchange rate volatility*), while no influence on the indirect channel (via affiliates) can be found. This pattern might be due to the different currencies in which parent banks operating abroad fund themselves and issue loans, while affiliates abroad more

often operate using primarily the local currency both for loan provision and funding.

A final interesting result can be found for the estimated coefficients of *Bilateral trade openness* within the indirect channel of cross-border lending (ie interacted with the *Affiliate relevance* variable). Lending continues to profit from *Bilateral trade openness* throughout the crisis, the more affiliates are involved in providing loans. Hence, tight international links prior to the crisis positively affect lending also during the financial crisis, when most economies experienced rough distortions. Thus in the crisis, the reduction of loan supply by German banks is less pronounced for economies which have tight trading links with Germany.

5 Robustness checks

Test on the validity of local demand and risk measures

We perform a robustness check on the validity of the set of macroeconomic variables which assess country specific demand and risk in the regressions. For this purpose, we replace all country specific macroeconomic variables with country-time fixed effects and rerun the econometric analysis. The quality of our results regarding the significance of bank-specific determinants of cross-border lending does not change. Two conclusions can be drawn from this: First, the estimations we provide do not suffer from omitted variable bias as we select local macroeconomic variables in order to assess the relevance of local demand and local risk which influence cross-border lending decisions. Second, all of the bank-specific determinants which we identify as crucial for the adjustment of cross-border loans are robust to changes in the set of macroeconomic variables included in the regressions.

Extension of the country sample by the US and the UK

Our sample of destination countries for German cross-border bank lending excludes – among other countries – the United States as well as the United Kingdom. These two countries host important financial centers and are therefore classified by the IMF as jurisdictions with offshore financial centers. Without doubt, both countries are also large retail markets for cross-border bank lending to non-financial firms. Unfortunately, the data does not allow a distinction to be made between loan recipients who may be part of the respective country's financial center and those borrowers who are part of the real economy. Thus, we opted to exclude both countries from our regressions.

However due to their relevance, we also investigated the impact on the results when both countries are considered as additional destination countries for cross-border lending: While bank-specific determinants for cross-border lending maintain their relative and absolute importance, the relevance of the macroeconomic developments in destination countries is strongly affected. First, when the US and the UK are included in the analysis, the formerly significant outcome of a parallel movement between lending at home and lending abroad disappears. Second, parent bank lending does not react anymore to changes in macroeconomic demand or risk. Solely the recourse of parent banks to their ability to redirect their lending to more promising markets remains significant (signaled by a negative coefficient for the variable Other countries' real GDP growth relative to local in the second regression specification). Third, the result that affiliate lending reacts more strongly to local demand and risk continues to hold. Even the exchange rate volatility, which did not turn out to be perceived as a mea-

sure of macroeconomic risk in the previous regressions, becomes significantly negative if affiliates play a large role in channeling loans to foreign borrowers.

All these results stress that lending to countries with financial centers is to a large extend different from lending to predominantly real economies. Credit flows to countries with important financial centers are strongly driven by channeling funds to and from special purpose vehicles, which may be non-bank parts of the banking group itself, or by banks' proprietary trading in portfolio instruments. As a consequence, the outcome above of a high significance of local demand and risk determinants for cross-border bank lending is blurred when the US and the UK are included in the regressions.

Loan transaction data versus loan stock data

In unreported regressions, we tested the outcome of our analysis if stock data (including valuation effects) rather than transaction data for lending abroad are used. The use of stock data makes supply-side determinants much less relevant. Especially some of the key variables of the bank's risk assessment in lending activity, like the interest margin on the home market, become irrelevant for lending. Moreover, the use of stock data affects the results above more strongly within the crisis period. This supports the presumption that the presence of devaluation effects in the stock data variations leads to an overestimation of the crisis' impact on banks' strategic behavior.

6 Conclusions

The paper addresses the motivation for German banks' foreign long-term private sector financing. As our sample also includes a substantial time span of the financial crisis, we are able to address lending strategies and to assess bank-specific and macroeconomic risk in view of the current crisis. The management of risks in a severe financial crisis is not only important for the bank itself, it is also relevant to the macroeconomic stability of countries whose firms rely on loans from foreign banks. To gain a deeper insight into the adjustment processes during the crisis, we split the crisis period into two stages with the break marked by the collapse of Lehman Brothers. This allows our analysis to be more flexible with respect to potential discontinuities in macroeconomic and bank-specific risk conditions over the time horizon of the crisis.

