# DEUTSCHE BUNDESBANK

# Clustering or competition? The foreign investment behaviour of German banks

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**Abstract:**

The presence of other firms in a foreign market can have a double-edged effect on the profitability of new entrants. Firstly, a larger presence of other firms implies more competition and thus lowers the earnings prospects of new entrants. Secondly, there might be positive spill-over effects between the activities of new and old entrants, which can lead to clustering effects. Such clustering of firms in foreign markets has been documented in the empirical literature on foreign direct investment (FDI) of non-financial firms, but little evidence is available for banks. This paper analyses whether banks have a tendency to cluster abroad and whether smaller banks in particular invest in markets where other banks are already present. We use firm-level evidence on the foreign direct investments of German banks for the period 1997-2000 to test this hypothesis. Our results suggest that German banks are indeed more active in markets in which other German banks are already present. However, once we control for country-fixed effects, the negative competition effect dominates.

## Non Technical Summary

Banks face a trade-off in assessing the value of the presence of other banks when choosing the location of their international investments. Firstly, a larger presence of other banks implies more competition and thus lowers the earnings prospects of new entrants. Secondly, there might be positive spill-over effects between the activities of new and old entrants, which can lead to clustering effects. Such clustering of firms in foreign markets has been documented in the empirical literature on foreign direct investment (FDI) of non-financial firms, but little evidence is available for banks.

This paper studies the trade-off between competition and clustering effects in the internationalisation decisions of German banks, focusing on two main questions: Do activities of other banks have an impact on the investment decisions of new entrants? And does the presence of other banks have a negative or a positive impact on the entry of new banks, ie does the competition or the clustering effect dominate? If activities of other banks increase the attractiveness of countries for new entrants, we take this as an indication of clustering effects; if activities of other banks lower the attractiveness of countries for new entrants, competition effects are likely to dominate.

Independently of the different measures we use for the activities of other banks, there is strong evidence that individual banks have higher investments in markets where other German banks are active as well. This result could be taken as evidence for clustering effects. But it can also be an indicator that there are further country-specific factors, which are not included in the analysis but nevertheless important for the decision making process in the banks' central offices. Including that in the analysis leads to the result that activities of other banks seem to have a negative impact on the foreign investments of German banks. These results are consistent with a competition effect rather than a clustering or agglomeration effect. If anything, results suggest that clustering might be somewhat more important for the small banks than it is for the large banks.

## Nichttechnische Zusammenfassung

Banken sehen sich bei der Wahl eines Ziellandes für ihre Direktinvestitionen einem Zwiespalt gegenüber, wenn sie etwa versuchen, den Wert der Tätigkeit anderer deutscher Banken in diesem Auslandsmarkt einzuschätzen. Denn einerseits führt die größere Aktivität anderer Banken zu mehr Wettbewerb und verringert dadurch die Gewinnaussichten der neuen Marktteilnehmer. Andererseits ergeben sich möglicherweise aber auch Übertragungseffekte zwischen eingesessenen und neuen Marktteilnehmern, was für eine Konzentration spräche. Während solche Effekte für nichtfinanzielle Unternehmen in der Literatur sehr gut dokumentiert sind, existieren nur wenige Untersuchungen für den Bankensektor.

Das hier vorliegende Papier analysiert den angesprochenen Zwiespalt zwischen Wettbewerbs- und Konzentrationseffekten in den Investitionsentscheidungen deutscher Banken. Es konzentriert sich dabei auf die folgenden Fragestellungen: Haben die Aktivitäten anderer deutscher Banken einen Einfluss auf die Investitionsentscheidungen neuer Marktteilnehmer? Und hat die Gegenwart anderer deutscher Banken einen positiven oder negativen Einfluss auf den Marktzutritt neuer Banken? Mit anderen Worten: Überwiegt der Wettbewerbs- oder der Konzentrationseffekt? Falls die Aktivitäten anderer deutscher Banken die Attraktivität dieser Länder für Marktzutritte weiterer Banken erhöht, so werten wir dies als Indiz für Konzentrationseffekte. Im umgekehrten Fall schließen wir auf die Dominanz von Wettbewerbseffekten.

