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Diversification and determinants of international credit portfolios: evidence from German banks

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Abstract

This paper examines the international credit portfolios of German banks. We construct a bank-country panel from a unique dataset for a representative set of countries and ask why banks leave diversification opportunities unexploited in some countries. Controlling for bank heterogeneity, we analyse the deviations of actual portfolios from a mean-variance based benchmark and their country-level determinants. Our results show that banking regulations are important determinants of the credit allocation of German banks. We present robust evidence that countries with stricter capital adequacy and entry requirements tend to be overweighted, primarily due to excess profits resulting from a lower level of banking market competition. German banks also overweight countries with larger and more developed banking markets. Moreover, we find support that German banks follow their domestic customers abroad to maintain existing lending relationships. Geographical factors, in contrast, do not seem to matter. Our findings suggest that changes in and convergence of banking regulations as well as financial deepening of banking sectors around the world may, in the long term, result in banks holding more diversified international credit portfolios.

JEL classification: G21, G11, F36, F21

Keywords: International banking, international financial integration, portfolio choice

Non-technical summary

The global financial crisis and the ongoing debt crisis have highlighted the role of large, globally oriented banks and their importance in studying international financial integration. Over the past two decades, major German banks, like other banks around the globe, have increased their international exposure through both cross-border lending and by the establishment of branches and subsidiaries abroad. Therefore, internationally oriented German banks nowadays rely heavily on the development of their foreign claims. However, even though the expansion into foreign markets creates opportunities for banks to better diversify their credit portfolios by exploiting the less-than-perfect co-movement of international business cycles, German banks continue to focus strongly on developed countries in their portfolios.

In this paper, we investigate which country-specific determinants lead German banks to overweight some countries and underweight others in their international credit portfolios against a mean-variance based benchmark. We ask which geographical, institutional, and regulatory frictions cause German banks to leave opportunities for diversification unexploited. To this end, we construct from the Deutsche Bundesbank's *External Position Reports of German Banks* a bank-country panel for the years 2003 to 2007 for large, internationally oriented German banks and a representative set of 35 countries from all regions of the world which comprehensively reflects the investment opportunity set of German banks.

Our results show that banking regulations are important determinants of German banks' international credit portfolios. Countries with stricter capital adequacy and entry requirements tend to be overweighted, primarily due to a lower level of banking market competition. German banks also overweight countries with larger and more developed banking markets, and tend to follow their domestic clients abroad in order to maintain existing lending relationships. Geographical factors, in contrast, do not seem to matter. German banks' credit portfolios do not appear to be determined by country factors which cannot change over time. Instead, there is reason to believe that changes in and convergence of banking regulations and deepening of banking sectors around the world may result in banks holding more diversified international credit portfolios, making them more stable and resilient to country-specific shocks.

Nichttechnische Zusammenfassung

Die globale Finanz- und die noch andauernde Schuldenkrise haben die Rolle großer, global ausgerichteter Banken sowie deren Bedeutung für das Verständnis internationaler Finanzintegration verdeutlicht. In den letzten zwei Jahrzehnten haben große deutsche Banken, wie andere globale Banken auch, ihr internationales Engagement sowohl durch eine Steigerung der grenzüberschreitenden Kreditvergabe als auch durch den Aufbau von Töchtern und Filialen im Ausland erhöht. International ausgerichtete deutsche Banken sind daher heute stark von der Entwicklung ihrer Auslandsforderungen abhängig. Während die Erschließung neuer Auslandsmärkte Banken grundsätzlich bessere Diversifikationsmöglichkeiten durch das Ausnutzen nicht perfekt synchron verlaufender Konjunkturzyklen ermöglicht, konzentrieren deutsche Banken ihre Portefeuilles dennoch weiterhin stark auf entwickelte Länder.

Das vorliegende Papier untersucht daher, welche länderspezifischen Determinanten deutsche Banken dazu veranlassen, gegenüber einem auf dem Mittelwert-Varianz-Ansatz basierenden Benchmarkportefeuille manche Länder in ihren internationalen Kreditportefeuilles über- und andere unterzugewichten. Insbesondere fragen wir, welche geografischen, institutionellen und regulatorischen Friktionen das von deutschen Banken ungenutzte Diversifikationspotenzial erklären. Dafür nutzen wir auf Grundlage des *Auslandsstatus der deutschen Banken* ein Bank-Land-Panel für die Jahre 2003 bis 2007 für große, international ausgerichtete deutsche Banken und eine repräsentative Stichprobe von 35 Ländern, die alle Regionen der Welt und damit die Investitionsmöglichkeiten deutscher Banken breit abbildet.

Unsere Ergebnisse zeigen, dass Bankregulierungen bedeutende Determinanten der internationalen Kreditportefeuilles deutscher Banken sind. Länder mit strengeren Kapital- und Markteintrittsbedingungen werden tendenziell übergewichtet, und zwar in erster Linie aufgrund geringeren Wettbewerbs im jeweiligen Bankenmarkt. Des Weiteren übergewichten deutsche Banken Länder mit größeren, entwickelteren Bankenmärkten und neigen dazu, ihren heimischen Kunden zwecks Sicherung bestehender Kreditbeziehungen ins Ausland zu folgen. Geografische Faktoren scheinen hingegen keine Rolle zu spielen. Von der Warte internationaler Finanzintegration und -stabilität aus betrachtet implizieren diese Ergebnisse, dass die Kreditportefeuilles deutscher Banken nicht durch unveränderbare länderspezifische Faktoren bestimmt sind. Es besteht im Gegenteil Grund zu der Annahme, dass langfristig Änderungen und Konvergenz von Bankregulierungen sowie eine weitere Vertiefung der Bankenmärkte der Welt zu diversifizierteren internationalen Kreditportefeuilles führen und somit Banken stabiler und robuster gegenüber länderspezifischen Schocks machen könnten.

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Diversification and Determinants of International Credit Portfolios: Evidence from German Banks*

1 Introduction

The global financial crisis and the ongoing debt crisis have brought to centre stage the activities of large, globally oriented banks and their importance in studying international financial integration. In fact, when the first signs of financial turmoil began to show in 2007, the foreign claims of banks reporting to the Bank for International Settlements (BIS) stood at \$34trn at the end of the year as compared to only \$11trn in 2000, and just \$1trn in 1990. Banks from Germany have likewise increased their international exposure through both cross-border lending and the establishment of branches and subsidiaries abroad. BIS data also reveal that Germany has been one of the top source countries of worldwide foreign claims for the past two decades. Moreover, at the end of 2007, foreign activities were already more important than domestic activities for major German banks, making up between 50 and 70% of their total assets. Therefore, internationally oriented German banks nowadays rely heavily on the development of their foreign claims.

This implies that internationally active banks should decide on new business with the risk and return of their foreign portfolios in mind. At the same time, the expansion into foreign markets creates the potential for banks to diversify across countries by exploiting the less-than-perfect co-movement of business cycles around the world. For instance, Kose et al. (2008) point out that notable business cycle asynchronicity between industrial countries on the one hand, and emerging market economies and developing countries on the other, continues to exist to this day. However, banking flows are primarily concentrated on developed markets (Milesi-Ferretti and Tille 2011). Large, globally oriented German banks also focus strongly on developed countries in their portfolios.

In this paper, we investigate which country-specific determinants lead German banks to overweight some countries and underweight others in their international credit portfolios

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against a mean-variance based benchmark. More specifically, we ask which geographical, institutional, and regulatory frictions cause German banks to leave opportunities for diversification unexploited. Our results show that banking regulations are important determinants of the international credit portfolios of German banks. We present robust evidence that countries with stricter capital adequacy and entry requirements tend to be overweighted, primarily due to a lower level of banking market competition. German banks also overweight countries with larger and more developed banking markets. Furthermore, we find that German banks tend to follow their domestic customers abroad in order to maintain existing lending relationships. Geographical factors, in contrast, do not seem to matter.

Our results are based on the Deutsche Bundesbank's *External Position Reports of German Banks*. This unique dataset contains micro-level data on the foreign exposure of all German banks, including their branches and subsidiaries abroad. From this dataset we construct a bank-country panel for the period between 2003 and 2007 for large, internationally oriented German banks and a representative set of 35 countries from all regions of the world that comprehensively reflects the investment opportunity set of German banks.

We compare the actual international credit portfolios of the banks in our sample to benchmark portfolios we would expect to observe in the absence of country-specific frictions. The benchmark portfolios are derived using a mean-variance approach à la Markowitz (1952, 1959). This is similar to García-Herrero and Vázquez (2007) and Buch et al. (2010). The latter use an unpublished aggregate, locational BIS dataset on the cross-border assets¹ of banks from France, Germany, Italy, the United Kingdom, and the United States in 23 countries around the world to identify barriers to international diversification. They estimate probit models and find that the probability of a country's being overweighted decreases with the severity of capital controls, and increases with a survey measure of trust among residents in the destination country. A major drawback of their study is that they concentrate on cross-border exposure only. However, large global banks have significantly increased their lending through foreign affiliates over the past two decades. The average bank in our sample, for instance, relies on branches and subsidiaries for about 40 to 50% of its foreign credit exposure. Moreover, solely focusing on cross-border lending might give a distorted view due to potential substitution effects because some loans that used to be extended cross-border may be granted locally once an affiliate has been set up (García-Herrero and Martínez Pería 2007). Our dataset, in contrast, allows us to consider the consolidated foreign exposure of individual banks and, crucially, to account for heterogeneity in banks' international portfolio strategies.

¹We focus more precisely on the credit portfolios of banks rather than their entire asset portfolios.

García-Herrero and Vázquez (2007) compile a bank-level dataset of international banks from eight major industrial countries to quantify the potential gains from international diversification. They find that international banks which allocate a larger share of their assets to foreign subsidiaries are able to achieve higher risk-adjusted returns, particularly in emerging markets. Banks' actual international asset portfolios are found to leave these opportunities largely unexploited in comparison to the results from a mean-variance optimisation. However, their results should be taken with caution, too, as they cannot account for parent bank and branch lending. Furthermore, the authors do not have information on ultimate lending destinations and, hence, implicitly assume that claims by foreign subsidiaries are exclusively against counterparties in the country of location. Our dataset does not suffer from these shortcomings since we are able to identify actual destination countries for the parent bank, its foreign branches, and its foreign subsidiaries.