German banks' loan provision abroad differs across our sample comprising 69 banks. Loans to foreign firms may be granted directly by the German parent bank, whereas large banks, in particular, keep affiliates in major foreign markets and distribute loans via this channel. To take this into account, it is necessary to work on the bank level and to address both channels of cross-border lending in order to draw a complete picture and achieve robust results. We enter rather new territory with this approach and with our correspondingly detailed data set, which combines several sources of bank-specific micro- and macroeconomic data. We are the first to work on the bank level with solely transaction-induced changes in loan provision to the foreign private sector. We combine this data with other bank-specific variables to test the relevance of supply-side factors for cross-border lending by German parent banks and by their foreign affiliates. We add macroeconomic demand and country risk variables known from the literature. The use of transaction-induced data on long-term lending is found to be key in revealing the importance of bank-specific determinants on the supply side. This is especially true for the period of the financial crisis when writedowns in banks' balance sheets drove

the stock data of cross-border loans to a large extent and obscured strategic adjustments by banks - the issue we are interested in.

Our findings strongly support the relevance of supply factors for the provision of loans by German banks abroad. Bank-specific variables play a crucial role. First and foremost, the parent banks' stance vis-à-vis risk has major implications for their foreign business. An increase in risk aversion among German banks, which we can observe during the financial crisis - especially after the collapse of Lehman Brothers - is accompanied by a reduction in the supply of cross-border loans. We show that risk measures applied in this study - increasing core capital ratios, tightened credit standards reported by German banks, and large loan interest margins between firm and interbank lending rates on the home market - have a negative impact on lending abroad. However, for the core capital ratio, we find a threshold at around 11% above which an increase does not curb lending anymore. We also find that expansion of credit abroad and lending to the home private sector tend to occur in parallel.

Local country variables which include broad demand and risk indicators for the foreign economies show only limited importance for German banks' overall cross-border lending. This confirms the assumption that German banks are strong players in terms of financing firms on their home market, while business in other countries tends to be conducted as an additional and to some extent erratic activity. This outcome is supported by the fact that we see a stronger reduction in loan supply abroad than at home, particularly during the financial crisis. Moreover, the crisis reveals that internationally active banks have the potential to redirect their business to especially promising or, during the financial crisis, less shrinking markets. During the crisis, cross-border lending carried out by the German parent bank suffered in markets which grew significantly less than the average economy to which the bank supplied loans. However, German banks' presence abroad differs from bank to bank and from country to country. If a German bank maintains affiliates abroad which fulfil an important role in channeling funds to firms in foreign markets, macroeconomic characteristics of these foreign economies become more relevant. In this case, German banks' lending abroad depends on foreign macroeconomic demand, measured by fixed capital formation relative to GDP. The funding of the economy by foreign banks' local affiliates may thus be more favourable for a country than the financing by a foreign parent bank from afar. This might be an argument for the country's government to foster direct investment by foreign banks.

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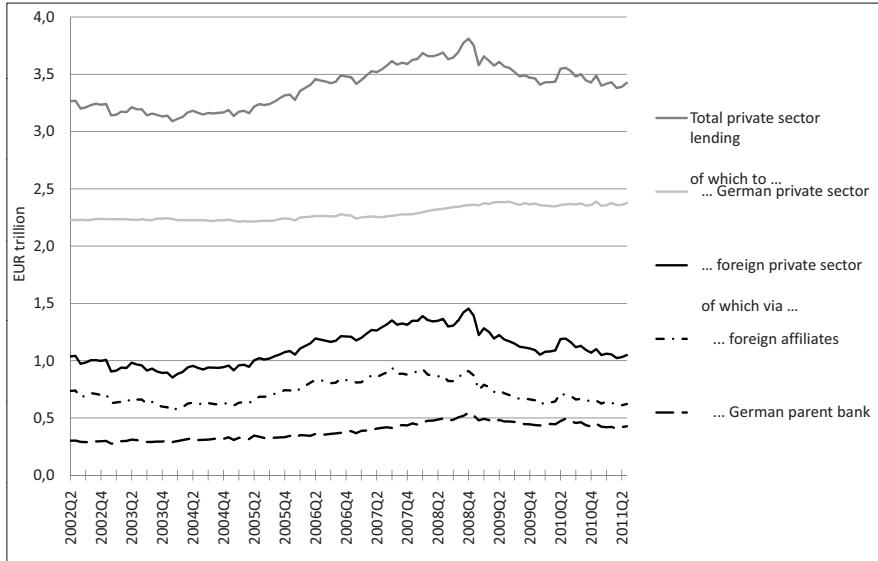
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Appendix

