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Changing Forces of Gravity: How the Crisis Affected International Banking

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Changing Forces of Gravity:

How the Crisis Affected International Banking [1]

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Abstract

The global financial crisis has brought to an end a rather unprecedented period of banks' international expansion. We analyze the effects of the crisis on international banking. Using a detailed dataset on the international assets of all German banks with foreign affiliates for the years 2002-2011, we study bank internationalization before and during the crisis. Our data allow analyzing not only the international assets of the banks' headquarters but also of their foreign affiliates. We show that banks have lowered their international assets, both along the extensive and the intensive margin. This withdrawal from foreign markets is the result of changing market conditions, of policy interventions, and of a weakly increasing sensitivity of banks to financial frictions.

Keywords: International banking, gravity model, financial frictions

JEL-Classification: G01, F34, G21

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1 Motivation

The global financial crisis has brought a rather unprecedented period of expansion of banks' international financial assets and liabilities to an end. In response to the crisis, banks have lowered their international assets and liabilities in the process of deleveraging and shrinking their balance sheets. While total international assets of German banks grew, on average, by 8% per year between 2002 and 2007, international assets dropped by almost 20% in 2008 alone. These adjustments have taken place due to changing risk perceptions, changing regulations, and changes in financial frictions. The key question is whether this withdrawal of banks from foreign markets will be short-lived or whether it marks the beginning of a sustained period of financial disintegration, as was observed after the Great Depression (Rajan and Zingales 2003).

In this paper, we study bank internationalization before and during the crisis from a bank-level perspective. Our data give detailed information on the internationalization of German banks. The "External Position Reports" provided by the *Deutsche Bundesbank* contain information on the international assets of German banks and their foreign affiliates (branches and subsidiaries), month-by-month and country-by-country. Our sample starts in December 2002, when minimum reporting thresholds were abolished, and ends in December 2011. We investigate the determinants of the stocks of banks' assets at the end of each year.

Data similar to ours have been used in previous work to analyze the importance of bank productivity for the international activities of banks (Buch et al. 2012, 2011b), the determinants of short-term adjustments of internationally active banks during the crisis (Düwel et al. 2011), the portfolio investment decisions of German banks in emerging markets (Wildmann 2011), the impact of international activities of German banks on performance at home (Buch et al. 2013), or the impact of crisis-related policy measures on international banking (Buch et al. 2011a). Düwel et al. (2011) find that rising risk aversion, measured through the capital-asset ratio of a German parent bank, has a negative impact on cross-border lending activities of the corporate banking group, even more so during the crisis. Düwel (2013) analyzes the adjustment of international banks through the internal capital market.

In contrast to this research, we explicitly distinguish between three modes of international banking activities: *direct* activities by the German bank holding companies in different destination countries and *indirect* activities via branches and subsidiaries located abroad (in what we call host countries) to different destination countries. Hence,

we distinguish the *direct mode* from the *branch mode*, and the *subsidiary mode* (Figure 1). Assets held through either of these modes are labeled "international assets" of banks. Thus, we can exploit a richer geographical structure of the data compared to previous work: Instead of analyzing the activities of domestic banks in certain foreign destination countries only, we also analyze international activities of German banks' foreign affiliates. In fact, a little more than half of our observations are related to such "export-platform" FDI, i.e. to activities of German banks' foreign affiliates outside the market in which these affiliates reside.

We find that the decline in international banking in response to the crisis is most pronounced in terms of the volume of international activities and thus for the intensive margin. We also describe adjustment along the extensive margin, and we find a decline in the number of foreign subsidiaries. However, this decline started well before the crisis and has hardly accelerated since then. In terms of the composition of foreign activities, we observe a shift away from assets held through subsidiaries towards assets held through branches.

Overall, our findings suggest three explanations for the decline in international banking.

First, banks have responded to changing funding conditions. During the crisis, banks had to economize on their use of capital. This could explain why banks have reduced the share of international assets held through the subsidiary mode, which is the most expensive way of entering foreign markets. Also, wholesale and short-term funding have become more costly during the crisis, thus affecting in particular those banks with a market-based funding model. However, the sensitivity of banks' international activities to bank-specific variables measuring the funding structure has not changed much during the crisis.

Second, government support during the crisis has been conditional on the requirement that banks close some of their foreign affiliates (EU 2009, Zimmer and Blaschczok 2012). In our empirical results, we show that banks which have received state support during the crisis from the German federal government or from state governments have indeed reduced their international assets.

Third, the withdrawal from foreign countries could reflect an increasing home bias in banks' activities, as has been documented in other work analyzing the response of banks to the crisis (Giannetti and Laeven 2011, Hildebrand et al. 2012, Rose and Wieladek 2011). Note that the reasons are difficult to disentangle: If withdrawal is due to increased risks and/or lower (relative) returns, it may in fact be a rational response to market conditions rather than an increased *bias* in investment decisions. Generally, we find a significant effect of financial frictions on the international activities of German

banks: Adjacency, common language, common legal origins, and regional trade agreements have a positive impact on international assets; distance has a negative impact. In the international trade literature, the distance coefficient is interpreted as a proxy for transportation costs. In international banking, physical transportation costs are of limited importance. Here, the geographic distance between two countries is a proxy for informational frictions or monitoring costs (Brüggemann et al. 2012, Okawa and van Wincoop 2012). Perhaps contrary to conventional wisdom, the effects of most of these financial frictions have remained rather unchanged during the crisis. If anything, the effects of adjacency and of regional trade agreements being in place have become more important.

Our research complements previous work analyzing the transmission of shocks across borders and the impact of the crisis on banks' investments at home. A first set of papers looks at the impact of government interventions. Rose and Wieladek (2011) use information on local lending by foreign banks residing in the UK to analyze how support measures, such as capital injections targeted at these banks, have affected lending in the UK. After nationalization, foreign banks reduced the share of their loans going to the UK, which can be interpreted as evidence for financial protectionism. Giannetti and Laeven (2011) analyze the geographic structure of syndicated loan issuances and find a "flight home" effect in response to the crisis. The strength of this effect is not affected by government intervention, measured by a dummy variable that equals one if a bank was nationalized or received state support in the form of asset or capital guarantees. Our findings show that state support (capital injections, credit lines, and guarantees) had a negative impact on the international activities of banks since these aids were given only subject to certain conditions.

De Haas and Van Horen (2011) use individual loan data from syndicated loan issuances for the world's largest banks. During the crisis, foreign banks have remained more committed to countries hosting an affiliated subsidiary, that are geographically close, and that have built up relationships with local banks. Our findings confirm the importance of geography for international bank assets, indicating a negative and strongly significant effect of distance on international lending. Furthermore, we also find a positive effect of affiliate lending within host countries.

Finally, our results are in line with previous studies for German banks documenting an impact of the crisis on lending at home and an increasing home bias in banks' security portfolios. Puri et al. (2011) study the impact of the crisis on lending at home. They find that savings banks which are linked to *Landesbanken* affected by the crisis reject substantially more loan applications than non-affected banks. Hildebrand et al. (2012)

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use the Bundesbank's Securities Holdings Statistics to analyze the securities portfolios of banks. During the crisis, banks have increased the share of domestic sovereign bonds in their portfolios.

Our research is motivated by recent theoretical work justifying a gravity equation in banking, which suggests taking into account variables proxying for information asymmetries in gravity equations for international asset holdings as a measure of financial frictions. Work by Brüggemann et al. (2012) and Niepmann (2013) provides a direct motivation for international bank loans, while most other models focus on international equity investments. We also borrow from the empirical analysis presented by Okawa and van Wincoop (2012) in the sense that we use a broad measure of financial frictions and that we test how their importance has changed over time, across countries, and – as a new element – across banks.

In Part 2, we summarize recent theoretical work motivating the use of gravity equations in international banking and finance. In Part 3, we describe our data and our empirical methodology. In Part 4, we present the regression results. Part 5 concludes.

2 Theoretical Background

Empirical gravity models have a long-standing tradition in the international banking literature. The distance between countries, the size of markets, regulatory barriers and variables capturing information frictions explain international asset holdings quite well (Aviat and Coeurdacier 2007, Berger et al. 2004, Buch 2003, Buch and Lipponer 2007, Claessens and van Horen 2012, Focarelli and Pozzolo 2005).[2] However, there has been, until recently, very little theoretical motivation for why international banking should depend on gravity-type variables. Recent theoretical work takes up the issue of motivating the use of gravity models in international banking and finance. These models differ with regard to the specific financial friction they assume and the type of asset they focus on. Yet, the empirical specifications following from this research are similar.

2.1 Gravity Equations for International Bank Assets

Brüggemann et al. (2012) provide a theoretical motivation for an empirical gravity equation of banks' international assets. They develop a search model in which a firm g located in country i seeks a bank loan with specific characteristics in terms of maturity, volume, interest rates, or other contractual features. Search is done across a number of possible countries N, including the home country. The firm chooses a bank k in a

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[2] For an extensive survey of literature on home bias in international asset portfolios, see Coeurdacier and Rey (2011).

particular country *j* if this bank offers the most attractive loan conditions. The lowest cost at which the bank can supply a loan is given by c_{igjk}. This cost depends on observable factors such as geographic distance, which generates monitoring costs (τ_{ij}). Banks also differ along other dimensions, hence total costs are composed of the average interest rate in a particular country r_j, average bank characteristics a_j, and a term capturing any unobservable cost or bank-firm-specific traits (ε_{igjk}): $c_{igjk} = \beta r_j + \gamma \tau_{ij} + \delta a_j + \varepsilon_{igjk}$. Any variation in costs across countries can be summarized as $\overline{c}_{ij}$: $c_{igjk} = \overline{c}_{ij} + \varepsilon_{igjk}$.

A firm then compares offers of banks located in different countries. The probability that a firm chooses a specific bank depends on the average cost structures, on the characteristics of the country pair, and on an unobservable cost component. Brüggemann et al. (2012) use their model to study aggregate credit relationships between banks and firms located in countries *i* and *j* as a function of the average interest rate in the host country, bilateral observable monitoring costs (geographic distance), the number of banks active in the foreign market, and the size of the foreign banking market. They also include time-varying measures of multilateral resistance, i.e. country-year fixed effects for the host and the destination country. The multilateral resistance term refers to the average financial barrier of any country vis-à-vis all other countries (Anderson and van Wincoop 2003, Baldwin and Taglioni 2006) (see Section 3.3).[3]

2.2 Gravity Equations for International Financial Assets

While the above models focus on international banking, in general it is straightforward to derive a gravity equation for international financial asset holdings as well. Martin and Rey (2004) model a portfolio choice for international holdings of equity in an environment with risk-averse agents, an endogenous number of assets, and costs of international transactions. This leads to a theoretical gravity equation in which bilateral asset holdings depend on the distance between two countries and the size of their markets. Aviat and Coeurdacier (2007) use a similar theoretical modeling approach. They focus on the relationship between bilateral trade and financial linkages, arguing

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[3] While Brüggeman et al (2012) focus on the role of information cost as a motivation for the gravity equation in banking, Niepmann (2013) focuses on relative efficiency. In her model, banks intermediate savings between the home and the foreign economy. There are two sources of heterogeneity: Countries differ in their factor endowments, and banks differ in their efficiency of intermediation. Efficiency is reflected in a fee banks collect for their services. Financial intermediation is subject to a moral hazard problem because firms can choose between good and bad projects, this choice being unobservable by the banks. In her model, bilateral bank assets between two countries depend on relative capital endowments and levels of bank efficiency.

that there can be two-way causality. Empirically, they find that accounting for asset trade reduces the impact of distance on trade in goods.