This paper also relates to empirical research on the determinants of the stocks and flows of international assets. Based on augmented gravity regressions, a number of studies investigate the importance of distance in explaining international financial flows. Whereas Portes et al. (2001) and Portes and Rey (2005) find that distance, proxying information costs, still massively impedes cross-border flows of equities and bonds, the evidence in Aviat and Coeurdacier (2007) is that the effect of distance on bilateral bank asset holdings is massively reduced once goods trade is accounted for. The issue does not appear to be settled, though. For instance, Heuchemer et al. (2009) detect significant distance and border effects using an aggregated bilateral dataset of European cross-border loans.

We consistently find that more distant countries are not systematically underweighted. This is a strong result because we are able to isolate the hypothesis that distance constitutes a barrier in international lending via informational asymmetries from the conjecture that it might have a positive effect on portfolio holdings through diversification opportunities, which tend to increase with distance (eg, Portes et al. 2001). Since diversification opportunities are accounted for in the benchmark portfolios against which we evaluate actual international credit portfolios, the evidence in this paper suggests that informational asymmetries do not monotonically increase with distance to the destination country. This is in line with Buch et al. (2010) who do not find an effect of distance on the probability of a country's being overweighted either.

However, we find strong evidence that banking regulations affect the over- or underweighting of countries in German banks' international credit portfolios. More specifically, German banks are particularly attracted to countries with higher entry and capital adequacy requirements. We show that this is due to lower levels of competition and efficiency in these

countries. As a consequence, German banks might be able to generate excess returns through superior management skills and technologies needed to run international operations.

Competition among banks for domestic customers also seems to be an important factor in the composition of international credit portfolios. German banks' international lending appears strongly driven by the desire to maintain existing relationships with domestic client firms when those venture abroad and set up operations in a foreign country. This follow-your-customer motive has been established by several studies (see, eg, Goldberg and Saunders 1980, 1981, Brealey and Kaplanis 1996, Yamori 1998) and also seems to affect the international lending decisions of German banks.

Moreover, German banks tend to overweight countries with deeper, more developed banking markets which might offer better opportunities for diversification. The level of risk-taking in the banking sector of the host country appears to matter as well. We observe that the banks in our sample increased their lending to countries with riskier banking sectors. This may have happened either deliberately to raise profits or ignorantly due to a failure of risk management systems that reduced risk perception.

The credit portfolios of German banks do not seem to be determined by country factors which cannot change over time. Instead, there is reason to believe that, in the long run, changes in and convergence of banking regulations as well as financial deepening of banking sectors around the world will result in banks holding more diversified international credit portfolios. A structural change in the portfolio composition of German banks may already have set in. While their exposure to developed countries contracted by roughly 30% between 2007 and 2010, lending to developing countries went up by about 20%. Similarly, the broad picture is that cross-border bank flows to developed countries in general, and the United States and Europe in particular, contracted to a significantly larger extent during the financial crisis than to emerging and developing countries (Milesi-Ferretti and Tille 2011). This process is desirable from the point of view of financial stability because it should reduce the deviations from our benchmark portfolios and leave banks with portfolios that make them more stable and resilient to country-specific shocks.

The paper is structured as follows: Section 2 describes the dataset and characterises the actual international credit portfolios of German banks. The methodology and properties of the benchmark portfolios are outlined in Section 3, while the frictions of interest and the empirical strategy to identify them are discussed in Section 4. The estimation results are presented in Section 5. Section 6 concludes.

2 International credit portfolios of German banks

2.1 Dataset

Data on international credit portfolios are from the Deutsche Bundesbank's *External Position Reports of German Banks*. This dataset contains monthly micro-level data on the external assets and liabilities of German banks, including their branches and subsidiaries abroad. Moreover, foreign assets and liabilities are broken down along a number of different dimensions such as destination country, asset class, counterparty sector, currency denomination, and maturity.² The richness of the dataset makes it highly suitable for investigating the international diversification of bank credit portfolios. Three advantages stand out in particular.

First, data are available at the bank level. While we are interested in the country-specific frictions due to which banks' portfolios deviate from optimally diversified benchmark portfolios, individual banks might differ in their country exposures for reasons other than the factors we are able to observe. For instance, banks may have a lot of experience and expertise in a certain market or other competitive advantages. There may also be banks which single out certain strategically important countries in their international portfolio strategy. The bank-country dimension of our dataset allows us to control for such unobserved heterogeneity in our econometric analysis (see 4.1). This is a significant improvement over the dataset used by Buch et al. (2010).

Second, reporting is not confined to the external positions of bank headquarters but instead includes those of foreign affiliates as well. This is important since banks have not only increased their cross-border exposures over the past two decades but also their lending via branches and subsidiaries (see, eg, Clarke et al. 2003).³ A glance at the data reveals the importance of foreign affiliates for internationally oriented banks. The average bank in our sample relies on branches and subsidiaries for about 40 to 50% of its foreign exposure, with percentages even ranging into the 90s as banks become larger and more internationally active. Moreover, there is reason to suspect substitution effects in international lending between the bank headquarters and their foreign affiliates. Some loans which used to be extended by the parent bank may be granted locally once a foreign affiliate has been set up.⁴ Hence, focusing only on either cross-border or affiliate lending would give a biased picture of banks' international diversification and its determinants. In contrast to García-Herrero and Vázquez

²For a more detailed documentation, see Fiorentino et al. (2010).

³Cross-border lending refers to lending conducted directly by the parent bank, ie from a banking group's headquarters, rather than by its foreign affiliates. We will therefore use these terms interchangeably. Likewise, we will also occasionally refer to lending via foreign affiliates as local lending.

⁴Also see García-Herrero and Martínez Pería (2007) who investigate the mix of international banks' foreign claims between cross-border and local affiliate lending.

(2007) and Buch et al. (2010), our dataset makes it possible to analyse a bank’s consolidated foreign exposure by summing cross-border and affiliate lending.⁵

Finally, foreign exposures are reported for the actual country of destination. This is another improvement with respect to other datasets that contain no information on lending destinations such as the one used by García-Herrero and Vázquez (2007). Their implicit assumption that claims by foreign subsidiaries are exclusively against counterparties in the country of location may be appropriate in most instances. However, international banks also use financial centres as “hubs” in order to lend to foreign clients outside those centres. Therefore, our data can be seen as providing a further refinement in that regard.

2.2 Sample selection

We use the detailed information on foreign claims to focus our analysis along a number of dimensions and to construct a dataset best suited to addressing our research question.

First, we focus on a specific set of banks. The key question of the paper is why banks which can be assumed to diversify internationally overweight some countries whilst underweighting others. We therefore require that the banks in our sample be sufficiently large and internationally oriented. For Germany, we identify those banks as the major commercial banks and the head institutions of the savings and co-operative banks. We exclude individual savings and co-operative banks as well as small or mid-sized banks due to their focus on domestic activities. Specialised lenders are not included either since they pursue distinct business models (eg, mortgage lending, business development loans, car financing).

Our final bank sample consists of 18 institutions. Compared to all other German banks, the banks in our sample have a considerably larger exposure to foreign countries. For example, while the banks in our sample have a significant credit exposure in roughly 50 countries, the average number of countries to which all other German banks have substantial exposure is close to zero. The banks in our sample also have significantly more foreign affiliates than the other banks. Whereas the former have, on average, a branch and/or subsidiary in about ten countries, the latter only have a local presence in approximately three foreign countries. Overall, the banks in our sample are sufficiently large and internationally oriented to pursue an international diversification strategy.

Second, we constrain our investigation to the period between 2003 and 2007. We exclude the global financial and debt crisis years since our research question appears most reasonable

⁵Whereas García-Herrero and Vázquez (2007) rely entirely on foreign subsidiaries data from Bankscope, Buch et al. (2010) cannot include subsidiaries as part of a banking group since their data are locational. In our dataset, the foreign subsidiaries of large, internationally active banks often account for as much as 20 to 30% of consolidated foreign exposure.

in “normal” times, ie relative tranquillity in financial markets. In times of financial distress, however, we would expect short-term motives (eg, loss reduction) to dominate strategic considerations by banks, such as the international diversification of credit portfolios.⁶

Third, we focus on loans to the non-bank private sector.⁷ Table 1 shows that this lending aggregate is the most important component of German banks’ total foreign claims over the entire sample period (42% in 2007). Holdings of foreign bonds and commercial paper (33%) and credit to foreign banks (18%) are less important. We do not include bonds and commercial paper since we cannot be sure that this asset category does not capture securitised assets. This might be problematic due to the fact that securitisation was particularly prevalent during our sample period in the run-up to the global financial crisis and driven by different considerations. Likewise, we exclude credit to foreign banks which is predominantly short-term in nature and not driven by long-term portfolio considerations. Foreign equity (5%) is unimportant with regard to the international exposure of German banks.

Table 1: **Foreign claims of German banks, by asset class**

	2003	2004	2005	2006	2007
Total foreign claims	2,042,764	2,352,294	2,369,503	2,689,540	2,976,689
Credit to foreign non-bank private sector	818,111 (40%)	881,777 (37%)	899,876 (38%)	1,018,373 (38%)	1,236,196 (42%)
Credit to foreign banks	522,400 (26%)	652,867 (28%)	577,717 (24%)	589,321 (22%)	547,576 (18%)
Foreign bonds and commercial paper (any sector)	581,636 (28%)	671,487 (29%)	734,321 (31%)	897,446 (33%)	992,201 (33%)
Foreign shares (any sector)	50,176 (2%)	76,921 (3%)	96,685 (4%)	122,919 (5%)	136,325 (5%)

Notes — This table shows the foreign claims of all German banks broken down by asset class. Data are from the Deutsche Bundesbank (External Position Reports of German Banks). All exposures are in €mn.

Finally, despite constraints on the availability of equity indices, which are the basis for the calculation of benchmark portfolios (see 3.1), we are able to construct a dataset that includes a representative sample of 35 countries covering all major regions of the world (see Table A.1). This set of countries covers about 85% of the total foreign non-bank credit by the banks in our sample. By capturing a substantial amount of cross-country heterogeneity and

⁶In the robustness section, we later check whether our results change if we exclude the year 2007. The first stage of the crisis already began in 2007 and was largely confined to the interbank market.

⁷Düwel et al. (2010) use the same database in a different context and make similar choices.