A Figures

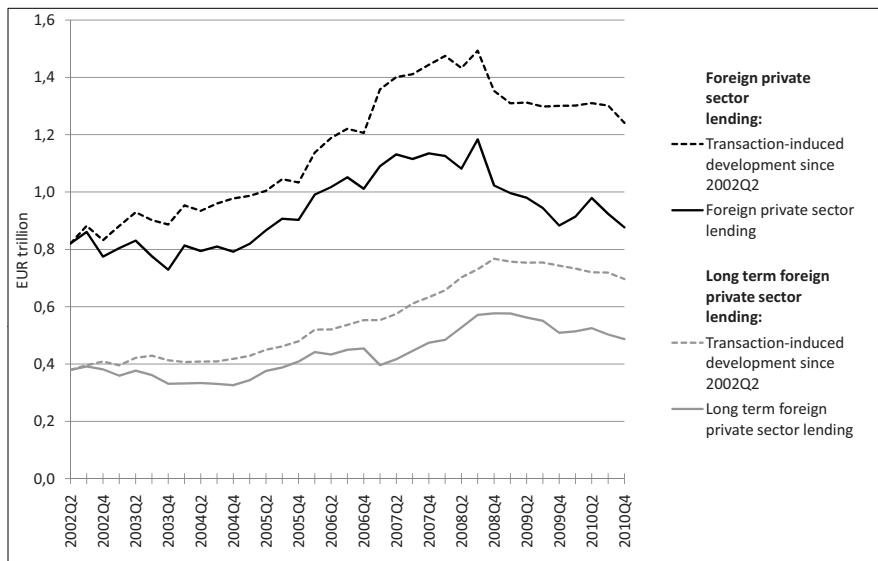
Figure 1: Overall private sector loans of German banks



Source: Deutsche Bundesbank.

This graph depicts overall private sector lending to Germany and to all foreign countries by the German banking system. The series are based on monthly observations reported to the Deutsche Bundesbank by the German banks and their affiliates located abroad. (See section 2 for details of the term »affiliates«.)

Figure 2: Transaction-induced versus stock development in foreign private sector loans issued by selected German banks



Source: Deutsche Bundesbank.

This graph is based on the sample of 69 banks which are used for the analysis in this paper. The sample covers 84% of total foreign private sector lending by the German banking system. (For details of the selection of banks, see section 2.) The underlying monthly series have been transformed into quarterly series. Dashed series represent our own calculations: Transaction-induced changes in cross-border lending are added to the stock of cross-border loans of German banks vis-à-vis the foreign private sector observed in 2002Q2.