Okawa and van Wincoop (2012) have taken up the role of gravity in international finance. Their portfolio model consists of risky assets, which could capture equity assets or fixed income securities such as corporate bonds. In addition, there is a risk-free bond. Each risky security has a payoff which depends on country-specific as well as global factors. The demand for an asset depends on the expected asset return (relative to the risk-free asset) and the variance of country-specific returns.

The main non-standard element is the assumption of an information asymmetry: domestic agents have better information about the idiosyncratic risk of the domestic securities as compared to foreign investors. As in Brüggemann et al. (2012), there is a bilateral cost term τ_{ij}, but the interpretation is different. In Okawa and van Wincoop (2012), this term affects the variance of a particular asset, i.e. $\tau_{ij}\sigma_i^2$ where $\tau_{ij} > \tau_{ii}$ when $i \neq j$. Okawa and van Wincoop (2012) estimate their model using bilateral data on equity holdings. They include variables capturing information frictions such as geographic distance, bilateral trade links, common language, adjacency, a common legal system, regulatory similarity, or currency unions.[4]

2.3 Implications for Empirical Work

The models reviewed above differ in terms of the assets considered, the type of informational friction, and the optimization approach. However, there are two important parallels.

The first parallel is that bilateral asset holdings depend not only on bilateral information frictions τ_{ij} but also on the *relative* friction τ_{ij}/D_iD_j, where D_i and D_j are the average financial frictions in the host and the destination country. These relative frictions can be captured by a full set of country-year fixed effects. The importance of dummy variables capturing multilateral resistance was first brought up in the international trade literature. In gravity regressions country-year dummies capture omitted variables, which are correlated with trade costs and with the error term (Baldwin and Taglioni 2006). Anderson and van Wincoop (2003) show that time-varying country fixed effects

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[4] Bergin and Pyun (2012) extend a model by Devereux and Sutherland (2011), which allows for an endogenous choice of international assets in an open economy macro model, to an *N*-country setting. Their theoretical setup is different from the papers discussed so far because they do not assume frictions in asset trade between countries. Instead, their multilateral resistance terms capture third-country correlation effects. The authors show that including these terms addresses the "correlation puzzle", i.e. the inability of previous literature to show an impact of return correlations on asset holdings as predicted by standard theory.

account for multilateral resistance. In their model, multilateral resistance captures country-specific price indices: for a given bilateral trade barrier, higher trade barriers between j and all its other trade partners will reduce the relative price of country i's exports to j and thereby cause a rise of i's exports to j. High multilateral resistance of one country thus increases bilateral trade of all other countries. Including multilateral resistance terms addresses the concern that early empirical applications of the gravity equation found implausibly high border effects. In our context, multilateral resistance terms capture portfolio effects and the effects of financial frictions in one host market relative to all other countries.

The second parallel across the theoretical papers is the similarity of control variables which should be included in an empirical gravity equation. Brüggemann et al. (2012) or Niepmann (2013) regress log bank assets between countries i and j on distance, proxies for the size and development of foreign banking systems as well as on a full set of host-country and receiving-country fixed effects. Okawa and van Wincoop (2012) use a larger set of measures for informational frictions as well as time-varying destination- and host-country fixed effects. They also replace the host country-year dummies by explanatory variables at the country level, while including separate country and year fixed effects. We proceed similarly in order to check the robustness of our results.

Our specific empirical model thus looks as follows. We estimate a baseline gravity equation which relates the log of bank k's international assets A in host country i and destination country j to fixed effects as well as to bank- and country-pair specific explanatory variables:

$$\ln\left(A_{kij,t}\right) = -\sum_{m=1}^{M} \phi_m z_{ij,t}^m + X'_{k,t}\,\alpha_{k1} + d_k + d_{i,t} + d_{j,t} + \varepsilon_{ij,t} \qquad (1)$$

where $z_{ij,t}^m$ is a vector of observable bilateral financial frictions between countries i and j including bilateral distance, adjacency, common language, a common legal system, and regional trade agreements being in place. ϕ_m are coefficient estimates on these observables, $X_{k,t}$ are explanatory variables at the bank level, and $\varepsilon_{ij,t}$ is an error term. d_k are fixed effects for each parent bank, $d_{i,t}$ and $d_{j,t}$ are time-varying destination and source country dummies. Standard errors are clustered at the level of each host-destination country pair.[5]

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[5] We have experimented with different clustering options such as destination country, host country, or bank-host country clusters, but the results are hardly affected.

As an alternative to our model with country-year fixed effects, Fitzgerald (2012) suggests modeling multilateral resistance terms by including price terms for all countries. This approach has the advantage that additional variables which vary along the country-time dimension can be included. Claessens and van Horen (2012) apply a similar empirical model to banking data. They include a measure of competitor remoteness by explaining the location decision of banks with a variable measuring the weighted distance of all competing banks in a specific host country. They find that competitor remoteness has an impact on the locational decision of banks. We do not follow the same route here for two reasons. First, we do not have a full set of bilateral trade data for all countries in the sample. Second, our main focus is on the effects of measures of bilateral financial frictions and their changing importance over time. Hence, the specific results for time-varying destination country variables such as GDP are of lesser interest for us.

In terms of the geographic dimension, the structure of our dataset differs from previous work in the following sense. Firms and households in any destination country can choose between loans granted by German banks, their respective foreign branches and subsidiaries, or loans by banks from countries other than Germany. In each market, German banks and their foreign affiliates are thus assumed to compete against many other domestic and foreign banks. Unobserved third-country characteristics, such as changes in the competitive environment, are also captured through the full set of time-varying host- and destination-country fixed effects.

3   Data

This section gives an overview of the data that we use. Data definitions and sources can be found in the appendix. Descriptive statistics are presented in Table 2.

3.1   External Position Reports

Our main data source are the External Position Reports of the *Deutsche Bundesbank* (Fiorentino et al. 2010). The data can be used for research purposes on the premises of the *Bundesbank* only. The dataset provides a full sample survey of German banks' international activities. The *Bundesbank* receives mandatory reports on external positions by all banks located in Germany and by their foreign affiliates, including assets and liabilities vis-à-vis foreign counterparties. These data serve, inter alia, as inputs to the bilateral banking statistics provided by the Bank for International Settlements. Reporting occurs monthly, and reporting thresholds have been abandoned in 2002. We use the data at an annual frequency (2002-2011) because we are interested

in the long-run structure of international asset holdings and also because most of our explanatory variables are available only at an annual frequency.

Modes of foreign activities

Our empirical model differs from previous work applying the gravity model to banking or financial markets in two regards. First, we use bank-level data, which allow us to analyze the importance of individual bank-related factors such as their size, their funding structure, as well as the fact that some banks have received state support during the crisis. Second, we restrict our analysis to banks which are headquartered in Germany. However, we have information not only on the international activities of the banks located in Germany, but also on the cross border activities of their foreign affiliates located in host countries other than Germany. Hence, we can still exploit the bilateral nature of international banking relations, which would not be the case if we estimated a model of the consolidated foreign exposure of each bank group. We distinguish three different modes of foreign activities (Figure 1):

Mode 1 captures the assets held in a given foreign country by domestic banks located in Germany. We label this the "direct mode".

Mode 2 captures assets held in a given destination country by branches located in a particular foreign host country. We label this the indirect "branch mode".

Mode 3 captures assets held in a given destination country by subsidiaries located in a particular foreign host country. We label this the indirect "subsidiary mode". Subsidiaries are legally independent, hold their own equity, are subject to host-country control, and frequently run large-scale retail operations. Therefore, they incur the highest costs in terms of capital requirements, regulatory (start-up) burden, and fixed investments (Cerutti et al. 2007, Fiechter et al. 2011).

Figure 1 shows the structure of the dataset: Suppose that there is a bank holding company *Banco Teutonia*[6] (BHC) in Germany. *Banco Teutonia* can now engage in direct or indirect international asset holdings. Direct asset holdings, or the "direct mode", imply that *Banco Teutonia* lends money to a firm, a household, a bank or the government in country A or in country B. Let us call country A the host country and country B the destination country. *Banco Teutonia* now also has branches and subsidiaries in host country A. If assets are held through a branch or a subsidiary, we call these indirect international asset holdings. These branches and subsidiaries in the

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[6] This name is purely fictitious. Any resemblance to real banks, living or dead, is purely coincidental.

host country can either lend to firms, households, banks or the government in host country A, or they can lend to firms, households, banks or the government in destination country B.

Figure 1: Modes of International Asset Holdings

Bank Holding Company (BHC) in Germany

Total assets in host country

Subsidiary of BHC in host country

Branch of BHC in host country

Total assets in destination country

→ direct cross-border activity (direct mode)