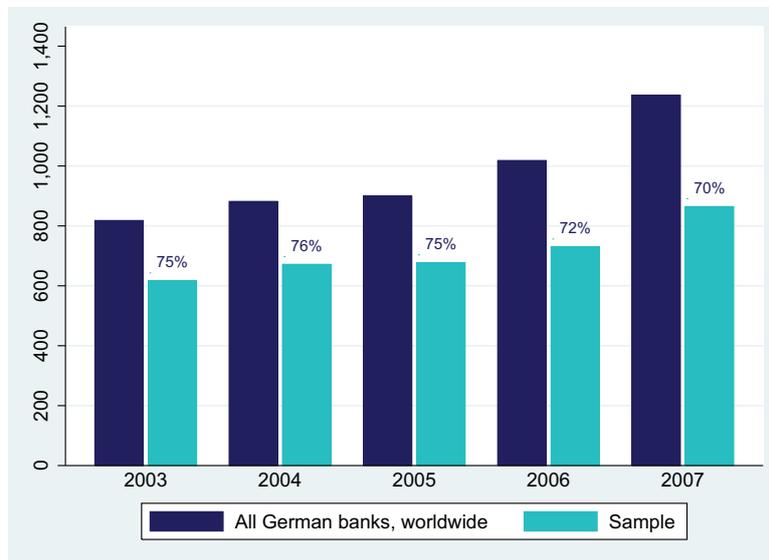
potential diversification opportunities, we can expect to gain insights into the country-specific determinants of German banks' international credit portfolios.

We consolidate the loans to the non-bank private sector for all 18 banking groups over the sample period by summing the exposures of the parent bank and all of its foreign affiliates. That is, we assume that German parent banks do not only consider their foreign branches as part of their international strategies, but also their foreign subsidiaries. This is reasonable due to the tendency of international banks to incorporate branches and subsidiaries in their international strategy and the special importance of internal capital markets for German banks. McCauley et al. (2010), for example, show that the foreign affiliates of German banks in particular depend more heavily on internal capital markets for funding than those of other international banking groups. This suggests that the foreign affiliates of German banks are particularly integrated with their parent. We therefore include them in the analysis.

2.3 Stylised facts

Figure 1 shows the development of credit to the foreign non-bank private sector between 2003 and 2007 for both the total foreign exposure of all German banks (circa 2,000) and that of the 18 sample banks to the representative set of 35 countries. In each case, there is a

Figure 1: **Credit to foreign non-bank private sector, 2003–2007**



Notes — Data are from the Deutsche Bundesbank (External Position Reports of German Banks). All exposures in €bn. Percentages indicate lending by the 18 sample banks to the 35 sample countries as a share of the entire German banking system's worldwide non-bank private sector credit.

marked upward trend, with the former increasing from €818 bn to €1.2 trn, and the latter from €617 bn to €865 bn. Both aggregates also move remarkably in tandem, indicating

that our sample is highly comprehensive and representative along both the bank and country dimensions. Overall, our sample consistently accounts for 70% or more of all foreign credit by the entire German banking system. We will refer to *this* sample here and in the following.

The top ten lending destinations of German banks at year-end 2007 are presented in Table 2 from both an aggregate and a micro-level perspective. The aggregate figures in the left-hand panel show the relative country weights in banks' international credit portfolios after summing the different country exposures over all banks in our sample. In the right-hand panel, we exploit the micro nature of our dataset and provide summary statistics on the basis of individual credit portfolios.

Table 2: **Primary lending destinations of German banks (year-end 2007)**

Aggregated		Disaggregated		
			Median	Std dev
United States	38.7%	United States	29.0%	12.5%
United Kingdom	33.6%	United Kingdom	13.6%	14.8%
Ireland	3.8%	Netherlands	4.7%	11.0%
Italy	3.2%	France	4.0%	12.1%
France	3.1%	Switzerland	2.9%	4.1%
Japan	3.0%	Spain	2.8%	3.7%
Spain	2.8%	Ireland	1.8%	13.5%
Netherlands	2.6%	Italy	1.1%	3.6%
Switzerland	1.6%	Russia	1.0%	1.7%
Poland	1.5%	Poland	1.0%	5.1%

Notes — Data are from the Deutsche Bundesbank (External Position Reports of German Banks). Aggregate figures (left-hand panel) obtain after summing country-specific exposures across banks. Disaggregated statistics (right-hand panel) are based on credit portfolios of individual banks. All figures refer to the sample of 18 internationally oriented German banks and the representative set of 35 countries.

The United States (US) and the United Kingdom (UK) are by far the most important lending destinations for the banks in our sample. On aggregate, the US account for almost 40% and the UK for roughly a third of total lending of lending to foreign non-banks. Six of the remaining top lending destinations are located in Western Europe (about 17%), the other two being Japan (3%) and Poland (1.5%). Together, the ten countries account for more than 90% of total lending to non-banks. The micro-level perspective is mostly in line with the observations at the aggregate level. The US and UK continue to be the two primary target countries for non-bank credit. Western European countries remain important as well, even though the rank ordering changes. Interestingly, Japan is no longer among the top lending destinations. In contrast, while Russia was not among the top ten countries based on aggregate data, it ranks in ninth place on the basis of disaggregated data.

A closer look at the disaggregated data provides further interesting insights into bank heterogeneity in portfolio holdings. For example, the standard deviations are large and frequently a multiple of the respective medians for all countries except the US and UK. This indicates that German banks take quite different views on the desirability of lending to specific countries. This heterogeneous behaviour is not confined to emerging economies like Russia or Poland, but is observable in highly developed economies like France or the Netherlands as well. Overall, the descriptive analysis of the primary lending destinations suggests that it is crucial to control for bank heterogeneity in our empirical investigation of country-level frictions.

3 Benchmark portfolios

3.1 Methodology

The goal of this paper is to examine which country-specific frictions drive a wedge between banks’ actual portfolios and *benchmark portfolios*, ie portfolios we could expect to observe as the outcome of optimal international diversification in the absence of those frictions.⁸

In a fashion similar to Buch et al. (2010) and García-Herrero and Vázquez (2007), we compute these benchmark portfolios by applying the Markowitz (1952, 1959) mean-variance framework on the basis of representative assets. We make some amendments to the benchmark portfolios in order to make them more suitable for our analysis. Most importantly, we account for the fact that portfolio weights obtained from mean-variance optimisation over representative assets are invariant to the size of the respective economies and their capacity to absorb credit. We therefore introduce more realism by correcting for credit demand.

Representative assets. We interpret a bank’s benchmark international credit portfolio as arising from an optimal choice from a universe of representative assets — one for every country in our sample. The decision to lend to a particular country or, more precisely, its non-bank private sector can be regarded as granting a loan to a “typical”, representative company in that country.⁹ It is this company’s economic and financial situation which the representative asset is intended to proxy.

⁸There may exist other frictions in portfolio allocation. For instance, rebalancing any kind of investment portfolio will generally entail some additional fixed transaction costs. In many cases the expected benefits will not outweigh those costs, leading to more stable portfolios than would be the case without them. These frictions differ by asset class, and can be quite substantial in the allocation of bank credit (especially as compared to more standardised transactions, such as commodity contracts on futures exchanges). While we focus on country-specific frictions in this paper, we account for the fact that fixed transaction costs may deter banks from massively rebalancing their credit portfolios.

⁹Here and in the following, whenever we refer to a *country*, we mean that country’s non-bank private sector (see 2.2 for our choice of lending aggregate).

The mean-variance framework then captures the trade-off between risk and return that banks face when lending internationally: all other things equal, they will prefer countries in which loan repayments are expected to be higher or less volatile. Crucially, in a portfolio context banks may even consider lending to a country for which repayments are expected to be relatively low, or volatile, or both. The rationale is that banks can exploit less-than-perfect correlation between one country's loan repayments and those in the rest of the portfolio to improve the risk-return profile of their international credit portfolio as a whole. Hence, the benefits of international portfolio diversification are greater the less aligned a country's economy with the business cycles of other countries.

To measure banks' expected risk and return in international lending, we would ideally like to use corporate bond indices. However, we found data availability to be too limited for non-Western countries.¹⁰ Since the benefits of portfolio diversification result in large part from the inclusion of countries with relatively asynchronous business cycles, a sample dominated by developed countries (from the Western hemisphere) with strong business cycle co-movements would underestimate the potential for international portfolio diversification. Hence, we choose a stock market index (from MSCI Barra) as the representative asset, ie we map the international credit allocation problem into one among national equity indices. This allows us to construct a dataset with a representative sample of 35 countries from all regions of the world which comprehensively reflects the investment opportunity set of German banks.¹¹

The firm-value model by Merton (1974) provides a compelling rationale for the idea that the stock market should contain information about creditworthiness. In a nutshell, the payoff to holders of a company's risky debt is interpreted as the sum of safe debt, ie the face value, and a short put option on the company's asset value with strike price equal to the face value of debt. A firm's debt value and default probability thus depend on the development of its asset value: while the expected rate of return on the firm's asset value raises the value of risky debt and reduces the probability of default, the opposite holds for the volatility of the asset value. Since the value of a firm's assets is not observable, industry models descending from Merton-type firm-value models infer the asset value and its development over time from that of a company's stock.¹²

¹⁰This has also been pointed out by Buch et al. (2010) who use government bond indices as representative assets instead, leaving them with 23 countries for the years 1995 through 2003.

¹¹The broader country coverage by using equity instead of corporate bond indices also leads to higher cross-country heterogeneity in the frictions we examine. Therefore, we should be better able to identify the relevant effects.

¹²That is the case, for instance, in Moody's KMV. For details on this and other credit risk models, see Kealhofer (2003), Crosbie and Bohn (2003), and Crouhy et al. (2000).

We take that as the starting point for our optimisation and proxy a country's representative firm by the return moments of its respective MSCI Barra stock market index.¹³ Each equity index in isolation is characterised by expected return μ and standard deviation σ . It follows from above that banks will, *ceteris paribus*, prefer companies from countries with higher μ 's and lower σ 's. In addition, the pairwise correlations ρ of national indices proxy for the degree to which equity markets (and business cycles) in the respective countries move together. At lower values of ρ , banks are more likely to engage in diversification between countries.

Table 3 reports regional return characteristics at the end of 2007 for our sample of 35 countries. Interestingly, monthly mean returns are highest in South America and South & Southeast Asia (1.9% each), and lowest in Western and Eastern Europe (0.7% each). Despite a relatively high figure for the developed region of North America (1.4%), mean returns in regions consisting primarily of developing and emerging economies tend to exceed those in developed regions (also see Table A.2). However, Western Europe and North America carry substantially lower individual risk. Their return standard deviations of 5.3 and 5.5%, respectively, are lower than those of any other region in the world. This suggests that their lending environments are more stable than other parts of the world. In contrast, the regions with the highest mean returns, South America and South & Southeast Asia, are also those with the highest standard deviations (10.6 and 9.4%, respectively). This indicates a risk-return trade-off in international lending.