B Tables

Table 2: Data

Variable	Remarks	Source
<i>Dependend Variable</i>		
Real transaction of long-term loans	Real transaction changes in cross-border lending vis-à-vis private sector. Long-term loans only ($M \Rightarrow Q$).	Deutsche Bundesbank: External Positions
<i>Demand side factors</i>		
Fixed capital formation / GDP	Fixed capital formation over GDP ($Q \Rightarrow$ average over last 4Q).	IMF: International Financial Statistics
Other countries' real GDP growth relative to local	Weighted average 4Q GDP growth of all other countries to which bank actually supplies loans relative to 4Q GDP growth of respective country (Q)	IMF: International Financial Statistics, World Economic Outlook, own calculations.
Stock market volatility	12-month volatility of the stock market index. ($M \Rightarrow Q$)	Bloomberg, DataStream, own calculations.
Liabilities / GDP	Total government liabilities over GDP ($Q \Rightarrow$ average over last 4Q).	IMF: World Economic Outlook, International Financial Statistics
Exchange rate volatility	6-month volatility of end-of-period exchange rates. ($M \Rightarrow Q$)	IMF: International Financial Statistics, own calculations
Bilateral trade openness	Share of imports from Germany in total imports of a country. ($M \Rightarrow Q$)	Deutsche Bundesbank: Balance of Payments Statistics
<i>Supply-side factors</i>		
<i>Bank level</i>		
Bank size (relative)	Balance sheet total minus average balance sheet total of all banks. ($M \Rightarrow Q$).	Deutsche Bundesbank: Bank Balance Sheet Statistics, own calculations.
Capital market activity	Claims from securities over balance sheet total. ($M \Rightarrow Q \Rightarrow$ average over last 4Q)	Deutsche Bundesbank: Bank Balance Sheet Statistics
Interest income / equity	Annual interest income ($A \Rightarrow Q$) over equity ($M \Rightarrow Q$). (\Rightarrow average over last 4Q)	Deutsche Bundesbank: Profit and loss accounts and Bank Balance Sheet Statistics
Core capital ratio	Tier I capital over risk-weighted assets. (Since 2004 Q, before $A \Rightarrow Q$)	Deutsche Bundesbank: Banking Supervision
Lending at home	Real change in long-term loans to German non-financial firms ($M \Rightarrow Q$).	Deutsche Bundesbank: Bank Balance Sheet Statistics
<i>Aggregate level</i>		
Tightening of credit standards due to liquidity position	Change of credit standards due to a worsening of the bank's liquidity position as applied to the approval of loans or credit lines to enterprises. Tighter standards go hand in hand with a higher index (Q , since 2003).	Deutsche Bundesbank: Bank Lending Survey
Home interest margin	Spread between the effective rate on new loans to non-financial corporations > EUR 1mio and the 12-months Euribor (Q)	Deutsche Bundesbank, own calculations.
<i>Other</i>		
Affiliate relevance	Fraction of long-term loans to private sector (stocks) handed out via local affiliates ($M \rightarrow Q$)	Deutsche Bundesbank External Positions
Crisis dummy (2007Q3-)	Dummy for financial crisis (=1 since 3rd quarter of 2007) (Q)	Authors' own definition.
Crisis dummy (2007Q3-2008Q2)	Dummy for financial crisis before collapse of Lehman (=1 between 3rd quarter of 2007 and 2nd quarter of 2008) (Q)	Authors' own definition.
Crisis dummy (2008Q2-)	Dummy for financial crisis after collapse of Lehman (=1 since 3rd quarter of 2008) (Q)	Authors' own definition.

M = monthly data, Q = quarterly data, A = annual data,

" \Rightarrow " = transformed into. Monthly data quartalized by summing up (flow data) or by taking end-of-period values (stock data).

Yearly data quartalized by linear interpolation

Table 3: Descriptive statistics

Variable	Obs.	Mean	StD	Min	Max
<i>Dependent variable</i>					
Real transaction of long-term loans (in EUR bn)	158,321	0.001	0.051	-3.078	5.703
<i>Demand-side factors</i>					
Fixed capital formation / GDP	2,340	0.223	0.060	0.072	0.656
Real GDP growth	2,328	0.058	0.087	-0.342	0.607
Other countries' real GDP growth relative to local	156,216	-7.981	343.774	-30,379.57	2,246.322
Bilateral trade openness	2,368	0.111	0.082	0.009	0.489
Stock market volatility	2,354	22.895	12.275	2.057	125.697
Exchange rate volatility	2,360	5.747	6.146	0.000	101.693
Liabilities / GDP	2,691	0.470	0.318	0.000	2.185
<i>Supply-side factors</i>					
<i>Bank level</i>					
Relative bank size	2,483	0.810	103.937	restricted	restricted
Capital market activity	2,480	0.228	0.119	restricted	restricted
Interest income / equity	2,480	0.387	0.257	restricted	restricted
Core capital ratio	2,469	0.094	0.066	restricted	restricted
Change in core capital ratio	2,467	0.001	0.010	restricted	restricted
Lending at home (in EUR bn)	2,482	-0.022	0.452	restricted	restricted
<i>Aggregate level</i>					
Home interest margin	36	0.018	0.008	0.003	0.030
Tightening of credit standards	33	-0.082	10.692	-20.000	23.077
<i>Other</i>					
Affiliate relevance	149,929	0.077	0.241	0	1
Crisis dummy (2007Q3-)	36	0.389	0.494	0	1
Crisis dummy (2007Q3-2008Q2)	36	0.111	0.318	0	1
Crisis dummy (2008Q2-)	36	0.278	0.454	0	1