⇢ indirect cross-border activity (branch mode and subsidiary mode)
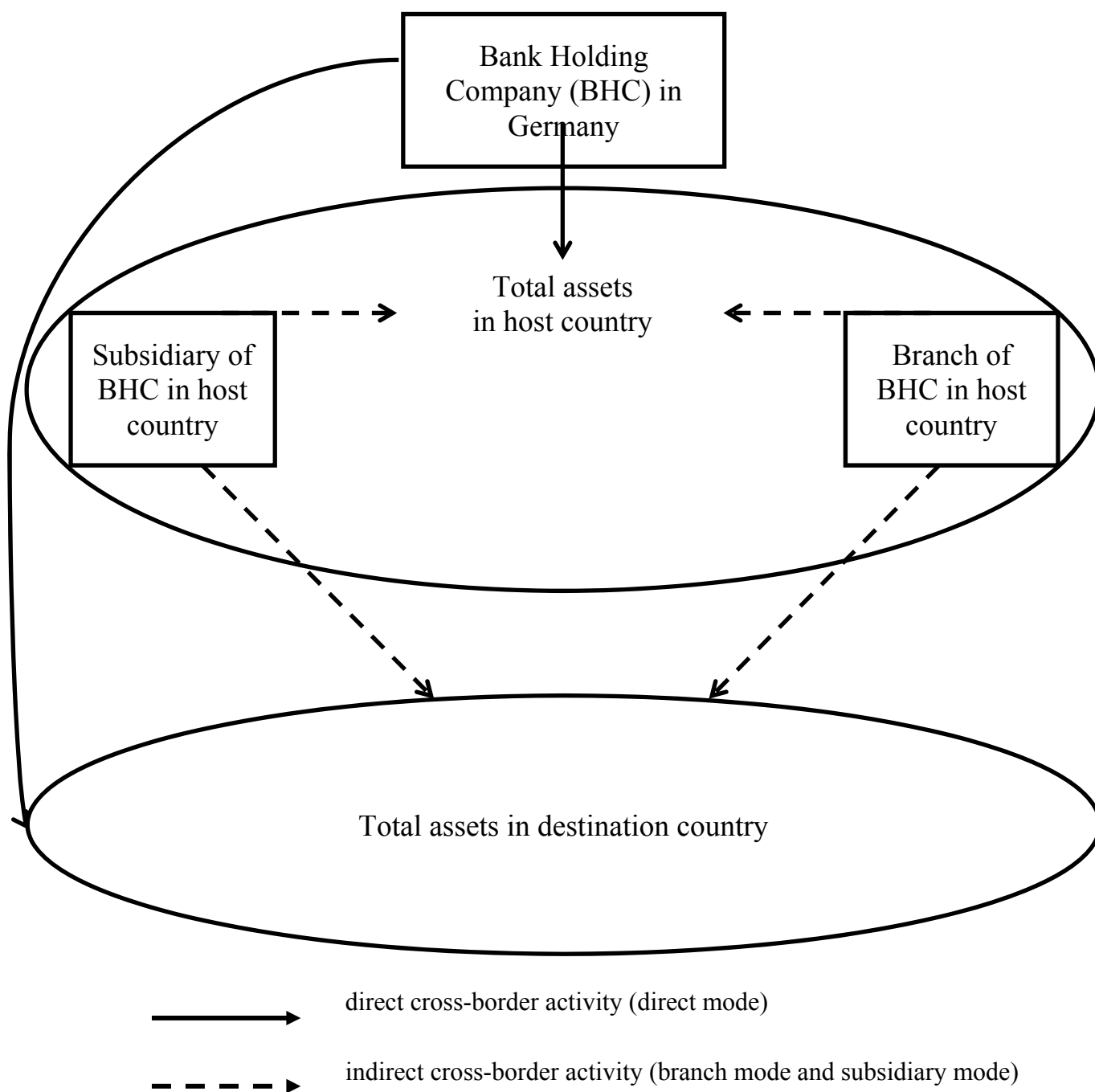
Overall, there are about 1,800 banks active in Germany. Many of these banks are small regional cooperative or savings banks without any active international business.[7] Activities of many of these banks remain confined even within small regional domestic market segments. International banking is dominated by the largest banks in Germany, in particular when it comes to direct investment abroad through foreign affiliates (Buch et al. 2012).

For this reason, we include all banks with foreign affiliates in our dataset, which is an unbalanced panel with information on (the largest) 100 bank holding companies plus almost all remaining bank holding companies (54), which are not among the largest 100 banks, but which have foreign branches or subsidiaries. Overall, the number of banks in our sample has declined from 154 to 123 over the sample period (2002-2011). Because we do not observe all of these bank holding companies at each point in time, we restrict our panel to those 92 bank holding companies (34 commercial banks, 45 savings banks, and 13 cooperative banks) that appear throughout the entire dataset. This means that we are left with a "balanced" panel, when it comes to bank holding companies and years. Of course, these bank holding companies are not present in all markets through all modes. Thus, the dataset is not entirely balanced along the foreign dimension. The banks reside in up to 68 host countries and are active in 79 destination countries. Our data cover 70-78% of all direct international activity by the bank holding companies, as well as 88-100% of all foreign subsidiaries, and 84-92% of all foreign branches of German banks (Figure 2).

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[7] Our dataset includes all large cooperative and savings banks as well as their head institutions (including Landesbanken). These, of course, are active abroad to a considerable extent.

Figure 2:   Number of Bank Holding Companies, Branches, and Subsidiaries

The graphs report the absolute number of bank holding companies active in non-German destination countries via subsidiaries and branches as well as the absolute number of subsidiaries and branches via which these bank holding companies are active abroad.

(a) Bank Holding Companies with Foreign Subsidiaries
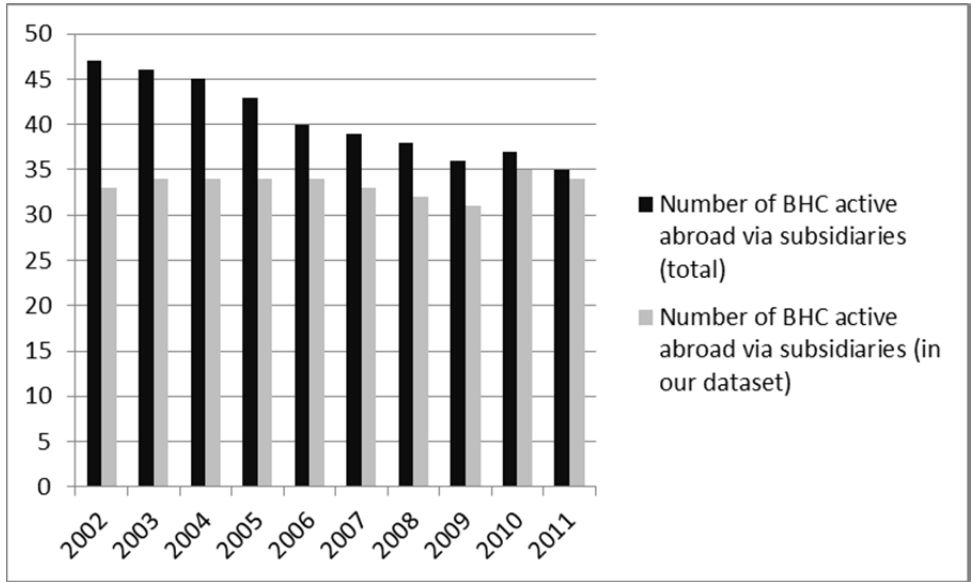
(b) Number of Foreign Subsidiaries
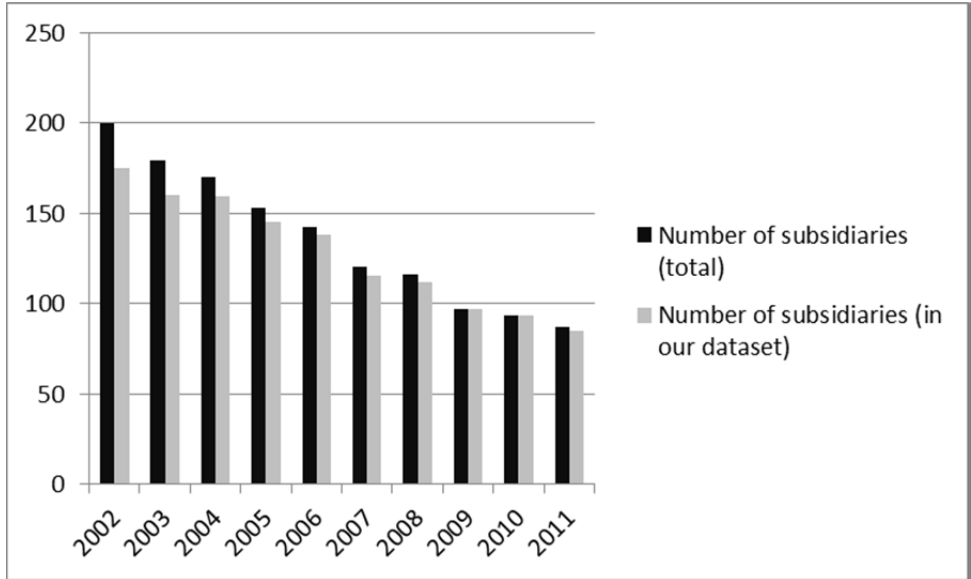
(c) Bank Holdings Companies Active via Branches
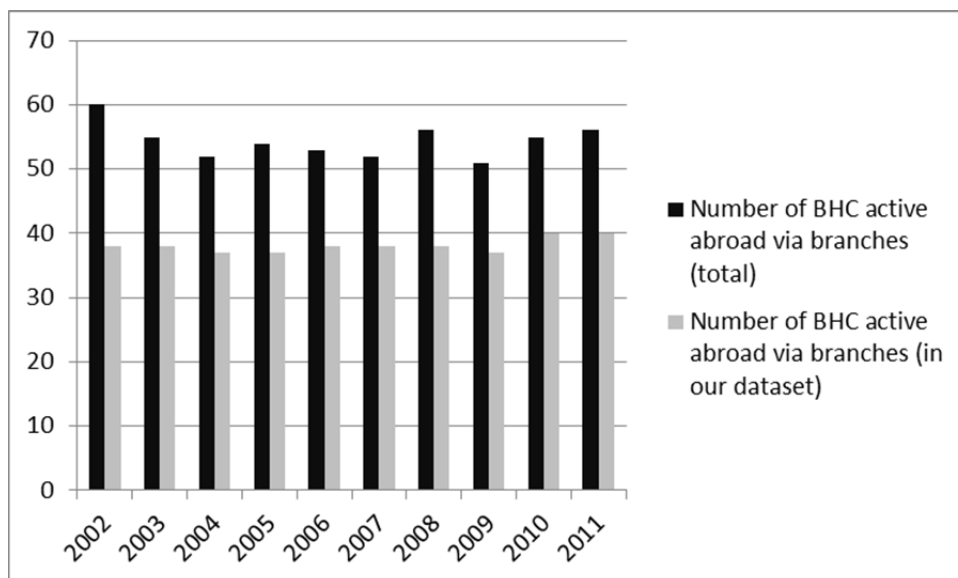
(d) Number of Foreign Branches
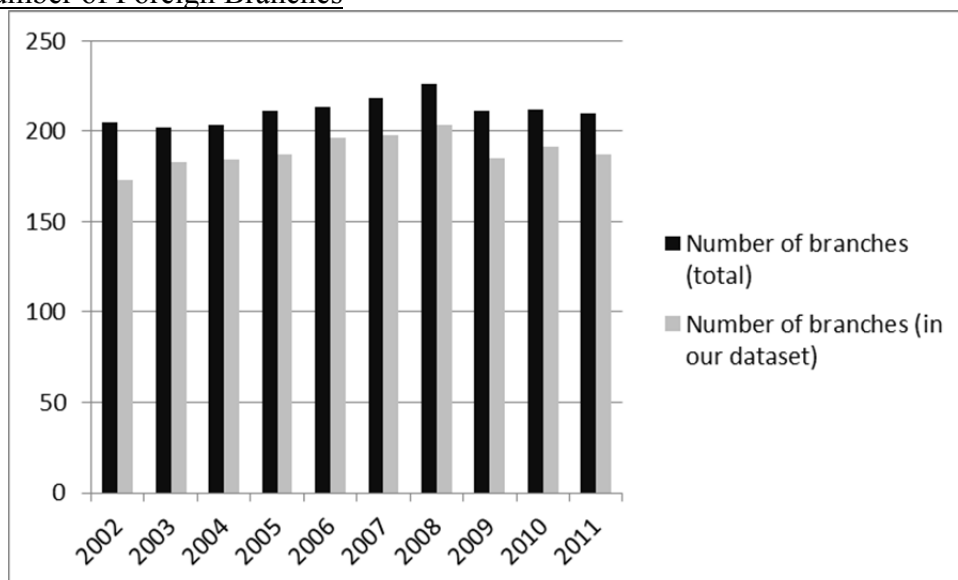
Source: Own calculations based on the External Positions Report of the Deutsche Bundesbank.