The return correlations presented in Table 3 underline the potential diversification gains that might be realised by lending abroad. As expected, correlations are consistently higher within than between regions. The correlation between Western Europe and South & South East Asia (0.28), for instance, is less than half that of Western European countries amongst each other (0.65). Returns are also highly correlated between Western Europe and North America (0.59), while correlations are significantly lower with all other regions of the world, which consist predominantly of emerging and developing economies. Returns in the latter group of countries are far from being perfectly aligned with each other as well. This suggests that explicitly discriminating between single regions and countries in the emerging and developing world, rather than treating them as a homogeneous block, may further increase the benefits from diversification.

¹³To keep our analysis tractable, we only borrow from industry models that stock prices contain valuable information on the development of a firm's creditworthiness, but do not employ any of the sophistications (eg, as introduced in Moody's KMV). At the cost of losing some precision, this should still give a broadly accurate and consistent picture across countries. Moreover, one may argue that national equity indices only reflect the financial health of large, publicly listed companies and might give an incomplete view of *the representative company* whenever smaller, non-listed companies are doing better or worse. While this may be the case at a point in time, it would have to occur systematically and for protracted periods of time to present a major shortcoming of our approach.

Table 3: **Return characteristics, by region (year-end 2007)**

	Monthly return		Correlations						
	Mean	S.d.	WE	EE	NA	SA	MEA	SSEA	EAO
Western Europe (WE)	0.7%	5.3%	0.65	0.39	0.59	0.39	0.47	0.28	0.40
Eastern Europe (EE)	0.7%	8.8%		0.54	0.51	0.36	0.40	0.28	0.35
North America (NA)	1.4%	5.5%			0.73	0.57	0.57	0.41	0.57
South America (SA)	1.9%	10.6%				0.46	0.40	0.35	0.39
Middle East & Africa (MEA)	1.6%	7.6%					0.45	0.31	0.47
South & Southeast Asia (SSEA)	1.9%	9.4%						0.53	0.41
East Asia and Oceania (EAO)	1.3%	7.3%							0.56

Notes — All values are based on calculations using nine years of monthly euro/deutschmark returns on the 35 representative assets in the sample. Reported are intra-region medians over constituent countries (see Table A.1). For correlations, values are medians over pairwise correlations between individual countries of the respective groups.

Portfolio optimisation. At the portfolio level, banks are assumed to minimise the return volatility σ for any given level of expected return μ , or maximise μ for any given level of σ . They are assumed to borrow at a risk-free rate r in the interbank market¹⁴ and optimally invest the funds in the risky representative assets under short-selling constraints.¹⁵ Optimality is achieved when the Sharpe ratio $\frac{\mu-r}{\sigma}$ of the overall portfolio is maximised. This is the case for any point on the capital market line connecting the risk-free asset and the tangency portfolio of risky representative assets on the efficient frontier. Any bank preferring higher μ 's and lower σ 's will choose a portfolio along that line, regardless of its degree of risk aversion. This portfolio is simply a mixture of the riskless asset and the tangency portfolio.¹⁶ More risk-averse banks invest more in the former and less in the latter, but the composition of the risky tangency portfolio is the same for all banks.¹⁷ The optimal relative country shares

¹⁴We focus on large international German banks (see 2.2) that rely heavily on short-term interbank loans to fund their operations rather than retail deposits.

¹⁵Recall that we are ultimately interested in international bank loan portfolios. We rule out the possibility of short selling because, in that context, it lacks an intuitive explanation and does not appear economically sensible.

¹⁶This separation theorem was first put forward in Tobin (1958), even though, in the strict sense, it applies to unconstrained portfolios only.

¹⁷This holds to the extent that banks possess homogeneous information and expectations. More importantly, it also requires that all banks be able to realise returns in the same way. We are aware that this assumption may be somewhat restrictive. For example, a bank located in the western part of Germany might have closer ties to, or more precise knowledge of, markets in, say, the Benelux countries. It may therefore find itself at an advantage over other German banks in picking borrowers and exploiting profit opportunities. In all probability, the optimal portfolios will thus not be completely identical across banks: for any given bank, they are likely to differ somewhat with respect to the computed portfolio. The computation of bank-individual benchmark portfolios at this stage would hence require knowledge of their specific expertise and strategy towards particular countries, which are naturally unobserved. However, one can reasonably assume that these are inherent traits of individual banks with little, if any, change over time. This allows us to account for heterogeneity later by including bank-country specific effects in our regression analysis (see 4.1).

from mean-variance optimisation can then be obtained as the weights of representative assets in the tangency portfolio.

The inputs for the optimisation (ie, expected returns, standard deviations, and correlations) are unobserved and need to be estimated from historical returns. Hence, we use a rolling-window approach on the basis of monthly returns. This yields a portfolio for each year-end in the sample period.¹⁸ We also account for the caveat that the optimality and out-of-sample performance of the computed portfolios can often be severely impaired when point estimates are treated as if they were known with certainty. That is because optimal portfolios are very sensitive with respect to the inputs. In particular, mean returns are subject to estimation error (see, eg, Michaud 1989). Neglecting this often leads to portfolios that are unrealistically exclusive, ie contain only very few of the initial assets, and are unstable over time.¹⁹ To mitigate this, we employ the *portfolio resampling* technique from the asset allocation literature (see, eg, Jorion 1992, Michaud 1998, or Scherer 2002) which amounts to parametrically bootstrapping from a distribution characterised by the estimates of the expected returns, standard deviations, and correlation coefficients. The idea is to calculate a separate efficient frontier and optimal representative-asset portfolio for each draw, with the bootstrapped optimal portfolio obtaining as the average of optimal portfolios from those draws.²⁰ Indeed, the resampled portfolio weights turn out to be more balanced and much less volatile.

Accounting for credit demand. The weights from (resampled) mean-variance optimisation over representative assets do not consider potential credit demand. A small country, for example, does not possess the same capacity to absorb credit as larger countries do. However, pure mean-variance optimisation may assign a weight well above the small country's share of credit demand relative to the countries in the portfolio. Sensible benchmark portfolios ought to account for this and be anchored around the relative credit demands of the other countries in our sample. In line with the terminology introduced by Black and Litter-

¹⁸We choose the length of the rolling window to be 9 years due to a trade-off. On the one hand, we require that the window be long enough to give reasonably reliable parameter estimates. We would like to characterise returns through the business cycle in order to learn about country fundamentals as well as to limit the impact that short-term developments, for instance, stock market rallies, might have. The use of 120 months of data, as very often done in the asset allocation literature, would therefore seem appropriate. On the other hand, restrictions on the availability of the indices mean we would have to drop several Eastern European countries with a major foreign bank presence (see, eg, de Haas and van Lelyveld 2006, Havrylchyk and Jurzyk 2011), and potentially strategic importance for German banks in particular. However, we can include those countries at the quite limited cost of reducing the window length by just one year to 9 years.

¹⁹The latter would be a particularly undesirable property since we mentioned earlier on that, in the presence of (fixed) transaction costs, banks should be expected to shy away from massively rebalancing their credit portfolios on an ongoing basis.

²⁰We make 1,000 draws and trace out each efficient frontier along 100 equally divided returns between the minimum and maximum returns. For a detailed description of the procedure, see Scherer (2002) or Michaud (1998).

man (1992), those relative credit demands can be thought of as neutral starting points for an international credit portfolio. Mean-variance optimisation then provides the bank with views on the relative merit of investing in different countries from a diversification perspective, so it can adjust the neutral weights accordingly. As credit demand is frequently proxied by GDP in the literature and, for our purposes, it also has the desirable property of being largely unaffected by the country-specific frictions of interest, we use relative GDP shares as neutral anchors.²¹ Since it is unclear how much confidence a bank would place in mean-variance optimisation as opposed to the neutral weights at any given point in time, we employ a simple heuristic and define the final benchmark weight for a country as the unweighted average of its weight from resampled mean-variance optimisation and its relative GDP share.²² However, our results are robust to alternative weighting schemes which put gradually more weight on the outcome from mean-variance optimisation and less on relative GDP shares.

3.2 Deviations from the benchmark

Table 4 gives a first overview of how German banks' actual portfolios deviate from the benchmark portfolios for the top ten lending destinations at the end of 2007. The degree of overweighting is the difference between a country's median actual weight and its benchmark weight according to the optimisation procedure outlined in 3.1.

Eight of the ten most important lending destinations are overweighted to varying degrees relative to the benchmark, while Italy and Russia are underweighted. The US and UK are the two most overweighted countries in German banks' credit portfolios (13.9 and 10.5 percentage points, respectively).²³ Even though the actual weight on the US is about twice that of the UK, their degrees of overweighting are quite similar. This is due to the much higher benchmark weight for the US. In contrast, Russia is heavily underweighted (−9.2 percentage points) relative to a similarly high benchmark weight of 10.2%.

Overall, Table 4 indicates a significant potential for diversification by lending to underweighted countries. In the next section, we analyse empirically which country-specific frictions explain why countries are over- or underweighted.

²¹See de Haas and van Lelyveld (2011), Altunbas et al. (2009), or Haselmann (2006) for the use of GDP as a credit-demand proxy in different contexts.

²²Similar heuristics are often applied in other contexts with multiple plausible decision criteria, but in which no single criterion is clearly superior. For instance, the shares of national central banks in the European Central Bank's capital are calculated using a key which is the unweighted average of countries' population and GDP shares. Also see Altman et al. (2002), who propose a "fifty-fifty" weighting scheme as a simple and transparent reference point in the context of shock analysis.

²³This is also the case for the years 2003–2006.

Table 4: **Overweighting for top ten lending destinations (year-end 2007)**

Country	Overweighting	Actual weight	Benchmark weight
United States	13.8	29.0%	15.2%
United Kingdom	10.6	13.6%	3.0%
Netherlands	3.9	4.7%	0.8%
France	1.2	4.0%	2.8%
Switzerland	2.2	2.9%	0.7%
Spain	1.2	2.8%	1.6%
Ireland	1.5	1.8%	0.3%
Italy	-1.2	1.1%	2.3%
Russia	-9.2	1.0%	10.2%
Poland	0.3	1.0%	0.7%

Notes — Data are from the Deutsche Bundesbank (External Position Reports of German Banks). Overweighting is defined as the difference in percentage points between actual and benchmark weights. Actual weights are median country shares based on the credit portfolios of individual banks. Benchmark weights are calculated according to the methodology in 3.1. All figures refer to the sample of 18 internationally oriented German banks and the representative set of 35 countries.