Maximum number of observations for country-specific variables: 66 countries x 36 quarters = 2,376, for bank-specific variables: 69 banks x 36 quarters = 2,484, for bank- and country-specific variables: 69x66x36 = 163,944.

Table 4: List of countries

Country	Number of German banks active in cross-border lending*	Volume of cross-border lending by the largest 69 German banks (in Euro)*	* Cross-border lending is lending to the private sector of the respective country as of 12/2009. It includes lending by the German parent bank itself and by its affiliates located abroad. ** Due to their special character as financial centers, these countries are excluded from the main empirical analysis. However, this exclusion is subject to a robustness check in Section 5.		
1 United States (US) **	69	243 231 219			
2 United Kingdom (UK) **	69	166 355 114	36	Slovak Republic (SK)	42
3 France (FR)	68	40 632 255	37	Slovenia (SI)	35
4 Spain (ES)	67	38 021 744	38	South Africa (ZA)	54
5 Italy (IT)	63	37 184 532	39	Croatia (HR)	43
6 Netherlands (NL)	69	35 802 393	40	Republic of Korea (KR)	30
7 Poland (PL)	53	22 814 701	41	Iran (IR)	27
8 Australia (AU)	58	14 887 368	42	Israel (IL)	45
9 Japan (JP)	44	14 504 422	43	Kuwait (KW)	16
10 Denmark (DK)	60	12 298 532	44	Latvia (LV)	26
11 Sweden (SE)	63	10 788 302	45	Thailand (TH)	47
12 Russian Federation (RU)	47	10 775 524	46	Taiwan (TW)	21
13 Hungary (HU)	50	10 367 725	47	Bulgaria (BG)	30
14 Canada (CA)	60	8 249 914	48	Egypt (EG)	28
15 Belgium (BE)	65	8 137 506	49	Uruguay (UY)	13
16 Norway (NO)	61	6 829 921	50	Oman (OM)	15
17 Portugal (PT)	57	6 790 016	51	Republic of Serbia (RS)	29
18 Turkey (TR)	59	6 582 163	52	Trinidad and Tobago (TT)	10
19 Greece (GR)	60	6 259 136	53	Estonia (EE)	17
20 Austria (AT)	67	5 173 132	54	Argentina (AR)	33
21 Czech Republic (CZ)	53	4 946 243	55	Kazakhstan (KZ)	19
22 India (IN)	38	4 018 714	56	Azerbaijan (AZ)	14
23 United Arab Emirates (AE)	54	3 736 370	57	Colombia (CO)	23
24 Mexico (MX)	41	3 343 853	58	Peru (PE)	22
25 Finland (FI)	45	3 324 059	59	Macedonia (MK)	15
26 Iceland (IS)	24	2 443 195	60	Lithuania (LT)	17
27 Saudi Arabia (SA)	25	2 328 016	61	Pakistan (PK)	13
28 China (CN)	52	1 883 197	62	Algeria (DZ)	7
29 Ukraine (UA)	21	1 875 544	63	Nigeria (NG)	18
30 Brazil (BR)	52	1 838 943	64	Belarus (BY)	11
31 Romania (RO)	45	1 758 661	65	Venezuela (VE)	23
32 New Zealand (NZ)	38	1 583 551	66	Bosnia and Herzegovina (BA)	18
33 Chile (CL)	34	1 424 967	67	Vietnam (VN)	21
34 Qatar (QA)	25	1 416 024	68	Montenegro (ME)	7
35 Indonesia (ID)	30	1 207 416	69	Ghana (GH)	20

Offshore financial centers as defined by the IMF (2000) were not considered for the analysis. These are: Luxembourg, Ireland, Switzerland, Singapore, Hong Kong, Malta, Cyprus, Bahrain, Macao, Mauritius, Liechtenstein, Antigua and Barbuda, Anguilla, Netherlands Antilles, Barbados, Bermuda, Guernsey, Gibraltar, Isle of Man, Jersey, Cayman Islands, Liberia, Marshall Islands, Panama, Philippines, Saint Vincent and the Grenadines, Virgin Islands (British), Virgin Islands (U.S.).