3.1.1 Extensive Margin

We are interested not only in the *volume* of international activities (the intensive margin) but also in the *number* of banks that are active abroad (the extensive margin). If banks withdraw from foreign markets, i.e. if they adjust along the extensive margin, adjustment is likely to be more persistent than in a situation in which they lower the volume of international assets only. Our analysis of the extensive margin is purely descriptive. Analyzing the extensive margin in a regression-based model is difficult given the nature of our dataset. In order to provide results comparable to those of the

intensive margin, we would need a dataset which spans options for all banks and all foreign affiliates to invest into all foreign markets.

Figure 2 shows the total number of bank holding companies active abroad via subsidiaries and branches. In the year 2011, there have been fewer bank holding companies with subsidiaries (35) than at the beginning of the sample period (47 in 2002). In terms of the number of subsidiaries, there has been quite a remarkable decline from 200 to 87 over the reporting period. The total number of banks active through the branch mode has been more stable (around 54). The total number of branches has increased from 205 in the year 2002 to 226 in the year 2008. In immediate response to the crisis, 16 branches have been closed.

The bank holding companies in our dataset had on average 1.9 subsidiaries in 2002 and 0.9 subsidiaries in 2011, where the average number of subsidiaries declined steadily in between. When only looking at the average of those BHCs that actually have at least one subsidiary, they had 5.3 subsidiaries on average in 2002 and 2.5 subsidiaries in 2011. As concerns branches, the bank holding companies in our dataset had on average 1.9 in 2002, 2.2 branches in 2008, and 2 branches in 2011. The number of branches rose up to 2008 and declined again thereafter. When only looking at the average of those BHCs that actually have at least one branch, they had 4.6 branches on average in 2002, 5.3 branches in 2008 and 4.7 branches in 2011.

3.1.2 Intensive Margin

Our data cover a time period which is characterized by two distinct trends in international banking. Prior to the crisis, banks have increased their exposure vis-à-vis foreign markets to a significant extent. This expansion of international activities reflects, both, enhanced financial market integration and the buildup of excessive credit on banks' balance sheets. After the start of the financial crisis in August 2007 and, at an accelerated path, after the fall of Lehman Brothers in September 2008, banks have withdrawn from foreign markets (Figures 3a and b).[8]

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[8] The share of international assets in Figure 3a is calculated as the amount of total international assets of the bank holding company and all subsidiaries and branches relative to the balance sheet total of the bank holding company. Since subsidiary assets are not part of the bank holding company's balance sheet, shares can exceed 100%.

Figure 3: Foreign Activity of German Banks by Mode

Graph (a) reports aggregated total international assets of the entire banking groups in % of the balance sheet total of the German bank holding companies for all banks as well as for the different groups of banks (commercial, savings, cooperative).

Graph (b) reports the absolute amount of total international assets of bank holding companies (residing in Germany, i.e. direct international activity) as well as their branches and subsidiaries (not residing in Germany) in millions of €.

Graph (c) reports the relative shares in total international assets attributable to the different modes of foreign activity (i.e. direct international activity by the bank holding company, via foreign branches, or via foreign subsidiaries).

(a) International Assets in % of Total Assets by Banking Group
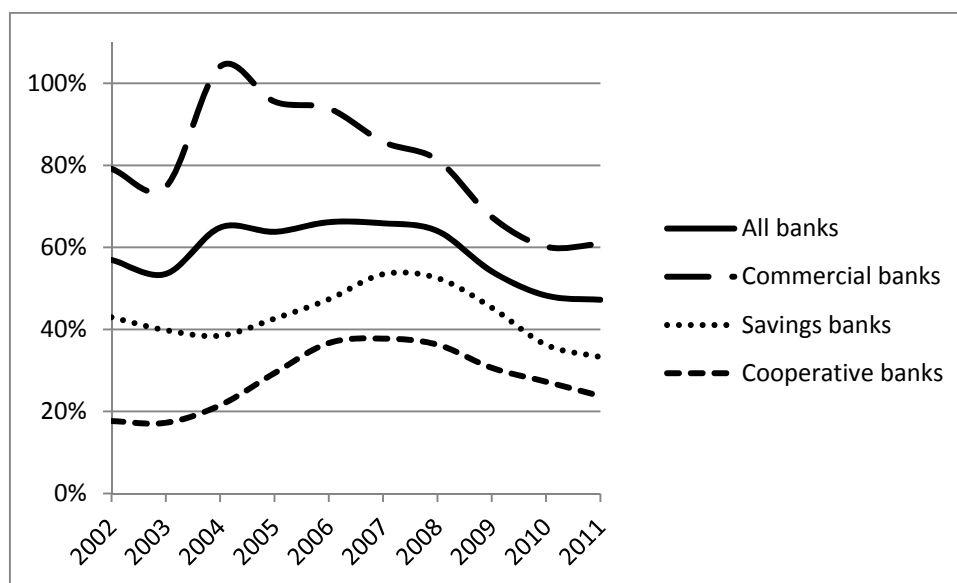
(b) International Assets in Million €
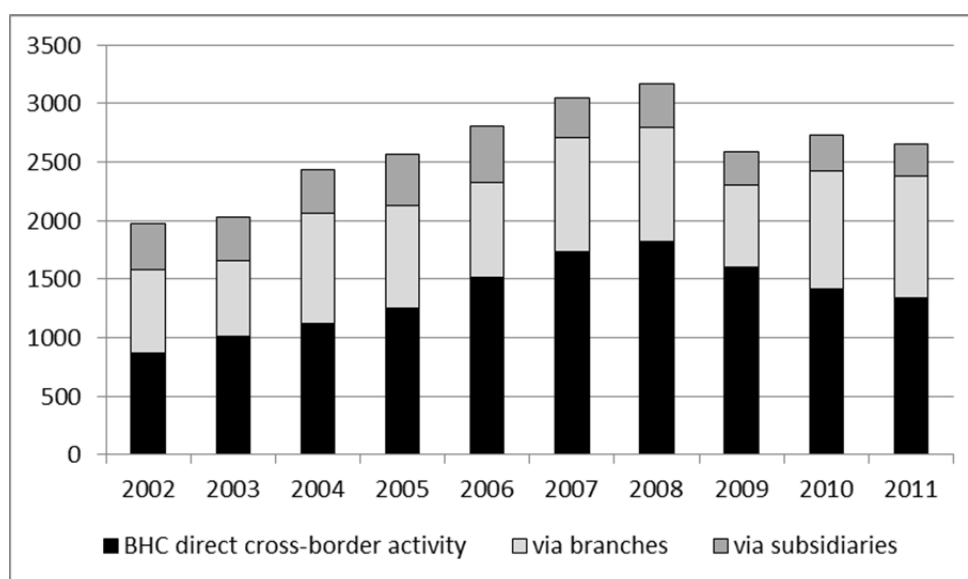
(c) International Assets by Mode in % of Total International Assets
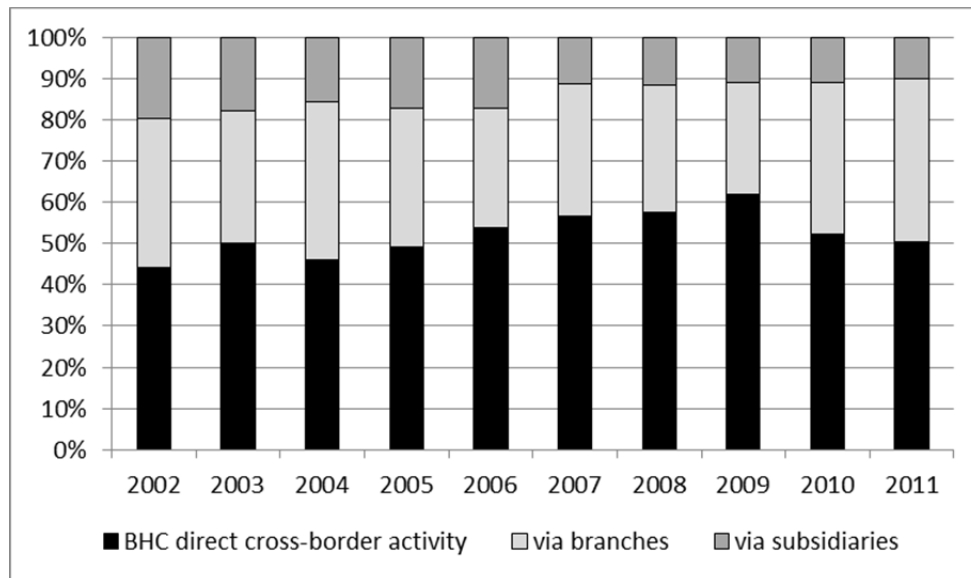
Source: Own calculations based on the External Positions Report of the Deutsche Bundesbank.

Banks have not only shifted their activities across regions, but there has also been a shift in the composition of international activities across modes. While international assets held through the direct mode had increased from below 50% of total international assets in 2002 to more than 60% in 2009, they stood at 50% in 2011 (Figure 3c). The overall importance of subsidiaries has declined from 17-20% at the beginning of the sample until 2006 to only 10-12% between 2007 and 2011. Branch activity fluctuated between 27 and 40% over the sample period, where it decreased during the crisis, but has been increasing again since 2010.

3.1.3 Summing up

Our data show five stylized facts: First, more German banks are active abroad via branches than via subsidiaries. Second, the number of subsidiaries has declined, but this decline has accelerated only marginally over the course of the crisis. Third, the number of foreign branches had increased before the crisis, and it has returned to the pre-crisis level subsequently. Fourth, the amount of international assets of large German banks increased steadily up until 2008 and dropped rapidly thereafter. Fifth, commercial banks started to lower their international assets already prior to the crisis; cooperative and savings banks increased their foreign exposures until 2007 and only started withdrawing from abroad in 2008.

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3.2 Proxies for Financial Frictions

One aim of our paper is to assess whether financial frictions have become more important during the financial crisis. Financial frictions are not directly observable, and we thus refer to proxies that have been used in the literature. These include the log *distance* between the host and destination country, dummies for *adjacency*, a *common legal origin*, a *common language*, a *common membership in a regional trade agreement*, and a dummy for countries that share the *Euro as their common currency*. In all models, we include dummies for countries hosting *financial centers* (Great Britain[9], Hong Kong, Ireland, Luxembourg, Singapore, Switzerland) and a dummy for the *financial crisis* (i.e. a variable that takes on the value of one after the period following the collapse of Lehman Brothers in September 2008).[10]

It could be argued that there is little variation in, say, the language dummy because we consider German banks only. Therefore, the common language dummy might capture asset holdings in Austria and Switzerland only. Note that our data include information not only on asset holdings of German parents, but also of assets held via subsidiaries or branches in different host and destination countries. This adds additional variation to these dummy variables. More than 50% of our observations cover these indirect relations. Hence, there is sufficient variation in the data to identify the effects of these dummies.