4 Empirical setup

4.1 Estimation framework

We use the benchmark portfolios as the reference point for banks' actual international credit portfolios to investigate the impact of country-specific frictions with the following econometric model:

$$ow_{cbt} = \alpha + INTEG_{ct}\beta + INST_{ct}\gamma + X_{ct}\delta + \mu_{cb} + \varepsilon_{cbt} .$$

Here, $ow_{cbt} = w_{cbt} - opt_{ct}$ is the degree of overweighting of country c in bank b 's international credit portfolio at the end of year t , ie the difference between the actual weight w_{cbt} and the optimal weight opt_{ct} from the benchmark. μ_{cb} is a bank-country specific effect that captures individual bank behaviour towards specific countries in our dataset.

For instance, some banks may be better able to exploit investment opportunities in certain countries due to greater expertise or experience in a market while others may single out strategically important countries without the aim to diversify. Due to the bank-country dimension of our dataset we can control for such unobserved time-invariant bank-country specific heterogeneity. This is a major advantage over the study by Buch et al. (2010).

The country-specific frictions are included in the vectors $INTEG_{ct}$ and $INST_{ct}$, and are described in the subsection below. $INTEG_{ct}$ is a matrix of variables that measure the degree of economic integration. Variables included are geographical distance (DIST), a

dummy variable which indicates whether the lending destination has a common border with Germany (BORDER), and its relative importance as a destination for German foreign direct investment in the real sector (FDI). We also check whether eurozone membership (EURO) biases banks' credit portfolios towards eurozone countries.

$INST_{ct}$ controls for the institutional and regulatory framework. It includes variables on the overall institutional environment (INSTITUTION) and the degree of private monitoring in the destination country (PMI). Moreover, we account for banking regulations such as entry requirements in the host country (ENTRY), regulatory requirements regarding bank capitalisation (CAPITAL), while restrictions on non-traditional bank activities are measured by RESTRICT. We also control for whether the destination country hosts a major financial centre (CENTRE).

X_{ct} is a matrix of additional control variables. The country-specific frictions are described in greater detail in the following. Table A.3 provides a summary of their definitions and data sources. As most of the variables do not vary over time, we estimate the model by random effects. We do use fixed effects, though, to check the robustness of the results for the time-varying variables in our model. Also note that we cannot include bank variables in the regression as level terms since the regression coefficients would be zero by definition.²⁴ As a further robustness check, however, we later exploit the bank-level dimension of our dataset by including interaction terms to identify whether the banks in our sample differ in their reactions to frictions.

4.2 Country-specific frictions

The previous section has shown that German banks' actual credit portfolios deviate from our benchmark portfolios. In line with the literature on international banking, we identify the following frictions which might cause the over- or underweighting of countries in banks' portfolios.

(1) Economic integration. We expect the degree of economic integration with Germany to be an important determinant of banks' deviations from the benchmark portfolios. To measure economic integration we use the following variables:

Distance (DIST) is measured as the log great-circle distance between the most important cities or agglomerations of Germany and the destination country. It has long been used in

²⁴This is the case because we look at countries' *shares* in the international credit portfolios of German banks. Those are defined as percentages. Hence, even though larger banks, on average, extend more credit to any given country than smaller banks, the portfolio shares for each bank in any given year always add up to 100%. Equivalently, the over- or underweightings for a bank will add up to zero. The regression coefficient of any bank variable in levels will therefore be zero as well.

estimating gravity equations in international trade, and has recently been investigated in the literature on the international holdings and flows of financial assets as well.²⁵ That literature has identified two rival hypotheses for the impact of distance (see, eg, Portes et al. 2001). According to the first hypothesis, the *absolute* level of holdings or flows should increase with distance since business cycle correlations tend to decrease with distance (also see Table 3). This indicates a positive relationship between distance and absolute holdings or flows. The second hypothesis postulates that distance is a proxy for the severity of informational frictions because information flows are generally lower between more distant countries. This suggests a negative relationship between distance and absolute holdings or flows.

In this paper, we explicitly model diversification opportunities and evaluate international credit portfolios *relative* to the benchmark portfolios containing optimal country weights. The benchmark portfolios already account for the first hypothesis from above, according to which the potential for diversification increases with distance. Hence, our regressions amount to a test of the hypothesis that informational frictions increase monotonically with distance, and that more distant countries should be less overweighted, or more underweighted, relative to the benchmark. This suggests a negative coefficient on DIST.

As an alternative measure, we include a dummy indicating whether a destination country borders on Germany (BORDER). By the same reasoning, we would expect a positive relationship between BORDER and the degree of overweighting.

Outward foreign direct investment in the real sector (FDI) is included to account for the fact that banks may follow domestic companies when those venture abroad and set up operations in a foreign country.²⁶ This decision might not be primarily driven by the desire to seek a particular foreign exposure but to retain an already existing customer base at home. In a way, this follow-your-client motive can be viewed as competing with that of international diversification. This may be particularly relevant in a bank-dominated financial system like Germany where many firms rely on their so-called “Hausbank” for funding rather than on capital markets (see, eg, Onetti and Pisoni 2009). To investigate the follow-your-client motive, we use a country’s share in the real-sector outward FDI stocks of German non-banks.²⁷ In line with the follow-your-customer hypothesis, we would expect a positive impact on overweighting.

²⁵See Portes et al. (2001) and Portes and Rey (2005) for cross-border trade in equities, corporate bonds, and government bonds, and Aviat and Coeurdacier (2007) for bilateral bank asset holdings.

²⁶This rationale for the international activity of banks has been stressed as early as Goldberg and Saunders (1980, 1981). However, empirical evidence has been mixed. Recent studies (eg, Focarelli and Pozzolo 2005, Berger et al. 2003, Seth et al. 1998, Williams 1998) tend to paint a more nuanced picture of the importance of the follow-your-client motive than earlier contributions (eg, Yamori 1998, Brealey and Kaplanis 1996).

²⁷We do not include FDI by banks or other financial firms in that measure. The establishment of subsidiaries in a foreign country by banks would not only be reflected in an increase of the FDI measure, but also of that country’s overweighting in banks’ portfolios. We would therefore introduce simultaneity into our estimation.

Eurozone membership (EURO) might also affect whether a country is overweighted or underweighted against the benchmark. Hence, we include a dummy variable which takes on a value of one if a country is a member of the eurozone, and zero otherwise. Several empirical studies provide evidence that the adoption of the euro may enhance financial integration.²⁸ Kalemli-Ozcan et al. (2010) mention different potential channels explaining those results. They identify the elimination of exchange rate risk and legislative-regulatory reforms along with the introduction of the euro as important drivers. In any case, eurozone membership should be positively related to the degree of overweighting.

(2) Institutional and regulatory environment. Over- or underweighting is also likely to depend on the institutional and regulatory environment in the destination country which is measured by the following variables:²⁹

The *overall institutional environment (INSTITUTION)* variable captures the quality of governance in a country. It is the simple average of six governance indicators compiled by the World Bank (see Table A.3 for a list). Higher values indicate a more developed institutional environment. We expect INSTITUTION to be positively associated with the overweighting measure.

We also include the *Private Monitoring Index (PMI)* to examine whether scrutiny from private market forces helps explain deviations from the benchmark. The index mainly reflects the amount of financial information banks have to disclose to the public. Higher values are associated with stricter requirements. On the one hand, we would expect banks to steer clear of markets with higher reporting requirements. This effect would unfold solely through local operations as banks' cross-border operations would remain unaffected. On the other hand, better private monitoring of banks is positively associated with a higher level of development in the banking sector (Barth et al. 2006, 2008). Furthermore, countries which require banks to provide the public with a significant amount of information might apply similar reporting standards to non-banks as well. In that case, higher index values would indicate increased transparency on the part of borrowers. This would enhance the ability of banks to screen or monitor potential borrowers and thereby increase the attractiveness of the destination country. Hence, the relationship between PMI and overweighting may also be positive.

The *Entry into Banking Requirements Index (ENTRY)* measures the restrictiveness of requirements that banks have to meet in order to obtain a banking licence. It considers

²⁸Lane (2006) and Lane and Milesi-Ferretti (2005) provide evidence of a eurozone bias in the international holdings by euro-area countries in bonds and equity, respectively. Similarly, Blank and Buch (2007) detect a positive and significant impact of the euro on the bilateral foreign assets held by banks.

²⁹These indices are constructed from the World Bank's Bank Regulation and Supervision Database according to the methodology in Barth et al. (2001). We use values from the second and third waves to capture the situation in the years 2003–2004 and 2005–2007, respectively (see Barth et al. 2008).

whether it is necessary to submit, for instance, organisational charts, financial projections and information, the prior banking experience of managers and directors, or the sources of funds for capitalisation. The effect of this restrictiveness on the degree of overweighting is not clear a priori. On the one hand, greater requirements make it harder for banks to obtain a licence. This hampers banks' ability to serve their potential clients through local operations. To the extent that those cannot be fully substituted by lending from banks' headquarters, this would imply a tendency for countries with stricter requirements to be underweighted, or less overweighted. On the other hand, (foreign) banks may be attracted by more heavily regulated markets if they hope to reap higher profits due to lower competition, mainly from domestic banks (see, eg, Focarelli and Pozzolo 2005). Such opportunities for excess profits are not reflected in the benchmark. Banks might therefore also overweight countries with stricter requirements.

The *Capital Regulatory Index (CAPITAL)* captures regulations pertaining to bank capitalisation. It considers factors such as minimum capital requirements, the stringency with which losses have to be deducted from reported capital, or the assets allowable as capital. The potential impact of capital regulation on overweighting is through banks' local operations or, more precisely, subsidiaries. In contrast to branches, subsidiaries are incorporated under local law and are legally separate entities from their parent banks. The latter generally do not assume responsibility for the liabilities of their subsidiaries. Therefore, subsidiaries need to be capitalised independently and have to comply with the capital regulations in the host country.³⁰ While more demanding regulations might reduce the attractiveness of a lending destination, they could also give (large) foreign banks a competitive edge over (small) domestic banks because they may be better able to raise capital than domestic institutions.

Restrictions on bank activities (RESTRICT) might also affect the propensity of banks to overweight a destination country in their portfolios. For example, banks may want to engage in business other than traditional lending. Prohibitions or limitations on such business might bias banks against a particular market more generally. This, in turn, could have a negative spillover effect on the amount of standard bank loans granted. We investigate this by using an index measuring the restrictions on banks with regard to securities, insurance, or real estate business as well as the ownership of non-financial firms. Since higher values imply

³⁰However, Cerutti et al. (2007) point out that the distinction between branches and subsidiaries has become rather blurred in practice. Parent banks have increasingly used "ring-fencing" provisions to limit the responsibility for their branches, too. Host countries are likely to differ in the degree to which they allow banks to negotiate such provisions. While we do not possess data on that, countries with more stringent capital regulations might also be less inclined to relieve parent banks from their responsibility to support their branches. Then, the estimated effect of capital regulations would also work through the channel of branches.

greater restrictiveness, we would expect a negative relationship between RESTRICT and the degree of overweighting.