Unabhängig vom verwendeten Maß für die Aktivität anderer deutscher Banken ergibt sich, dass deutsche Banken höhere Investitionen dort tätigen, wo schon andere präsent sind. Dieses Ergebnis könnte als Indiz für Konzentrationseffekte gewertet werden. Aber es kann genauso gut ein Hinweis darauf sein, dass es länderspezifische Einflussfaktoren gibt, welche in die Analyse nicht eingegangen sind, aber sehr wohl bedeutend für die jeweiligen, individuellen Investitionsentscheidungen der Banken sind. Dies kann durch ein spezielles Verfahren überprüft werden. Es zeigt sich nun ein deutlich negativer Einfluss der Aktivität anderer deutscher Banken auf das Investitionsvolumen. Dieses Ergebnis spricht somit eher für die Dominanz von Wettbewerbseffekten. Wenn überhaupt, dann stützen die Ergebnisse die Hypothese wonach Konzentrationseffekten bei kleineren Banken eine höherer Bedeutung zukommt als bei großen Banken.

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## 1 Motivation

International banking has expanded rapidly over the past few decades as is shown by a growing number of mergers and acquisitions in banking and by increased cross-border lending. Regional and sequential patterns of banking internationalisation, however, differ for banks from country to country. Spanish banks, for instance, have made significant inroads into the banking markets of Latin America, as have Austrian banks in the transition economies of central and eastern Europe. Similarly, German banks' activities abroad cluster in a few countries such as Luxembourg, the United Kingdom, and the United States. More recently, German banks have also moved into the transition economies. One reason for these uneven patterns of international expansion might be positive spill-over effects that the presence of home-country banks has on the profitability of new entrants from that same country.

Banks face a trade-off in assessing the value of the presence of other banks when choosing the location of their international investments. Firstly, a larger presence of other banks implies more competition and thus lowers the earnings prospects of new entrants. Secondly, there might be positive spill-over effects between the activities of new and old entrants, which can lead to clustering effects. Such clustering of firms in foreign markets has been documented in the empirical literature on foreign direct investment (FDI) of non-financial firms, but little evidence is available for banks.

For non-financial firms, there is a large body of theoretical and empirical evidence demonstrating the importance of agglomeration effects which lead to the clustering of firms in certain markets. (For recent contributions and surveys of the literature see Barry *et al* (2001) and Crozet *et al* (2003).) Reasons for the presence of agglomeration effects, which are stressed in the theoretical literature, are knowledge spill-overs between firms, access to labour markets in specialised factors, the scope for backward and forward linkages, and signalling

effects which lower information costs (Barry *et al* 2001). Empirical work testing the presence of these agglomeration effects has so far focused mainly on manufacturing firms, finding evidence in favour of agglomeration effects for British and US investment in Ireland (Barry *et al* 2001), foreign direct investment in France (Crozet *et al* 2003), for Japanese investment in Europe (Head and Mayer 2002), or for Japanese firms in the United States (Head *et al* 1995).

As far as the banking literature is concerned, there is one paper that studies the following-behaviour of small versus large banks. Barron and Valev (2000) have formalised the idea that small banks are less likely to go abroad than their larger counterparts and, if at all, are more likely to follow other banks. Barron and Valev have a theoretical model which focuses on wealth constraints as barriers to international investment. They argue that investing abroad requires a (fixed) investment in information on foreign markets. Smaller banks, being more wealth-constrained than larger banks, have less of an incentive to incur this fixed cost. If these smaller banks go abroad, they would, according to this model, have an incentive to follow the behaviour of (presumably better informed) larger banks.

This paper studies the trade-off between competition and clustering effects in the internationalisation decisions of German banks, focusing on two main questions: Do activities of other banks have an impact on the investment decisions of new entrants? And does the presence of other banks have a negative or a positive impact on the entry of new banks, ie does the competition or the clustering effect dominate? If activities of other banks increase the attractiveness of countries for new entrants, we take this as an indication of clustering effects; if activities of other banks lower the attractiveness of countries for new entrants, competition effects are likely to dominate.[1]

We use a new and unique dataset which comprises data on the foreign direct investments and on the balance sheets and income statements of German banks. Using these data, we can analyse not only whether banks invest abroad but also how the relevant decision is influenced by the size of banks. That is, we can test whether the following behaviour differs for small and large banks.

Studying the German banking sector is particularly interesting in this context because this sector is characterised by a significant dichotomy between some large, international banks and a number of small, local and regional banks. The importance of banks' foreign activities

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[1] Note that the regional dimension of out data does not allow clustering within host countries to be studied directly. However, in most of the countries under study, international banking activity is concentrated in a few or mostly only one large city. Therefore, we can take clustering effects at a country level as proxies for regional clustering as well.

illustrates this point. Whereas, for the large commercial banks in Germany, foreign borrowing or lending accounted for about half of their balance sheet total in 2001, the corresponding figure for the savings banks was in the order of no more than 1–3% (OECD 2002).