In Column 5 of Table 3, we also include one specification with information on bilateral trade. Note that these data are not available for all country-pairs in the sample. Therefore, the total number of observations declines from about 59,000 to 49,000. Trade has the expected positive sign, being significant at the 10%-level. Because the remaining results are not affected much, we leave out this variable in all subsequent regressions in order to work with the full sample.

The above proxies for financial frictions and other transaction costs are country-pair-specific. To check the robustness of our results, we also include variables that vary across countries. *Indicators of financial and business freedom* from the Heritage Foundation measure the degree of economic and financial development, including potential unilateral informational frictions. Furthermore, we include host countries' GDP per capita (from the World Bank) to control for the level of economic development.

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[9] Great Britain is treated as a financial center because the data do not allow discriminating between the United Kingdom and the Channel Islands Jersey, Guernsey and Isle of Man, which are all considered to be financial centers. Also, this dummy captures the role of the City of London as a financial center.

[10] Alternatively, we use a financial crisis dummy that equals one for the period following August 2007.

3.3 Bank-Level Controls

The intensity and the mode through which banks are active abroad are affected strongly by bank-specific traits. We control for characteristics of the German bank holding company by including log *size* (total assets), the degree of *capitalization* (the ratio of capital to total, non risk-weighted assets), the dependence on *wholesale funding* (liabilities vis-à-vis banks / total liabilities), and the share of *short-term funding* (short-term liabilities / total liabilities). The source for this information are the "Monthly Balance Sheet Statistics" provided by the *Deutsche Bundesbank*. Bank-level controls are lagged by one year to account for simultaneity issues.

We also include a dummy variable which equals one for those banks that have received state support from the German government. Several German banks, including IKB and Landesbanken like WestLB, BayernLB, and SachsenLB, have received capital injections, credit lines, and guarantees by the German government (federal and state-level) between August 2007 and August 2008. In October 2008, the German government announced a blank guarantee for bank deposits and it set up a € 400 billion bank guarantee fund and a € 70 billion recapitalization facility. The government created a special institution to administer these funds, the so-called SoFFin (*Sonderfonds Finanzmarktstabilisierung*, Special Fund Financial Market Stabilization). As of August 2010, a total of € 152.6 billion in guarantees by the SoFFin has been taken up by eight German banks in addition to € 29.3 billion in equity stakes in four German banks (Aareal Bank, Commerzbank, Hypo Real Estate, WestLB). Additionally, capital support has been provided by the federal states to their Landesbanken (BayernLB, HSH Nordbank). This information has been made publicly available on the SoFFin's website (see also Table 1).

To capture the effects of these state support measures, we use a combined indicator which assumes the value of one from the time when the German parent has received some kind of support measure. A reason for using a combined indicator rather than treating capital injections and guarantees separately is that most banks have received different rescue measures. While the timing of these measures has differed to some extent, there is insufficient variation in the data to clearly identify the effects of capital injections or guarantees. Overall, 10 out of our over 92 parent banks have received government support in one form or another. The expected effect of the state support measures is negative because state support has been linked to requirements to close foreign affiliates.

In terms of the bank-level variables, the expected sign for bank size is straightforward, International asset holdings involve fixed and variable costs. Larger and thus

presumably more productive banks should be able to shoulder these costs more easily. The expected effects on the funding variables are not clear cut a priori. Ceteris paribus, weakly capitalized banks, banks with a high share of wholesale funding, and banks with a high share of short-term funding are more risky. This could induce the banks to be less active internationally; hence the expected sign would be positive for capitalization and negative for the two funding variables. At the same time, internationalization may be seen as a channel for risk diversification and for access to market-based funding. If this aspect dominates the decisions of banks to expand internationally, we would expect to see a negative effect of capitalization and positive effects of wholesale and short-term funding.

Bank-level controls are potentially endogenous. Because we lack convincing instruments for the bank-level variables, we present results including and excluding bank-level variables to check the sensitivity of our results. Our main interest lies in the country-level proxies for financial frictions. We will show below that our results are fairly robust to including or excluding the bank-level variables. Therefore, endogeneity of bank-level controls does not affect our results regarding the impact of financial frictions to any important degree.

3.4 Country-Level Controls

In our baseline specification, we include country-year fixed effects in order to capture multilateral resistance (Section 2.3). Hence, we cannot include country-level variables such as GDP or trade, which vary across countries and years at the same time.

Nevertheless, we test whether regulatory policies have affected the international activities of banks. The IMF (2011) shows that macroprudential policies affect the cyclicality of bank lending. One channel through which these policies affect domestic lending could be their impact on the international activities of banks. Hence, we include dummy variables capturing regulatory indicators, which have kindly been provided as summary statistics by the IMF from a survey among central banks. These regulatory measures can be divided into three groups: asset measures, asset/liability measures, and capital measures. These indicators are converted into indicator variables ranging from 0-5 for the asset measures and from 0-3 for the asset/liability measures or for the capital measures. The dummies for the individual measures are switched on for the countries and years in which the respective measures have been in place. Sample size shrinks somewhat to 57 host and 77 destination countries if we add these variables at the country level. Hence, we use these variables as robustness tests only (Table 8).

4 Estimation Results

This section analyzes the determinants of banks' international assets and possible changes in these determinants over time. We begin with a set of baseline regressions (Table 3). Furthermore, we perform the following robustness tests: We test whether the determinants of banks' international assets have changed significantly over time by introducing interaction terms between all explanatory variables and crisis dummies (Table 4) as well as by estimating our model for pre- and post-crisis sample splits (Table 5). We distinguish the determinants of the intensive margin by mode of foreign activity (direct, subsidiary, branch) (Table 6), for the three pillars of the German banking system (Table 7), and we examine the effects of specific host-country characteristics and banking regulation (Table 8).

4.1 What Determines the Volume of Banks' International Assets?

In Table 3, we analyze the volume of international assets of banks. Our full sample has almost 60,000 bank-country-year observations. All regressions include a full set of country-year effects; the exception is Column (4), which includes separate host country, destination country, and year fixed effects to check for the sensitivity of all other results with respect to the level of fixed effects. Results are extremely robust. Additionally, we include fixed effects for each bank holding company in all regressions presented in this paper. We vary the empirical model with regard to the set of regressors included. Most of the variation in the data is driven by the overall cross-section of bank holding company-affiliate-destination combinations: while the overall R^2 is 0.50, the within R^2 takes a value of only 0.07.

In terms of bank-level explanatory variables, two results are in line with expectations and with previous literature: larger banks and banks with a higher share of wholesale funding hold higher international assets. Quantitatively, a rise of one percentage point in the share of wholesale funding is associated with a one percent increase in total international assets in a particular destination country. Hence, the strains that the crisis has induced for the wholesale funding market are causes for the decline in banks' international assets during the crisis. Capitalization and short-term funding do not impact international assets though. It is thus difficult to draw a straight line from the riskiness of banks' funding models to their internationalization. State support has the expected negative effect on international assets: banks which received state support

during the crisis hold approximately exp(-0.13)-1= -12.19%[11] lower international assets than those that did not have to be supported.

With regard to the proxies for financial frictions, we obtain the expected result: A one percent increase in distance lowers international assets by a little more than half a percent; sharing a common border or a common language increases foreign asset holdings by 95 or 59 percent, respectively; so does membership in a regional trade agreement (73 percent). A dummy for international assets held in the Euro Area is insignificant in all specifications which include country-year fixed effects.

Acknowledging the special nature of our dataset, we also include a set of dummies capturing the mode through which banks hold their international assets (host is the same as destination, host or destination are financial centers). All these dummies are positive and significant. This can be interpreted as evidence that lower information costs or lower regulatory barriers increase the volume of international bank activity. The results for financial frictions do not change qualitatively or in terms of significance when the bank-level variables are excluded. This is important because it shows that the potential endogeneity of bank-level variables does not affect our main results.

How important are the different explanatory variables? We answer this question by looking at the χ^2-value for different sets of variables. These values indicate how much a particular set of variables contributes to the explanatory power of the overall model. The higher the χ^2-value the higher the probability that the variables in question are jointly significant.

In the baseline regression of Table 3 Column (1), financial frictions are the most important set of variables. The $\chi^2(7)$-value for the bank-specific variables is equal to 165.7. The null hypothesis that all seven bank-specific variables are equal to zero can be rejected at conventional levels of significance. The null hypothesis of the financial frictions being all zero can be rejected with a $\chi^2(6)$-value of 187.8 as well. The other dummy variables (host is destination, host and destination are financial centers) seem to be the least important ones with a $\chi^2(3)$-value of only 89.3, but they are significant at the one percent level, too.

In addition, we have calculated standardized beta-coefficients (unreported) in order to assess the magnitude of the different variables with respect to the overall model.[12] In the

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[11] This formula to calculate the change in international assets will be applied to all coefficients on dummy variables throughout the rest of the paper.

[12] Beta coefficients are given by the coefficient estimate of a particular variable, multiplied by the standard deviation of this variable, and divided by the standard deviation of the dependent variable. Hence, beta coefficients give the contribution of each explanatory variable to the variance of the banks' international assets.

baseline model in Table 3 Column (1), the most important variables are distance, size, and the dummies for financial centers and local lending in the host country.

4.2 Have the Determinants of Banks' International Assets Changed During the Crisis?

Given the reversal of banks' international assets during the crisis as documented in Figures 2 and 3, the natural question to ask is whether this has been due to a change in the determinants of banks' foreign activities or due to a changing sensitivity of banks with regard to these determinants. This question can be answered by either splitting the sample to estimate the model for the pre-crisis and for the crisis period or by including interaction terms between all variables and a crisis dummy. Both methods require defining a crisis and a pre-crisis period. We perform two splits, using the periods 2002-2007 or 2002-2008 as the pre-crisis periods, and the subsequent years (2008-2011 or 2009-2011) as the crisis years. The main results are not affected by this choice.

Table 4 reports the results including interaction terms between crisis dummies and all explanatory variables. It shows that the impact of bank-level controls and most of the proxies for financial frictions has not changed over the course of the crisis with two exceptions. For the case of the financial crisis dummy being one after the Lehman collapse (i.e. starting in 2008), adjacency has become more important and common language has become less important.

Table 5 shows the results splitting the sample into pre-crisis and crisis period. In terms of the bank-level variables, it shows that the positive effect of size significantly increased during the crisis and that capitalization changed from being negatively significant before the crisis to being a positive and significant determinant of international assets during the crisis. In terms of the financial frictions, the effect of distance, common legal origin, and common language did not change over time. As the model with interaction terms, the data are thus not supporting the conventional wisdom that banks have become more sensitive to financial frictions or to cultural factors during the crisis.

The sample splits detect three changes in the country-level determinants of banks' international assets, though: the importance of adjacency, of bilateral trade agreements, and of the Euro Area dummy has become stronger over time. One interpretation is that banks have re-focused their international assets on trade-related activities during the crisis. The positive effect of the Euro Area dummy for the crisis-period could reflect a general home bias effect or increasing sensitivity to exchange rate risk.