Finally, we account for the presence of *financial centres (CENTRE)*.³¹ Controlling for financial centres is necessary because our lending aggregate also contains lending to insurance companies and other financial institutions, which are, technically, non-banks. Since internationally oriented banks are highly active in the money markets, the overweighting we observe for countries with financial centres is partly the consequence of lending to non-bank financial counterparties located there. However, overweighting a financial centre for that reason cannot be considered a strategic decision to seek exposure to a specific country risk.

For variable definitions and data sources see Table A.3.

5 Results

Our regression analysis proceeds as follows. As a baseline, we estimate different models including the frictions related to economic integration and the institutional and regulatory environment. We then augment those by additional country controls for the level of competition and development of banking markets as well as the degree of risk-taking in the banking sector. Finally, we present a number of further robustness checks of our results. Tables A.4 and A.5 show descriptive statistics and correlations, respectively, of all variables used in the regressions.

5.1 Baseline results

We first estimate a model with the frictions related to economic integration (Model 1). To control for the institutional environment in the host country, we add our overall governance indicator (Model 2). We then account for banking regulations instead of the overall institutional framework (Model 3), before including all institutional and regulatory variables jointly (Model 4). The results are presented in Table 5.

In line with the follow-your-customer hypothesis, we find a large and significantly positive relationship between outward foreign direct investment in the real sector (FDI) and the degree of overweighting in all regressions. This is consistent with the view that existing economic integration in the real sector promotes financial integration.

The euro area dummy (EURO), in contrast, is positive but insignificant indicating that the impact of the euro on credit market integration might be limited. This contrasts with

³¹In line with the literature, the countries classified as financial centres in our dataset are Ireland, Switzerland, and the United Kingdom.

Table 5: **Baseline results**

	(1)	(2)	(3)	(4)
DIST	-0.0022 (0.0029)	-0.0012 (0.0032)	-0.0031 (0.0029)	-0.0026 (0.0032)
BORDER	-0.0087 (0.0087)	-0.0094 (0.0086)	-0.0109 (0.0090)	-0.0113 (0.0090)
FDI	0.5453*** (0.1211)	0.5351*** (0.1208)	0.5260*** (0.1244)	0.5202*** (0.1243)
EURO	0.0046 (0.0071)	0.0041 (0.0070)	0.0100 (0.0074)	0.0098 (0.0073)
CENTRE	0.0547*** (0.0116)	0.0526*** (0.0117)	0.0545*** (0.0120)	0.0536*** (0.0120)
INSTITUTION		0.0034* (0.0018)		0.0016 (0.0021)
PMI			0.0053** (0.0022)	0.0053** (0.0023)
ENTRY			0.0059*** (0.0021)	0.0059*** (0.0021)
CAPITAL			0.0071*** (0.0013)	0.0071*** (0.0013)
RESTRICT			0.0011 (0.0013)	0.0011 (0.0013)
Observations	3,045	3,045	2,958	2,958
R^2	0.33	0.33	0.32	0.32

Notes — Robust standard errors (clustered at the bank-country level) in parentheses. Unit of dependent variable is 100 percentage points. Marginal effects on INSTITUTION, PMI, ENTRY, CAPITAL, and RESTRICT are reported for a change by one respective sample standard deviation. ***, **, and * denote significance at the 1, 5, and 10% levels, respectively. All estimations are based on the sample of 18 internationally oriented German banks and the representative set of 35 countries. For variable definitions and data sources, see Table A.3. Descriptive statistics and correlations are provided in Tables A.4 and A.5, respectively.

Lane (2006), who analyses the bilateral composition of international bond portfolios and shows that euro area member countries disproportionately invest in one another relative to other country pairs. He interprets this as evidence for a euro area bias.³² Jappelli and Pagano (2008) find a positive effect of the euro on bond and stock markets as well. However, a considerable body of empirical literature also suggests that credit markets have integrated much more slowly than bond or stock markets, and that they are still separated along national lines (see, eg, Adam et al. 2002, Baele et al. 2004).³³ Furthermore, our finding could also be due to the fact that we only consider large, internationally oriented banks that are better at managing exchange rate risk and for which, as a consequence, eurozone membership may matter less.³⁴

Distance from and a common border with Germany do not seem to have an impact on the international credit allocation of German banks either. Since diversification opportunities related to distance are incorporated in the benchmark portfolios, both variables capture informational asymmetries. If informational frictions increase monotonically with distance, we would expect more distant countries to be less overweighted, or more underweighted, relative to the benchmark. Our results suggest this is not the case as the coefficients on both DIST and BORDER turn out to be insignificant.³⁵ This is in line with Buch et al. (2010) who do not detect a significant relationship between distance and the probability of a country's being overweighted either.

While most frictions related to economic integration do not matter, frictions related to the institutional environment in general, and banking regulations in particular, do. The positive and significant coefficient for ENTRY, for instance, suggests that banks overweight countries with stricter entry requirements. Focarelli and Pozzolo (2005) argue that banks may be attracted by more heavily regulated markets if they hope to reap higher profits due to a lower level of competition. This corresponds to findings of Barth et al. (2004) and Demirgüç-Kunt et al. (2004).³⁶ They show that financial systems with greater entry restrictions record higher net interest margins and overhead expenditures due to a lower level competition

³²Further evidence on bond and equity portfolio composition is provided by De Santis and Gérard (2006). Kalemli-Ozcan et al. (2010) more closely investigate the underlying channels of the euro's effects on financial integration. They find that the euro's impact on financial integration is primarily driven by the elimination of currency risk. Legislative-regulatory convergence has also contributed to the spur of cross-border financial transactions, while trade in goods does not play a key role in explaining the euro's positive effect on financial integration.

³³Adam et al. (2002) and Baele et al. (2004) show that there are persistent interest rate differentials in the medium and long term in the corporate loan and the consumer credit markets. More recent evidence is provided by the European Central Bank (2011).

³⁴More generally, German banks' foreign exchange exposure is fairly limited, indicating that they hedge themselves against those risks (Deutsche Bundesbank 2011).

³⁵To check whether these results are robust to collinearity between DIST and BORDER, we re-run the regressions dropping each variable in turn. The coefficients remain insignificant throughout.

³⁶For further evidence, see Claessens and Laeven (2004).

than other countries. This is consistent with our results. Once we include the average net interest margin and stock market capitalisation in the host country as additional controls, ENTRY loses significance (see Table 6). A lower level of banking sector competition and efficiency may allow foreign banks to generate excess profits due to superior management skills and technologies required to run international operations. Such profit opportunities are not reflected in our benchmark.

Opportunities for excess profits could also explain the results for RESTRICT and CAPITAL. The positive coefficient for RESTRICT indicates that banks overweight countries with stricter activity restrictions. This may again be the consequence of reduced competition and efficiency in a destination country’s banking sector as shown by Barth et al. (2004) and Demirgüç-Kunt et al. (2004). The evidence is weak, however, as RESTRICT turns out to be insignificant in many regressions. CAPITAL, in contrast, is significant in all regressions. German banks appear to overweight countries with stricter capital requirements, which might reduce the competitive strength of low-quality banks vis-à-vis high quality banks. This may increase lending rates and encourage the entry of foreign banks (Boot and Marinc 2006). Furthermore, the subsidiaries of (large) foreign banks might have easier access to capital through their parents and, hence, be better able to meet higher capital requirements than (small) domestic banks. This may allow them to increase their lending and market share relative to locally incorporated banks.

INSTITUTION, the aggregate governance indicator, is insignificant in most regressions. This contrasts with the Private Monitoring Index (PMI). Its positive and significant coefficient suggests that German banks overweight countries with higher reporting requirements for banks. Barth et al. (2006, 2008) offer an explanation for this. They show that better private monitoring of banks is positively associated with a higher level of development in the banking sector. This is consistent with our results. Once we control for the level of banking sector size and development, PMI becomes insignificant (see Table 6). This indicates that the positive effect of PMI on overweighting is primarily through its impact on the size and development of the banking sector in the host country. CENTRE is positive and significant as well underlining the need to control for the presence of financial centres.

5.2 Additional country controls

As a first robustness check and to learn more about the channels proposed above, we augment the regression containing all frictions (Model 4) by additional country controls.³⁷ The results are presented in Table 6. The ratios of private credit to GDP (PCRDGDP) and stock market capitalisation to GDP (STMKTCAP) control for the size and development of banking and

³⁷All additional controls are from the World Bank’s Financial Structure Database (Beck et al. 2010).

financial markets (Models 5 and 7). In addition, we include the average net interest margin (NIM) and the log average Z-score of the banking sector (ZSCORE) as proxies for the level of competition and bank risk-taking in the host country, respectively (Models 6 and 7).

The ratio of private credit to GDP (PCRDGDP) has been used as a proxy for the size and development of banking markets (see, eg, Driessen and Laeven 2007, Beck et al. 2010). Countries with more developed banking systems should have deeper markets with better diversification opportunities. Moreover, banking sector development is likely to depend on the institutional and regulatory environment in the host country, both on the characteristics we are able to control for and those for which we are not. Hence, PCRDGDP may also be regarded as a robustness check for the impact of the frictions we investigate and as capturing “residual” frictions. Since frictions should decrease with banking sector development, we would expect PCRDGDP to be positively related to the degree of overweighting. This is what we find. In line with our hypothesis, PCRDGDP turns out to be significantly positive in all regressions.

We also include the ratio of stock market capitalisation over GDP, which is often regarded as an indicator for the relative size and level of development of financial markets (Driessen and Laeven 2007, Beck et al. 2010). In contrast to PCRDGDP, STMKTCAP is significantly negative, indicating that German banks tend to underweight countries with larger and more developed stock markets, possibly due to a lower demand for bank finance and greater competition with other non-bank intermediaries and financial markets. This is supported by the fact that countries with higher net interest margins are overweighted by German banks as suggested by the positive and significant coefficient for NIM. The net interest margin is often used to measure the operational efficiency and competitive nature of a banking sector, where higher margins are generally associated with less competition (Demirgüç-Kunt et al. 2004, Beck et al. 2010).³⁸ Interestingly, ENTRY becomes less significant once we include NIM in the regression. This supports our earlier interpretation that ENTRY may proxy for the level of competition in the banking sector.