Table 5: Regression results: baseline and affiliate relevance

<i>Dependent variable:</i>	(1a)	(1b)	(2)
	Baseline		Affiliate relevance
<i>Transactions of long-term loans</i>			
<i>Foreign country determinants: demand and risk</i>			
Fixed capital formation/GDP	-0.000 (0.002)	-0.000 (0.002)	-0.003 (0.002) 0.055*
Other countries' real GDP growth relative to local	-3.87e-08 (0.000)	-4.00e-08 (0.000)	-8.31e-08* (0.000) 2.60e-07 (0.000)
Bilateral trade openness	-0.003 (0.007)	-0.003 (0.007)	-0.012 (0.008) 0.147** (0.068)
Stock market volatility	-1.65e-05 (0.000)	-1.69e-05 (0.000)	1.71e-05** (0.000) -4.70e-04*** (0.000)
Exchange rate volatility	6.91e-05** (0.000)	6.88e-05** (0.000)	7.69e-05** (0.000) -2.45e-04 (0.001)
Liabilities/GDP	0.001 (0.001)	0.001 (0.001)	0.002** (0.001) -0.004 (0.006)
Affiliate relevance	0.006*** (0.002)	0.006*** (0.002)	-0.009 (0.011)
<i>Home country determinants: general and bank-specific supply</i>			
Home interest margin	-0.178*** (0.026)	-0.178*** (0.026)	-0.179*** (0.025)
Tightening credit standards due to liquidity position	-2.82e-05** (0.000)	-2.72e-05** (0.000)	-2.48e-05* (0.000)
Change in core capital ratio	-0.055** (0.022)	-0.094*** (0.035)	-0.089** (0.035)
Core capital ratio	0.001 (0.002)	0.002 (0.002)	(0.002)
Core capital ratio: change x level	0.141*** (0.052)	0.135*** (0.052)	
Interest income/equity	0.006** (0.002)	0.006** (0.002)	0.006** (0.002)
Capital market activity	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
Bank size (relative)	2.80e-05 (0.000)	2.77e-05 (0.000)	3.75e-05 (0.000)
Lending at home	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Constant	0.004 (0.010)	0.004 (0.010)	0.003 (0.010)
Observations	136192	136192	136192
Number of bank-country pairs (clusters)	4484	4484	4484
adj. R-squared	0.0365849	0.0366218	0.0379748

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

Regressions are cluster-robust OLS with fixed effects for banks and countries. Seasonal dummies included. Time period covered by regressions: 2003Q3 to 2010Q4. All explanatory variables are lagged one period. Affiliate relevance is the share of affiliate business in total long-term credit allocation of a bank to a foreign country's private sector.