Generally, a comparison between the two methods reveals that simply including interaction terms for the crisis period fails to detect changes in the determinants of cross-border banking that have evolved over the years. Most importantly, the growing importance of regional trade agreements is not detected by the interaction terms. However, both methods detect a growing importance of adjacency, pointing into the direction of an increasing concentration on familiar markets during the crisis.

4.3 What is the Impact of the Mode of Foreign Banking?

So far, we have pooled the data across the different modes and we have not distinguished differences in foreign business models. Given that foreign branches and subsidiaries differ in terms of their costs and in terms of their business model, the natural question to ask is whether our main results hold when splitting the sample into different modes. Table 6 thus shows the baseline model from Table 3 for all three modes of activities separately.

Many results are qualitatively similar across the different modes, which justifies our pooling assumption. For the bank-level variables at the level of the bank holding company, results are similar with some exceptions: capitalization has a negative impact on branch activity but no impact on all other modes. Size plays a role only for the direct mode, and short-term funding impacts only the two indirect modes negatively.

Financial frictions are somewhat less important for subsidiaries than for the branch or the direct mode. One might think that retail-focused subsidiary activity is more information sensitive than wholesale oriented direct and branch activity. However, the lower information sensitivity might result from the fact that subsidiaries, which are engaged in local and geographically close retail markets and also rely on local deposits and deposit guarantees (see also Cerutti et al. 2007, Fiechter et al. 2011), have better knowledge of the greater region than only wholesale oriented branches or even bank holding companies that are situated in Germany. Information and monitoring costs as proxied by bilateral gravity-type variables might thus be lower than for branches and bank holding companies that do not have this advantage of a better knowledge of the local retail market, which in turn is very important for wholesale activity, too. The effect of common legal origin is negative for the direct mode and positive for the branch or subsidiary mode.

4.4 What is the Impact of the Banks' Business Model?

While Table 6 accounts for differences across the foreign business models of banks, Table 7 takes into consideration that the domestic business models differ as well. The German banking system is characterized by a three-tier structure consisting of

commercial, savings, and cooperative banks. These banks have different business models: the private banks are traditionally more active in the wholesale business and on international markets, while the savings and cooperative banks focus more on retail activities in local markets.

To check how pooling across the different domestic business models affects our results, we split the sample into observations for banks in each of these groups (Table 7). Given these different business models and differences in the probability of going abroad, the determinants of international activities of banks in these three groups are surprisingly similar. One exception is the effect of short-term funding which is associated with lower international assets for commercial banks, but with higher international assets for savings banks.

The most interesting difference across the different banking groups is that for the state support variable though: commercial banks which have received state support have increased rather than decreased their international assets. The negative effect for the pooled regressions is driven by the savings banks. This result is interesting as it suggests an alternative interpretation of the effect of state support: on the one hand, state support was associated with the requirement to divest international activities. On the other hand, however, state support has also allowed banks to stabilize their activities and to expand their international activities relative to total assets (which we include as a control variable). Analyzing whether these international expansions have increased or decreased bank risk would be an interesting extension of our study.

Finally, most results for the financial frictions are similar across the different specifications as well. The main exceptions are that the positive effect of adjacency found for the full sample is driven to a large extent by the savings banks, reflecting the regional nature of their business model. But adjacency is positive for all three banking groups and significant at the ten percent level for commercial banks, too. Common legal origin, common language, and regional trade agreements play a role only for the commercial banks.

4.5 What Are the Effects of Host Country Characteristics and Regulations?

Table 8 presents the results for augmenting the baseline specification by additional (lagged) host-country characteristics. Host country and year fixed effects are now included separately because host-year dummies would be collinear with the additional variables. We also estimate this specification for samples before and during the crisis.

The country-level variables proxying for financial and business freedom enter significantly with the expected positive signs. The remaining results are hardly affected. Bank-level covariates and proxies for financial frictions are quite robust compared to the baseline specification in Table 3, Column 1. The joint significance of all seven variables proxying for financial frictions hardly changes. The null hypothesis for those variables being jointly zero can be rejected with a $\chi^2(6)$-value of 189.02 at the one percent significance level, which is almost the exact same value as in the baseline model.

All three macroprudential regulations are jointly significantly different from zero at the one percent level. Asset measures are strongly significant whereas asset/liability measures and capital measures are not significant. More restrictive asset side measures in the form of limits on exposure concentration and caps on foreign currency lending lower international bank assets. This is in line with expectations because these measures impact a bank's international assets directly, as opposed to capital and liability measures.

5 Conclusion

The past decades have witnessed a substantial increase in international banking which the recent financial crisis has brought an abrupt end to. International banking has declined significantly, and it is not clear whether it will revert to its pre-crisis level in the near future. This paper has examined the extent of the decline and its determinants. Using a novel bank-level dataset for German bank holding companies and their branches and subsidiaries, we have examined their international activity for the period 2002-2011.

Stylized facts show that German banks have withdrawn from foreign markets, both along the extensive and the intensive margin. This withdrawal has been relatively stronger for activities of foreign subsidiaries compared to direct cross-border assets or assets held through branches.

Our results suggest the following interpretation of these trends and their persistence.

First, banks with market-based funding models and, in particular, with a high share of wholesale funding have higher international assets. Hence, persistently tighter conditions on funding markets would have an impact on the internationalization strategies that banks will pursue in the future. How persistent this adjustment is going to be is hard to predict. To the extent that the re-regulation of the banking industry that is

currently taking place changes market structures in banking and banks' funding markets, the adjustment is likely to be sustained.

Second, policy interventions matter. Some banks receiving German state support during the crisis have lowered their international assets, and foreign macroprudential policies had a negative impact as well. To the extent that reductions in international assets are associated with the closure of foreign affiliates, they are likely to be persistent.

Third, financial frictions matter for international banking. As in previous studies, we find that geographical and cultural proximity has a positive impact on banks' international assets. Perhaps contrary to conventional wisdom, the impact of financial frictions has remained relatively stable throughout the crisis as well. The variables for which we find a stronger effect during the crisis period are adjacency and the presence of bilateral trade agreements. This suggests that trade-related finance has become relatively more important over time.

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6   Data Appendix

Table 1:   **List of Variables and Definitions**

Variable	Definition	Source
Dependent variable		
Log total international assets (intensive margin)	Natural logarithm of gross total assets (in million €) held in any destination country by any bank located in any host country	External Position Reports, Deutsche Bundesbank
Bank-level covariates		
Log size	Natural logarithm of banks' gross total assets	Monthly Balance Sheet Statistics, Deutsche Bundesbank
Capitalization	Ratio of total equity capital to gross total assets	Monthly Balance Sheet Statistics, Deutsche Bundesbank
Wholesale funding	Liabilities vis-à-vis banks (including central bank) / total liabilities	Monthly Balance Sheet Statistics, Deutsche Bundesbank
Short-term funding	Total short-term liabilities (with maturity of up to one year) / total liabilities	Monthly Balance Sheet Statistics, Deutsche Bundesbank
State support	Dummy variable equal to 1 for bank holding companies that received state support during the crisis, 0 otherwise	SoFFin (German Restructuring Fund) http://www.fmsa.de/de/fmsa/soffin/instrumente/SoFFin-Massnahmen/SoFFin-Massnahmen.html
Subsidiary	Dummy variable equal to 1 for subsidiary activity, 0 otherwise	External Position Reports, Deutsche Bundesbank
Branch	Dummy variable equal to 1 for branch activity, 0 otherwise	External Position Reports, Deutsche Bundesbank
Bilateral financial frictions		
Log distance	Natural logarithm of the population weighted distance (in km) between host and destination country	Centre d'Etudes Prospectives et d'Informations Internationales, CEPII
Adjacency	Dummy variable equal to 1 if two countries share a common border, 0 otherwise	CEPII
Common legal origin	Dummy variable equal to 1 if two countries have the same legal origin, 0 otherwise	CEPII

Common language	Dummy variable equal to 1 if two countries share a common language that is spoken by at least 9% of the population in both countries, 0 otherwise	CEPII
Regional trade agreement	Dummy variable equal to 1 if two countries are both members of a regional trade agreement, 0 otherwise	CEPII
Common currency (Euro)	Dummy variable equal to 1 if two countries share the Euro as same currency, 0 otherwise	
Bilateral trade	Total yearly bilateral trade flows in thousands of euros, total trade in goods (grand total)	OECD, STAN Bilateral Trade Database
Unilateral financial frictions		
Business freedom	Index from 0 (repressive) – 100 (completely free business environment)	Index of Economic Freedom, The Heritage Foundation
	"measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process."	
Financial freedom	Index from 0 (repressive) – 100 (negligible government interference)	Index of Economic Freedom, The Heritage Foundation
	"measure of banking efficiency as well as a measure of independence from government control and interference in the financial sector."	
GDP per capita	In thousands of euros	World Governance Indicators, World Bank
Asset measures	Index of macroprudential regulations running from 0 to 5 capturing whether caps on loan-to-value ratios, caps on debt/loan-to-income ratios, limits on exposure concentration, caps on foreign currency lending, and ceilings on credit or credit growth have been in place for a given year. The index is the sum of individual dummy variables for the specific asset measures	International Monetary Fund (IMF), Survey of Central Banks

	being in place (=1) or not (=0).	
Asset/liability measures	Index of macroprudential regulations running from 0 to 3 capturing whether limits on net open currency positions, limits on maturity mismatch, and reserve requirements have been in place for a given year. The index is the sum of individual dummy variables for the specific asset/liability measures being in place (=1) or not (=0).	IMF
Capital measures	Index of macroprudential regulations running from 0 to 3 capturing whether countercyclical capital requirement, dynamic provisioning, and restrictions on profit distribution have been in place for a given year. The index is the sum of individual dummy variables for the specific capital measures being in place (=1) or not (=0).	IMF
Other country level covariates		
Host is destination	Dummy variable equal to 1 if host country is destination country, 0 otherwise	
Host (destination) is financial center	Dummy variable equal to 1 if host (destination) country is a financial center, 0 otherwise	Deutsche Bundesbank
Financial crisis dummies		
August 2007	Equal to 1 after (and including 2007), 0 before	
September 2008	Equal to 1 after (and including 2008), 0 before	

7   Regression Tables

Table 2:   Descriptive Statistics

An asterisk (*) indicates that minima and maxima for these variables cannot be disclosed due to confidentiality reasons.