Finally, we include the Z-score of each country’s banking system. The Z-score measures bank stability, with higher scores indicating greater stability (see, eg, Boyd and Nicoló 2005, Laeven and Levine 2009).³⁹ If banks preferred countries with a more stable banking system,

³⁸The net interest margin (NIM) equals interest income minus interest expense divided by interest-bearing assets. As a further robustness test, we replace NIM by the ratio of overhead costs divided by total assets (OVERHEAD). Demirgüç-Kunt et al. (2004) argue that OVERHEAD is an alternative indicator for the level of efficiency and market competition, since higher overhead costs reflect greater cost inefficiencies and market power. The coefficient for OVERHEAD turns out to be significant and positive in line with the hypothesis that German banks tend to overweight countries with a less efficient and competitive banking sector. The results are not reported for the sake of brevity.

³⁹It is defined as the ratio of the return on assets plus the capital ratio divided by the standard deviation of the return on assets. If profits are normally distributed, the Z-score is the inverse of the probability of

Table 6: Results including additional country controls

	(4)	(5)	(6)	(7)
DIST	-0.0026 (0.0032)	-0.0019 (0.0033)	-0.0027 (0.0032)	-0.0022 (0.0033)
BORDER	-0.0113 (0.0090)	-0.0118 (0.0091)	-0.0150* (0.0090)	-0.0140 (0.0090)
FDI	0.5202*** (0.1243)	0.5876*** (0.1261)	0.5202*** (0.1277)	0.5761*** (0.1304)
EURO	0.0098 (0.0073)	-0.0011 (0.0073)	0.0151** (0.0074)	0.0058 (0.0074)
CENTRE	0.0536*** (0.0120)	0.0431*** (0.0118)	0.0568*** (0.0121)	0.0474*** (0.0121)
INSTITUTION	0.0016 (0.0021)	-0.0050* (0.0029)	0.0055** (0.0022)	0.0000 (0.0029)
PMI	0.0053** (0.0023)	0.0033 (0.0021)	0.0044* (0.0023)	0.0032 (0.0021)
ENTRY	0.0059*** (0.0021)	0.0041** (0.0019)	0.0041** (0.0018)	0.0029* (0.0017)
CAPITAL	0.0071*** (0.0013)	0.0086*** (0.0013)	0.0071*** (0.0014)	0.0082*** (0.0014)
RESTRICT	0.0011 (0.0013)	0.0026** (0.0012)	0.0018 (0.0013)	0.0028** (0.0013)
PCRDGDP		0.0384*** (0.0086)		0.0339*** (0.0090)
STMKTCAP		-0.0144*** (0.0034)		-0.0127*** (0.0036)
NIM			0.1764*** (0.0567)	0.2784*** (0.0650)
ZSCORE			-0.0107*** (0.0022)	-0.0086*** (0.0023)
Observations	2,958	2,941	2,727	2,710
R^2	0.32	0.31	0.35	0.34

Notes — Robust standard errors (clustered at the bank-country level) in parentheses. Unit of dependent variable is 100 percentage points. Marginal effects on INSTITUTION, PMI, ENTRY, CAPITAL, and RESTRICT are reported for a change by one respective sample standard deviation. ***, **, and * denote significance at the 1, 5, and 10% levels, respectively. All estimations are based on the sample of 18 internationally oriented German banks and the representative set of 35 countries. For variable definitions and data sources, see Table A.3. Descriptive statistics and correlations are provided in Tables A.4 and A.5, respectively.

we would expect them to overweight countries with a higher Z-score. This is not the case. In contrast, our results suggest that German banks tend to overweight countries with a less stable banking system in their portfolio as indicated by the significant and negative coefficient for ZSCORE. Since, on average, net interest margins declined over the sample period, the banks in our sample might have increased their lending to less stable countries either deliberately to raise their profits or ignorantly due to a failure of risk management systems that reduced risk perception.

The results for ZSCORE also support the mechanisms of our benchmark portfolio model. If the risks banks incurred in the run-up to the crisis are not fully captured by this model, we would expect countries to receive a lower benchmark weight due to smaller risk-adjusted returns once we control for these risks. In particular, countries exposed to a high level of banking sector risk should receive lower benchmark weights. Hence, these countries should be even more overweighted in our model. The negative and significant coefficient for ZSCORE indicates that this is the case. The results for ZSCORE, therefore, do not only suggest that banks increasingly lent to countries with less stable banking sectors, but also supports the mechanisms of our portfolio model. They also indicate that the results for the other control variables are robust even if we control for the level of banking sector risk.

Overall, our results suggest that German banks tend to overweight countries with larger and more developed banking markets that offer greater opportunities to generate excess profits due to a lower level of competition and efficiency. We also find evidence that the banks in our sample lent to more risky countries, possibly to raise their profits or due to a lower risk perception. More importantly, however, the results for the remaining variables are largely unchanged. Only ENTRY and PMI become insignificant in line with our hypothesis that they may proxy for the level of competition and development in the banking sector.

5.3 Robustness checks

As a last step, we perform several tests to check the robustness of our findings. The results are reported in Table 7. First, we test whether our results are robust with respect to the sample period from 2003 to 2007. Even though the most severe period of the financial crisis started in September 2008 with the collapse of Lehman Brothers, the first stage of the crisis already began in 2007. For example, starting in August 2007 banking flows slowed down primarily among developed countries due to increased uncertainty among banks (Milesi-Ferretti and Tille 2011). A priori, we would think that this should not affect our results because the first

insolvency. More specifically, it indicates the number of standard deviations below the expected value of a bank's return on assets at which equity is depleted and the bank is insolvent (Roy 1952, Hannan and Hanweck 1988, Boyd et al. 1993).

stage of the crisis was mainly limited to the interbank market, while we focus on non-bank credit. However, to check the robustness of our results, we restrict our sample period to the years from 2003 to 2006 and obtain similar results (Models 8 and 9).

Second, we test whether our results are robust to the country sample. We are particularly concerned that our results may be driven by the inclusion of the US and UK since they dominate in German banks' international credit portfolios (see Table 2). For this reason, we exclude both countries from the sample and re-estimate our model. The results are presented in Models 10 and 11 of Table 7. They confirm our findings for ENTRY and PMI. CAPITAL also remains significant and positive. In addition, EURO becomes positive and significant, possibly because the non-eurozone countries US and UK are both heavily overweighted against the benchmark. FDI, in contrast, is insignificant once we exclude the UK and US. However, if we exclude both 2007 as well as the UK and the US, FDI is significantly positive again. Furthermore, in all other robustness checks FDI remains significant and positive. Hence, the overall evidence is in support of the follow-your-customer hypothesis for German banks. The results of the other control variables are also unchanged.

In addition, we exploit the bank-level dimension of our dataset by including interaction terms between the country-specific frictions and bank size, proxied by total assets, to identify whether banks react differently to country-specific factors. The size of a bank can be regarded as a measure of its international orientation or its experience in different lines of business with a variety of customers. Larger banks may also have stronger incentives to diversify internationally (Focarelli and Pozzolo 2005). Deviations from the benchmark induced by a country-specific factor might differ across banks, for instance because it may be easier for larger banks to overcome informational asymmetries than smaller banks. Since we already focus on a group of large and internationally oriented German banks, however, we would not expect major differences in reactions for our sample. Indeed, we find that the interaction terms turn out to be insignificant, whereas the level terms remain very similar in both magnitude and significance. The country-specific frictions we identify as being important determinants of international credit portfolios seem to affect all German banks in largely equal measure. This supports our choice of bank sample.

We also test whether our results change if we re-estimate all models for those banks that are considered systemically important by the Deutsche Bundesbank. Furthermore, we check whether the results are robust to the exclusion of all countries that host an international financial centre. Even though this considerably reduces the total number of observations, the results remain unchanged. Finally, we estimate our model with the fixed instead of the random effects estimator to test the robustness of the time-varying variables and confirm our results. The results of these robustness tests are not reported for the sake of brevity.

Table 7: Robustness checks

	(4)	(7)	(8)	(9)	(10)	(11)
	Full sample		Ex 2007		Ex US & UK	
DIST	-0.0026 (0.0032)	-0.0022 (0.0033)	-0.0049 (0.0033)	-0.0044 (0.0033)	-0.0017 (0.0027)	-0.0023 (0.0028)
BORDER	-0.0113 (0.0090)	-0.0140 (0.0090)	-0.0104 (0.0091)	-0.0136 (0.0090)	0.0110 (0.0088)	0.0036 (0.0090)
FDI	0.5202*** (0.1243)	0.5761*** (0.1304)	0.6316*** (0.1143)	0.6629*** (0.1175)	-0.0561 (0.1476)	0.1197 (0.1622)
EURO	0.0098 (0.0073)	0.0058 (0.0074)	0.0034 (0.0071)	0.0010 (0.0073)	0.0250*** (0.0074)	0.0153** (0.0073)
CENTRE	0.0536*** (0.0120)	0.0474*** (0.0121)	0.0500*** (0.0116)	0.0448*** (0.0122)	0.0315*** (0.0094)	0.0314*** (0.0101)
INSTITUTION	0.0016 (0.0021)	0.0000 (0.0029)	-0.0019 (0.0020)	-0.0031 (0.0030)	0.0004 (0.0018)	-0.0027 (0.0025)
PMI	0.0053** (0.0023)	0.0032 (0.0021)	0.0058*** (0.0022)	0.0030 (0.0022)	0.0081*** (0.0020)	0.0060*** (0.0020)
ENTRY	0.0059*** (0.0021)	0.0029* (0.0017)	0.0023 (0.0015)	-0.0001 (0.0013)	0.0059*** (0.0021)	0.0027* (0.0016)
CAPITAL	0.0071*** (0.0013)	0.0082*** (0.0014)	0.0075*** (0.0012)	0.0076*** (0.0013)	0.0047*** (0.0012)	0.0061*** (0.0013)
RESTRICT	0.0011 (0.0013)	0.0028** (0.0013)	0.0035** (0.0014)	0.0036** (0.0015)	0.0001 (0.0011)	0.0015 (0.0012)
PCRDGDP		0.0339*** (0.0090)		0.0267*** (0.0095)		0.0383*** (0.0076)
STMKTCAP		-0.0127*** (0.0036)		-0.0077* (0.0040)		-0.0136*** (0.0034)
NIM		0.2784*** (0.0650)		0.2203*** (0.0678)		0.3050*** (0.0543)
ZSCORE		-0.0086*** (0.0023)		-0.0086*** (0.0021)		-0.0087*** (0.0018)
Observations	2,958	2,710	2,380	2,149	2,784	2,536
R^2	0.32	0.34	0.34	0.36	0.11	0.14

Notes — Robust standard errors (clustered at the bank-country level) in parentheses. Unit of dependent variable is 100 percentage points. Marginal effects on INSTITUTION, PMI, ENTRY, CAPITAL, and RESTRICT are reported for a change by one respective sample standard deviation. ***, **, and * denote significance at the 1, 5, and 10% levels, respectively. All estimations are based on the sample of 18 internationally oriented German banks and the representative set of 35 countries. For variable definitions and data sources, see Table A.3. Descriptive statistics and correlations are provided in Tables A.4 and A.5, respectively.