Table 6: Regression results: financial crisis

Dependent variable: Transactions of long-term loans	(3) Crisis		(4) Crisis: pre- vs. post-Lehman		
	(3/1)	(3/2) <i>Interacted terms (x Crisis)</i>	(4/1)	(4/2) <i>Interacted terms (x Crisis pre Lehman)</i>	(4/3) <i>Interacted terms (x Crisis post Lehman)</i>
<i>Foreign country determinants: demand and risk</i>					
Fixed capital formation/GDP	-0.004 (0.003)	-0.001 (0.004)	-0.004 (0.002)	-0.004 (0.003)	0.000 (0.005)
Other countries' real GDP growth relative to local	-5.74e-08 (0.000)	-3.25e-07** (0.000)	-5.41e-08 (0.000)	-6.32e-05 (0.000)	-2.02e-07 (0.000)
Bilateral trade openness	-0.013 (0.010)	0.003 (0.004)	-0.013 (0.010)	0.009 (0.007)	-0.002 (0.004)
Stock market volatility	-4.36e-06 (0.000)	3.25e-05* (0.000)	-7.23e-06 (0.000)	-4.33e-06 (0.000)	4.00e-05** (0.000)
Exchange rate volatility	7.18e-05** (0.000)	2.78e-05 (0.000)	5.12e-05* (0.000)	-1.11e-04 (0.000)	-2.18e-05 (0.000)
Liabilities/GDP	0.002* (0.001)	0.001* (0.001)	0.002** (0.001)	0.000 (0.001)	0.001 (0.001)
<i>... via Affiliate Relevance</i>					
Fixed capital formation/GDP x Affiliate relevance	0.023 (0.036)	0.051 (0.062)	0.023 (0.035)	0.022 (0.079)	0.019 (0.079)
Other countries' real GDP growth x Affiliate relevance	0.000 (0.000)	-2.07e-06 (0.000)	1.26e-06 (0.000)	-2.34e-04 (0.000)	-2.23e-06 (0.000)
Bilateral trade openness x Affiliate relevance	0.183** (0.079)	-0.118 (0.115)	0.183** (0.079)	0.123 (0.134)	-0.277 (0.171)
Stock market volatility x Affiliate relevance	-4.67e-04* (0.000)	-5.59e-05 (0.000)	-4.69e-04* (0.000)	-1.05e-04 (0.001)	3.59e-04 (0.000)
Exchange rate volatility x Affiliate relevance	-4.12e-04 (0.001)	1.60e-04 (0.001)	-4.53e-04 (0.001)	1.38e-04 (0.002)	-3.48e-04 (0.001)
Liabilities/GDP x Affiliate relevance	-0.005 (0.008)	0.002 (0.009)	-0.005 (0.008)	0.006 (0.011)	0.001 (0.010)
Affiliate relevance	-0.005 (0.011)	0.000 (0.021)	-0.005 (0.011)	-0.012 (0.024)	0.011 (0.030)
<i>Home country determinants: general and bank-specific supply</i>					
Home interest margin	-0.153*** (0.031)	-0.065 (0.050)	-0.153*** (0.031)	0.036 (0.179)	-0.085 (0.065)
Tightening credit standards due to liquidity position	-4.45e-05** (0.000)	8.25e-07 (0.000)	-3.86e-05* (0.000)	6.26e-05 (0.000)	-3.82e-05 (0.000)
Change in core capital ratio	-0.071 (0.046)	-0.050 (0.072)	-0.066 (0.045)	0.069 (0.065)	-0.258** (0.115)
Core capital ratio	0.001 (0.002)	0.000 (0.009)	-0.001 (0.002)	0.011 (0.011)	0.007 (0.011)
Core capital ratio: change x level	0.108 (0.067)	0.204 (0.442)	0.105 (0.066)	-0.257 (0.430)	1.292** (0.643)
Interest income/equity	0.006* (0.003)	0.000 (0.001)	0.005 (0.003)	-0.003* (0.001)	0.003 (0.002)
Capital market activity	0.005** (0.002)	-0.001 (0.002)	0.004* (0.002)	-0.002 (0.002)	-0.003 (0.003)
Bank size (relative)	2.84e-05 (0.000)	6.74e-06 (0.000)	8.94e-06 (0.000)	2.42e-05*** (0.000)	-9.10e-07 (0.000)
Lending at home	0.001** (0.001)	0.000 (0.001)	0.001** (0.001)	0.001 (0.001)	0.000 (0.001)
Constant	0.005 (0.010)		0.011 (0.010)		
Observations	136192		136192		
Number of bank-country pairs (clusters)	4484		4484		
adj. R-squared	0.0382496		0.0414567		

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

Regressions are cluster-robust OLS with fixed effects for banks and countries. Seasonal dummies included. Time period covered by regressions: 2003Q3 to 2010Q4. All explanatory variables are lagged one period. Affiliate relevance is the share of affiliate business in total long-term credit allocation of a bank to a foreign country's private sector. The crisis dummy in column (3) equals 1 from 2007Q3 onwards. In column (4), the pre-Lehman crisis dummy equals 1 from 2007Q3 to 2008Q2, the post-Lehman crisis dummy is 1 from 2008Q3 onwards.

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