Variable	Observations	Mean	Std. Dev.	Min	Max
Dependent Variable					
Log total international assets	59,701	1.39	3.96	*	*
Bank level covariates					
Log size	59,701	11.27	1.58	*	*
Capitalization	59,701	4.29	2.05	*	*
Wholesale funding	59,701	42.12	20.37	*	*
Short-term funding	59,701	63.17	22.49	*	*
State support (0/1)	59,701	0.12	0.33	0	1
Savings bank (0/1)	59,701	0.42	0.49	0	1
Cooperative bank (0/1)	59,701	0.12	0.32	0	1
Subsidiary activity(0/1)	59,701	0.24	0.43	0	1
Branch activity (0/1)	59,701	0.28	0.45	0	1
Bilateral financial frictions					
Log distance	59,701	7.71	1.30	2.13	9.88
Adjacency (0/1)	59,701	0.14	0.34	0	1
Common legal origin (0/1)	59,701	0.21	0.41	0	1
Common language (0/1)	59,701	0.12	0.33	0	1
Regional trade agreement (0/1)	59,701	0.60	0.49	0	1
Common currency (Euro) (0/1)	59,701	0.22	0.41	0	1
Log bilateral trade	49,716	8.97	2.25	-0.61	21.07
Unilateral financial frictions (host country)					
Financial freedom	45,691	63.13	14.65	10	90
Business freedom	45,691	84.04	10.21	40	100
GDP per capita	45,691	24.67	6.98	9	92
Asset measures	45,691	0.17	0.48	0	5
Asset/liability measures	45,691	0.06	0.27	0	3
Capital Measures	45,691	0.02	0.15	0	3
Other country level covariates					
Host is destination (0/1)	59,701	0.04	0.19	0	1
Host is financial center (0/1)	59,701	0.29	0.45	0	1
Destination is financial center (0/1)	59,701	0.17	0.38	0	1
Financial crisis dummies					
August 2007 (0/1)	59,701	0.55	0.50	0	1
September 2008 (0/1)	59,701	0.44	0.50	0	1

Table 3: Baseline Fixed Effects Regressions

This table presents results from regressions with bank holding company fixed effects using the full sample, i.e. pooling across the three different modes of international banking. The dependent variable is the log of banks' total international assets held in different destination countries by the domestic headquarters, their foreign branches, or their foreign subsidiaries located in different host countries. Standard errors are in parentheses. All bank-level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. * Significant at 10% level.

	(1) Baseline	(2) Excluding country-specific regressors	(3) Excluding bank-specific regressors	(4) Separate country- and years dummies	(5) Including bilateral trade
Log size (t-1)	0.662***	0.661***		0.663***	0.496***
	(0.094)	(0.094)		(0.091)	(0.106)
Capitalization (t-1)	0.003	0.003		0.009	-0.019
	(0.013)	(0.013)		(0.012)	(0.014)
Wholesale funding (t-1)	0.010***	0.010***		0.007***	0.011***
	(0.002)	(0.002)		(0.002)	(0.002)
Short-term funding (t-1)	-0.002	-0.001		0.000	-0.003
	(0.002)	(0.002)		(0.002)	(0.002)
State support (0/1)	-0.130***	-0.130***		-0.370***	-0.122**
	(0.050)	(0.050)		(0.056)	(0.053)
Subsidiary activity (0/1)	-8.252***	-8.610***		-6.831***	-9.611***
	(2.810)	(2.827)		(0.590)	(3.238)
Branch activity (0/1)	-7.448***	-7.836***		-6.052***	-8.982***
	(2.804)	(2.823)		(0.559)	(3.235)
Log distance	-0.554***		-0.549***	-0.619***	-0.695***
	(0.156)		(0.160)	(0.142)	(0.169)
Adjacency (0/1)	0.666***		0.685***	0.644***	0.326
	(0.241)		(0.241)	(0.239)	(0.247)
Common legal origin (0/1)	0.200		0.191	0.197	0.170
	(0.127)		(0.127)	(0.124)	(0.142)
Common language (0/1)	0.461**		0.459**	0.440**	0.252
	(0.216)		(0.216)	(0.216)	(0.209)
Regional trade agreement (0/1)	0.546**		0.525**	0.267	0.223
	(0.240)		(0.239)	(0.178)	(0.245)
Common currency (Euro) (0/1)	0.255		0.267	0.313**	0.073
	(0.207)		(0.209)	(0.148)	(0.196)
Log bilateral trade					0.137*
					(0.070)
Host is destination (0/1)	2.877***	4.480***	2.898***	2.750***	2.062***
	(0.470)	(0.422)	(0.474)	(0.476)	(0.541)
Host is financial center (0/1)	5.120*	5.083*	0.912	4.182***	6.767**
	(2.823)	(2.845)	(0.575)	(0.600)	(3.250)
Destination is financial center (0/1)	1.939***	2.105***	1.895***	1.397***	2.275***
	(0.365)	(0.491)	(0.363)	(0.385)	(0.453)
Country-year fixed effects	Yes	Yes	Yes	No	Yes
Country fixed effects	No	No	No	Yes	No
Year fixed effects	No	No	No	Yes	No
Number of observations	59,701	59,701	59,701	59,701	49,716
Number of panel units	11,159	11,159	11,159	11,159	9,318
R² within	0.071	0.070	0.065	0.018	0.065
R² between	0.514	0.486	0.509	0.509	0.522
R² overall	0.500	0.474	0.498	0.491	0.494

Table 4: Regressions with Crisis Dummies and Crisis Interaction Terms

This table presents results from regressions with bank holding company fixed effects using the full sample, i.e. pooling across the three different modes of international banking. The dependent variable is the log of banks' total international assets held in different destination countries by the domestic headquarters, their foreign branches, or their foreign subsidiaries located in different host countries. The second columns of regressions (2) and (4) display the coefficients for the interaction terms of the variables with the crisis dummy. Standard errors are in parentheses. All bank-level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. * Significant at 10% level.

	(1) Baseline with crisis dummy (August 2007)	(2) Baseline with crisis dummy (August 2007) and crisis interaction terms		(3) Baseline with crisis dummy (September 2008)	(4) Baseline with crisis dummy (September 2008) and crisis interaction terms	
		Baseline	Interaction term		Baseline	Interaction term
Log size (t-1)	0.662***	0.653***	0.018	0.662***	0.663***	0.011
	(0.094)	(0.098)	(0.021)	(0.094)	(0.098)	(0.022)
Capitalization (t-1)	0.003	0.004	-0.014	0.003	0.009	-0.018
	(0.013)	(0.015)	(0.012)	(0.013)	(0.014)	(0.013)
Wholesale funding (t-1)	0.010***	0.010***	-0.000	0.010***	0.011***	-0.001
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Short-term funding (t-1)	-0.002	-0.002	-0.000	-0.002	-0.003	0.001
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
State support (0/1)	-0.130***	-0.172***		-0.130***	-0.152***	
	(0.050)	(0.050)		(0.050)	(0.054)	
Subsidiary activity (0/1)	-8.252***	-6.340***	-2.157	-8.252***	-7.211***	-1.221
	(2.810)	(0.621)	(2.633)	(2.810)	(0.572)	(2.599)
Branch activity (0/1)	-7.448***	-5.874***	-1.514	-7.448***	-6.627***	-0.719
	(2.804)	(0.584)	(2.630)	(2.804)	(0.533)	(2.595)
Log distance	-0.554***	-0.510***	-0.083	-0.554***	-0.519***	-0.076
	(0.156)	(0.159)	(0.059)	(0.156)	(0.160)	(0.059)
Adjacency (0/1)	0.666***	0.590**	0.140	0.666***	0.565**	0.229**
	(0.241)	(0.239)	(0.106)	(0.241)	(0.241)	(0.111)
Common legal origin (0/1)	0.200	0.123	0.124	0.200	0.143	0.101
	(0.127)	(0.135)	(0.084)	(0.127)	(0.133)	(0.078)
Common language (0/1)	0.461**	0.584***	-0.203*	0.461**	0.577***	-0.225**
	(0.216)	(0.225)	(0.114)	(0.216)	(0.223)	(0.110)
Regional trade agreement (0/1)	0.546**	0.457*	0.128	0.546**	0.475*	0.126
	(0.240)	(0.246)	(0.158)	(0.240)	(0.249)	(0.145)
Common currency (Euro) (0/1)	0.255	0.229	0.082	0.255	0.281	0.010
	(0.207)	(0.212)	(0.129)	(0.207)	(0.209)	(0.133)
Host is destination (0/1)	2.877***	3.038***	-0.302*	2.877***	3.008***	-0.294
	(0.470)	(0.473)	(0.180)	(0.470)	(0.477)	(0.185)
Host is financial center (0/1)	5.120*	3.877***	1.270	5.120*	4.500***	0.642
	(2.823)	(0.632)	(2.641)	(2.823)	(0.584)	(2.602)
Destination is financial center (0/1)	1.939***	1.437***	0.515**	1.939***	1.662***	0.297
	(0.365)	(0.376)	(0.232)	(0.365)	(0.364)	(0.224)
Crisis dummy (0/1)	-1.750	0.462		-1.034	0.405	
	(2.615)	(0.685)		(2.578)	(0.685)	
Country-year fixed effects	Yes	Yes		Yes	Yes	
Country fixed effects	No	No		No	No	
Year fixed effects	No	No		No	No	
No. of observations	59,701	59,701		59,701	59,701	
Number of panel units	11,159	11,159		11,159	11,159	
R² within	0.071	0.074		0.071	0.073	
R² between	0.514	0.516		0.514	0.515	
R² overall	0.500	0.501		0.500	0.501	

Table 5: Sample Splits Pre-Crisis versus Crisis Sample

This table presents results from regressions with bank holding company fixed effects using the full sample, i.e. pooling across the three different modes of international banking. The dependent variable is the log of banks' total international assets held in different destination countries through the domestic headquarters, its foreign branches, or its foreign subsidiaries located in different host countries. The samples are split as indicated in the top of the columns. Standard errors are in parentheses. All bank-level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

	(1) Before 2007	(2) After 2007	(3) Before 2008	(4) After 2008
Log size (t-1)	0.163	0.851***	0.547***	0.838***
	(0.151)	(0.100)	(0.131)	(0.107)
Capitalization (t-1)	-0.027*	0.046***	-0.033**	0.052***
	(0.016)	(0.017)	(0.016)	(0.017)
Wholesale funding (t-1)	0.001	0.007***	0.005**	0.005***
	(0.003)	(0.001)	(0.002)	(0.001)
Short-term funding (t-1)	0.003	-0.003**	0.003	0.001
	(0.003)	(0.001)	(0.003)	(0.001)
State support (0/1)	0.000	-0.137***	0.095	-0.268***
	(0.000)	(0.044)	(0.155)	(0.092)
Subsidiary activity (0/1)	1.024	-8.083***	0.000	-7.507**
	(2.362)	(2.939)	(0.000)	(3.144)
Branch activity (0/1)	1.331	-6.853**	0.429**	-6.276**
	(2.343)	(2.932)	(0.172)	(3.136)
Log distance	-0.528***	-0.549***	-0.521***	-0.555***
	(0.171)	(0.161)	(0.169)	(0.160)
Adjacency (0/1)	0.439*	0.778***	0.432*	0.913***
	(0.239)	(0.253)	(0.238)	(0.256)
Common legal origin (0/1)	0.135	0.221*	0.158	0.211
	(0.152)	(0.134)	(0.147)	(0.136)
Common language (0/1)	0.589**	0.375*	0.571**	0.327
	(0.248)	(0.215)	(0.243)	(0.222)
Regional trade agreement (0/1)	0.434*	0.869***	0.428*	0.826**
	(0.249)	(0.329)	(0.242)	(0.329)
Common currency (Euro) (0/1)	0.269	0.407*	0.306	0.460**
	(0.229)	(0.216)	(0.217)	(0.232)
Host is destination (0/1)	3.066***	2.602***	3.082***	2.596***
	(0.536)	(0.483)	(0.527)	(0.485)
Host is financial center (0/1)	-2.266**	4.718	-2.794***	4.238
	(0.931)	(2.950)	(0.828)	(3.153)
Destination is financial center	1.994***	1.965***	1.296***	1.936***
(0/1)	(0.507)	(0.380)	(0.449)	(0.381)
Country-year fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No
Year fixed effects	No	No	No	No
No. of observations	26,933	32,768	33,693	26,008
Number of panel units	8,607	9,571	9,012	9,034
R² within	0.056	0.066	0.062	0.063
R² between	0.544	0.516	0.550	0.499
R² overall	0.515	0.505	0.518	0.498

Table 6: Regressions by Mode of Foreign Activity

This table presents results from regressions with bank holding company fixed effects using sample splits according to the three different modes of international banking (direct, branch, subsidiary). The dependent variable is the log of banks' total international assets held in different destination countries by the domestic headquarters, their foreign branches, or their foreign subsidiaries located in different host countries, respectively. Standard errors are in parentheses. All bank-level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. * Significant at 10% level.