6 Conclusion

German banks have massively increased their foreign exposure over the past two decades by both an increase in their cross-border activities and the establishment of branches and subsidiaries abroad. Therefore, major German banks are now heavily dependent on the development of their foreign assets. At the same time, business cycles across the world continue to exhibit notable asynchronicity, giving rise to international diversification opportunities.

In this paper, we investigate which country-specific determinants make German banks overweight some countries and underweight others in their international credit portfolios. More specifically, we ask which geographical, institutional, and regulatory frictions cause German banks to leave opportunities for diversification unexploited. To this end, we construct a bank-country panel for the period between 2003 and 2007 on the basis of the *External Position Reports of German Banks*, a unique dataset provided by the Deutsche Bundesbank. For large, internationally oriented German banks and a representative set of 35 countries from all regions of the world, we compare banks' actual international credit portfolios to mean-variance based benchmark portfolios that we would expect to observe in the absence of country-specific frictions.

The results show that banking regulations are important determinants of the credit allocation of German banks. We present robust evidence that countries with stricter capital adequacy and entry requirements tend to be overweighted, primarily due to excess profits resulting from a lower level of banking market competition. Moreover, German banks are found to overweight countries with larger and more developed banking markets. In contrast, geographical factors do not appear to matter. There is no evidence that informational asymmetries are obstacles to international lending which increase monotonically with distance. We also find support that German banks, in order to maintain existing lending relationships at home, follow their domestic customers abroad when those set up operations in a foreign country. Finally, the level of risk-taking in the host-country banking sector seems to matter as well since we observe that the banks in our sample increased their lending to countries with riskier banking sectors.

German banks' credit portfolios do not seem to be determined by country factors which cannot change over time. Instead, there is reason to believe that, in the long run, changes in and convergence of banking regulations as well as financial deepening of banking sectors around the world will result in banks holding more diversified international credit portfolios. Deviations from our benchmark portfolios should then gradually disappear and leave banks with portfolios that make them more stable and resilient to country-specific shocks.

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Appendix

Table A.1: **List of countries**

Name	Development	Region
Argentina	Emerging and developing	South America
Australia	Advanced	East Asia and Oceania
Austria	Advanced	Western Europe
Belgium	Advanced	Western Europe
Brazil	Emerging and developing	South America
Canada	Advanced	North America
Chile	Emerging and developing	South America
China	Emerging and developing	East Asia and Oceania
Colombia	Emerging and developing	South America
Czech Republic	Advanced	Eastern Europe
Denmark	Advanced	Western Europe
France	Advanced	Western Europe
Greece	Advanced	Western Europe
Hungary	Emerging and developing	Eastern Europe
India	Emerging and developing	South and South East Asia
Indonesia	Emerging and developing	South and South East Asia
Ireland	Advanced	Western Europe
Israel	Advanced	Middle East and Africa
Italy	Advanced	Western Europe
Japan	Advanced	East Asia and Oceania
Mexico	Emerging and developing	North America
Netherlands	Advanced	Western Europe
Norway	Advanced	Western Europe
Philippines	Emerging and developing	South and South East Asia
Poland	Emerging and developing	Eastern Europe
Russia	Emerging and developing	Eastern Europe
South Africa	Emerging and developing	Middle East and Africa
South Korea	Advanced	East Asia and Oceania
Spain	Advanced	Western Europe
Sweden	Advanced	Western Europe
Switzerland	Advanced	Western Europe
Thailand	Emerging and developing	South and South East Asia
Turkey	Emerging and developing	Middle East and Africa
United Kingdom	Advanced	Western Europe
United States	Advanced	North America

Development is from IMF World Economic Outlook Database; region is self-defined.

Table A.2: **Return characteristics, by development**

	Monthly return		Correlations	
	Mean	S.d.	AE	EDE
Advanced economies (AE)	0.8%	5.3%	0.55	0.39
Emerging and developing economies (EDE)	1.7%	9.5%		0.39

Notes — All values are based on calculations at year-end 2007 using nine years of monthly euro/deutschmark returns. Reported are intra-region medians over constituent countries (see Table A.1). For correlations, values are medians over pairwise correlations between individual countries of the respective groups.

Table A.3: Variable definitions and data sources

Variable name	Definition	Source
<i>Dependent variable</i>		
Overweighting	Difference between actual country weights in a bank's portfolio and weights in the benchmark portfolio (see 3.1).	Deutsche Bundesbank External Position Reports of German Banks, MSCI Barra, OECD; authors' own calculations/simulations.
<i>Independent variables</i>		
Common border (BORD)	Dummy variable taking on a value of 1 if the destination country shares a border with Germany.	CEPII Gravity Dataset (Mayer and Zignano 2011)
Distance (DIST)	Logarithm of the great-circle distance between the most important cities or agglomerations of Germany and the destination country.	CEPII Gravity Dataset
Outward FDI in the real sector (FDI)	Share of the destination country (relative to the sample) in real-sector outward FDI stocks of German real-sector companies.	Microdatabase Direct Investment, Deutsche Bundesbank (Lipponer 2009)
Eurozone membership (EURO)	Dummy variable taking on a value of 1 if the destination country is a member of the eurozone.	Authors' own definition
Overall institutional environment (INSTITUTION)	Index measuring the average score on indicators of voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Higher values indicate a more developed institutional environment.	Index of Economic Freedom (Kaufmann et al. 2009)
Private monitoring index (PMI)	Private Monitoring Index ranging from 0 to 7, measuring the degree to which banks are subject to market or private supervision. Higher values indicate more private oversight.	Bank Regulation and Supervision Database (Barth et al. 2001)
Entry into banking requirements (ENTRY)	Entry into Banking Requirements Index ranging from 0 to 8, measuring the required legal submissions for obtaining a banking licence. Higher values indicate more restrictiveness.	Bank Regulation and Supervision Database
Capital regulatory index (CAPITAL)	Capital Regulatory Index ranging from 0 to 9, measuring the regulatory requirements regarding the amount of capital and the sources of funds that qualify as regulatory capital. Higher values indicate greater stringency.	Bank Regulation and Supervision Database
Restrictions on bank activities (RESTRICT)	Index ranging from 1 to 4, measuring the restrictions on banks with regard to securities, insurance, or real estate business and ownership of non-financial firms. Higher values indicate more restrictiveness.	Bank Regulation and Supervision Database
Financial centre (CENTRE)	Dummy variable taking on a value of 1 if the destination country hosts a major international financial centre (UK, Ireland, Switzerland).	Authors' own definition

Table A.4: **Descriptive statistics**

	Obs	Mean	Median	Std dev
DIST	3,045	0.9234	0.7252	1.3238
BORDER	3,045	0.2286	0	0.4200
FDI	3,045	0.0286	0.0122	0.0451
EURO	3,045	0.2286	0	0.4200
CENTRE	3,045	0.0857	0	0.2800
INSTITUTION	3,045	0.7374	0.8058	0.8230
PMI	2,958	4.2390	4	0.9665
ENTRY	2,958	7.2390	8	1.5102
CAPITAL	2,958	5.5243	6	1.5271
RESTRICT	2,958	2.3571	2.25	0.6524
PCRDGDP	2,941	0.7733	0.7646	0.4723
STMKTCAP	2,941	0.7619	0.6247	0.5320
NIM	2,727	0.3744	0.0282	0.0240
ZSCORE	2,727	2.0563	2.1032	0.4323

Notes — This table presents descriptive statistics (means, medians, and standard deviations) of the variables used in the investigation. Definitions and data sources for the country-level frictions are provided in Table A.3. PCRDGDP, STMKTCAP, NIM, and ZSCORE are from the World Bank’s Financial Structure Database (Beck et al. 2010).

Table A.5: Variable correlations

	Overweighting	DIST	BORDER	FDI	EURO	CENTRE	INSTITUTION	PMI	ENTRY	CAPITAL	RESTRICT	PCRDGDP	STMKTTCAP	NIM	ZSCORE
Overweighting	1.000														
DIST	-0.1765	1.000													
BORDER	0.0342	-0.7275	1.000												
FDI	0.5487	-0.2701	0.1573	1.000											
EURO	0.091	-0.5592	0.3767	0.1356	1.000										
CENTRE	0.2937	-0.3262	0.0727	0.1699	0.0400	1.000									
INSTITUTION	0.2681	-0.5611	0.4276	0.3420	0.3210	0.3302	1.000								
PMI	0.1731	0.1317	-0.2494	0.0829	-0.0752	0.1813	0.1247	1.000							
ENTRY	0.0451	-0.0936	0.1671	0.1950	-0.0584	-0.0898	-0.0166	-0.1046	1.000						
CAPITAL	0.0910	0.1407	-0.0546	0.0999	-0.2329	0.0325	-0.1245	0.1592	0.1058	1.000					
RESTRICT	-0.2328	0.5184	-0.3140	-0.2299	-0.3816	-0.3813	-0.4115	-0.1754	-0.1578	-0.1214	1.000				
PCRDGDP	0.2430	-0.4943	0.2950	0.1730	0.3664	0.5018	0.7857	0.2617	-0.0122	-0.0294	-0.4287	1.000			
STMKTTCAP	0.2490	-0.0523	0.0379	0.2718	-0.1077	0.4348	0.4366	0.3596	-0.0446	0.1905	-0.2177	0.5150	1.000		
NIM	-0.1087	0.4623	-0.3384	-0.1384	-0.4021	-0.2560	-0.5777	-0.1673	0.1188	0.1589	0.1352	-0.6151	-0.2131	1.000	
ZSCORE	-0.1992	-0.0099	-0.0850	-0.2944	0.0741	0.1378	0.1281	-0.1218	-0.3353	-0.0976	0.0272	0.1324	0.0275	-0.2199	1.000

Notes — This table shows the correlations among all variables used in the investigation. Definitions and data sources for the dependent variable and country-level frictions are provided in Table A.3. PCRDGDP, STMKTTCAP, NIM, and ZSCORE are from the World Bank's Financial Structure Database (Beck et al. 2010).

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