	(1) Direct Mode	(2) Subsidiary Mode	(3) Branch Mode
Log size (t-1)	0.875***	-0.277	-0.101
	(0.107)	(0.207)	(0.205)
Capitalization (t-1)	0.012	0.039*	-0.125***
	(0.018)	(0.020)	(0.032)
Wholesale funding (t-1)	0.007***	0.011**	0.019***
	(0.002)	(0.004)	(0.003)
Short-term funding (t-1)	0.003*	-0.018***	-0.019***
	(0.002)	(0.005)	(0.004)
State support (0/1)	-0.075	-0.440***	0.033
	(0.074)	(0.095)	(0.100)
Log distance	-1.195***	-0.345**	-0.486***
	(0.135)	(0.172)	(0.136)
Adjacency (0/1)	0.132	0.145	-0.025
	(0.379)	(0.251)	(0.269)
Common legal origin (0/1)	-1.366***	0.410***	0.666***
	(0.031)	(0.155)	(0.150)
Common language (0/1)	0.679***	0.261	0.608***
	(0.022)	(0.223)	(0.234)
Regional trade agreement (0/1)	0.682***	0.422	0.464*
	(0.022)	(0.287)	(0.237)
Common currency (Euro) (0/1)	-1.132***	-0.018	-0.673***
	(0.050)	(0.260)	(0.252)
Host is destination (0/1)		3.342***	3.088***
		(0.606)	(0.434)
Host is financial center (0/1)		2.942***	5.105*
		(0.752)	(3.014)
Destination is financial center (0/1)	1.892***	-1.603***	3.004***
	(0.012)	(0.559)	(1.134)
Country-year fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No
Year fixed effects	No	No	No
Number of observations	28,691	14,219	16,791
Number of panel units	4,218	3,359	3,582
R² within	0.104	0.102	0.092
R² between	0.760	0.488	0.470
R² overall	0.689	0.466	0.448

Table 7: Regressions by Bank-Group

This table presents results from regressions with bank holding company fixed effects using sample splits according to the type of the bank (commercial, savings (including Landesbanken), cooperative). The dependent variable is the log of banks' total international assets held in different destination countries by the domestic headquarters, their foreign branches, or their foreign subsidiaries located in different host countries. Standard errors are in parentheses. All bank-level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. * Significant at 10% level.

	(1) Commercial Banks	(2) Savings Banks	(3) Cooperative Banks
Log size (t-1)	0.713***	0.090	1.447***
	(0.114)	(0.212)	(0.415)
Capitalization (t-1)	-0.005	-0.067*	-0.067
	(0.014)	(0.035)	(0.127)
Wholesale funding (t-1)	0.011***	0.003	0.016***
	(0.003)	(0.003)	(0.004)
Short-term funding (t-1)	-0.007***	0.013***	0.011*
	(0.002)	(0.003)	(0.006)
State support (0/1)	0.221***	-0.233***	0.000
	(0.077)	(0.082)	(0.000)
Subsidiary activity (0/1)	-8.143***	-5.515***	1.269
	(2.846)	(1.012)	(5.018)
Branch activity (0/1)	-7.402***	-5.106***	2.961
	(2.840)	(0.970)	(4.838)
Log distance	-0.472***	-0.678***	-1.101***
	(0.137)	(0.193)	(0.305)
Adjacency (0/1)	0.464*	0.709***	0.537
	(0.244)	(0.265)	(0.436)
Common legal origin (0/1)	0.249*	0.161	-0.219
	(0.135)	(0.176)	(0.301)
Common language (0/1)	0.537***	0.356	0.585
	(0.206)	(0.290)	(0.451)
Regional trade agreement (0/1)	0.700***	0.341	-0.806
	(0.214)	(0.336)	(0.798)
Common currency (Euro) (0/1)	0.107	0.129	1.002**
	(0.233)	(0.243)	(0.427)
Host is destination (0/1)	3.454***	1.928***	-0.261
	(0.399)	(0.741)	(1.512)
Host is financial center (0/1)	4.540	3.326***	-4.741
	(2.860)	(1.039)	(4.974)
Destination is financial center (0/1)	2.440***	1.606***	0.028
	(0.608)	(0.480)	(0.823)
Country-year fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No
Year fixed effects	No	No	No
Number of observations	27,908	24,900	6,893
Number of panel units	5,800	4,319	1,066
R² within	0.088	0.106	0.229
R² between	0.436	0.626	0.740
R² overall	0.440	0.585	0.682

Table 8: Regressions with Host Country Characteristics and Banking Regulation

This table presents results from regressions with bank holding company fixed effects using the full sample, i.e. pooling across the three different modes of international banking. The dependent variable is the log of banks' total international assets held in different destination countries through the domestic headquarters, its foreign branches, or its foreign subsidiaries located in different host countries. Standard errors are in parentheses. All bank-level as well as the host country level covariates are lagged by one year. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

	(1) Baseline	(2) Baseline with regulatory measures	(3) Before 2007	(4) After 2007	(5) Before 2008	(6) After 2008
Log size (t-1)	0.609***	0.603***	0.305*	0.136	0.731***	0.062
	(0.106)	(0.106)	(0.158)	(0.146)	(0.130)	(0.165)
Capitalization (t-1)	-0.018	-0.015	-0.008	-0.075***	-0.016	-0.070***
	(0.014)	(0.014)	(0.016)	(0.021)	(0.017)	(0.021)
Wholesale funding (t-1)	0.008***	0.008***	0.001	0.012***	0.005**	0.014***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)
Short-term funding (t-1)	0.001	0.001	0.004	-0.006***	0.004	-0.005**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
State support (0/1)	-0.253***	-0.233***	0.000	-0.138***	-0.126	-0.107
	(0.054)	(0.055)	(0.000)	(0.045)	(0.227)	(0.088)
Subsidiary activity (0/1)	-6.142***	-6.172***	-8.176***	-9.190***	-6.137***	-10.144***
	(0.892)	(0.931)	(1.272)	(1.044)	(1.109)	(1.327)
Branch activity (0/1)	-5.175***	-5.206***	-7.659***	-7.576***	-5.475***	-8.478***
	(0.873)	(0.904)	(1.257)	(1.022)	(1.088)	(1.310)
Log distance	-0.587***	-0.587***	-0.606***	-0.593***	-0.603***	-0.615***
	(0.202)	(0.202)	(0.212)	(0.218)	(0.208)	(0.223)
Adjacency (0/1)	0.370	0.371	0.273	0.401	0.230	0.535**
	(0.246)	(0.246)	(0.242)	(0.262)	(0.240)	(0.269)
Common legal origin (0/1)	0.301*	0.303*	0.286	0.321*	0.266	0.330*
	(0.168)	(0.168)	(0.191)	(0.177)	(0.183)	(0.186)
Common language (0/1)	0.527**	0.528**	0.569**	0.516**	0.610**	0.413
	(0.252)	(0.252)	(0.270)	(0.256)	(0.264)	(0.270)
Regional trade agreement (0/1)	0.482*	0.486**	0.326	0.863**	0.306	0.862**
	(0.247)	(0.248)	(0.255)	(0.375)	(0.244)	(0.385)
Common currency (Euro) (0/1)	0.241	0.233	0.293	0.282	0.339	0.293
	(0.201)	(0.202)	(0.238)	(0.212)	(0.224)	(0.239)
Financial freedom (t-1)	0.014***	0.014***	0.003	0.006	0.008**	0.015*
	(0.003)	(0.003)	(0.004)	(0.008)	(0.004)	(0.008)
Business freedom (t-1)	0.010***	0.009***	0.002	-0.019*	0.008**	0.004
	(0.003)	(0.003)	(0.003)	(0.012)	(0.003)	(0.014)
GDP per capita (t-1)	0.079***	0.083***	-0.031	0.035	0.063	-0.072
	(0.030)	(0.029)	(0.043)	(0.041)	(0.040)	(0.049)
Host is destination (0/1)	3.133***	3.131***	3.142***	3.068***	3.234***	2.972***
	(0.497)	(0.496)	(0.560)	(0.528)	(0.541)	(0.536)
Host is financial center (0/1)	2.074**	2.134**	4.986***	4.916***	2.218*	6.444***
	(0.984)	(0.988)	(1.396)	(1.244)	(1.223)	(1.491)
Destination is financial center (0/1)	1.872***	1.899***	-0.079	1.934***	-0.092	1.995***
	(0.353)	(0.346)	(0.470)	(0.386)	(0.461)	(0.400)
Asset measures (0-5)		-0.147**	-0.033	-0.134**	0.088	-0.066
		(0.063)	(0.227)	(0.054)	(0.178)	(0.048)
Asset/liability measures		0.049	0.118	0.158	-0.027	-0.007

(0-3)		*(0.111)*	*(0.293)*	*(0.109)*	*(0.192)*	*(0.149)*
Capital measures (0-3)		-0.110	0.038	0.200	-0.433	-0.018
		(0.181)	*(0.079)*	*(0.184)*	*(0.630)*	*(0.206)*
Country-year fixed effects	Destination	Destination	Destination	Destination	Destination	Destination
Country fixed effects	Host	Host	Host	Host	Host	Host
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	45,691	45,691	23,203	22,488	29,030	16,661
Number of panel units	8,694	8,694	7,371	7,312	7,712	6,796
R² within	0.056	0.056	0.047	0.040	0.051	0.039
R² between	0.544	0.544	0.555	0.550	0.561	0.535
R² overall	0.522	0.522	0.526	0.535	0.530	0.532

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