Our analysis proceeds in three steps. In Section 2 below, we briefly review earlier evidence on clustering in banking markets. In Section 3, we describe our data and the differences in the international activities of small and large banks. Section 4 presents regression results. We start with regressions explaining FDI of banks both for the full sample and for banks of different size. We then account for whether banks cluster in specific markets, and we test whether these clustering effects are more or less important for the smaller banks than for the larger banks in the sample. Moreover, we try to disentangle the clustering from the competition effect.

## 2    Clustering of banks: earlier evidence

Although the clustering of investors in foreign markets and herding behaviour have been an important area of research in the finance literature, only a few papers have looked at evidence for banks. An exception to this is the work undertaken by Barron and Valev (2000), and we therefore review their main arguments here. Barron and Valev start with a theoretical model which assumes that investors – ie banks – have access to two international investment opportunities. Investors can either buy a risk-free asset or a risky asset. They have the option to learn more about the characteristics of the risky asset by purchasing a signal and thus information about this investment opportunity. The costs of purchasing this information are fixed. Therefore, the level of investors' wealth enters the decision problem: the higher the level of wealth, the more information is purchased. As an alternative to purchasing information on the market, investors may try to infer from the behaviour of other investors what the signal might have been. The model predicts that there will be a leader-follower behaviour of investors and that the less wealthy investors will be more prone to herding than the wealthy investors.

From their model, Barron and Valev (2000) derive two main testable implications: (i) changes in the investment behaviour of large ("wealthy") banks trigger changes in the investment behaviour of smaller banks, and (ii) the intensity of the follower-behaviour of smaller banks depends on the degree of persistence in the underlying economic conditions of the host economy. The degree of persistence matters because a higher persistence implies that last-period signals are informative with regard to current conditions. Hence, more useful information can be gained from observing the behaviour of investors in the past.

The model is tested on semi-annual data on the short-term foreign assets of US banks in 40 host countries for the period 1982-1994. Data on longer-term assets are included as robustness

checks. Large and small banks are defined according to their total assets and total capital. Medium-sized banks are excluded. The main empirical testing strategy is to use changes in lending for large and small banks and to test for Granger non-causality between the two. The hypothesis is that changes in the cross-border lending of large banks cause changes in the lending of smaller banks but that the reverse does not hold. Also, lending by large banks is interacted with proxies for the degree of persistence in economic conditions. Regression results confirm both of the hypotheses stated above: there is a stronger link between the lending of larger banks and that of small banks than there is in the reverse case, and this link is stronger, the more persistent economic conditions are.

While work by Barron and Valev (2000) looks for evidence on herding behaviour in the international lending of small and large banks, work by Chang, Chaudhuri, and Jayaratne (1997) tests whether there is evidence that bank branches cluster in certain regions. Using data for New York City for 221 bank branches opened between 1990 and 1995, they test whether banks are more likely to open branches in areas where other banks are already active. Results suggest that such clustering is indeed important: even after controlling for factors affecting expected profitability, new branch openings tend to succeed those of other banks. Adopted to the issue of FDI, their empirical analysis is based on a profit function for foreign branches which takes the following form:

$$\pi_{ij,t} = \beta_1 X_{it} + \beta_2 X_{jt} + \beta_2 FDI_{jt} + \varepsilon_{ijt} \tag{1}$$

where $\pi_{ij,t}$ are the profits for bank $i$ from operating a branch in country $j$, $X_{it}$ is a vector of bank-specific factors for bank $i$, $X_{jt}$ is a vector of country-specific factors, $FDI_{jt}$ is a proxy for the activities of other banks in country $j$, and $\varepsilon_{ijt}$ is an error term.

Rather than estimating the above profit equation directly, Chang *et al* (1997) use the investment of bank $i$ in a given region ($FDI_{ij,t}$) as the dependent variable. The reason for this specification is that the higher are the profits from operating branches in a given region, the larger will be the investment of bank $i$. Hence, the equation to be estimated is given by

$$FDI_{ij,t} = \beta_1 X_{it} + \beta_2 X_{jt} + \beta_2 FDI_{jt} + \varepsilon_{ijt} \tag{2}$$

The proxy for the activities of other banks is included as a measure for the intensity of competition in the country in question. Hence, as in equation (1), the expected coefficient on the activities of other banks $\beta_2$ is expected to be negative if more activities of others have a negative impact on the profitability of bank $i$ owing to increased competition. The expected impact of $FDI_{jt}$ would be positive, however, if herding and agglomeration effects were at work.

The work by Chang *et al* (1997) is closely related to work on FDI of non-financial firms that tries to test for agglomeration effects. One route typically taken in this line of research is to use the FDI of other firms in order to explain the FDI of an individual investor. Head and Mayer (2002) use such an approach to analyse the FDI of Japanese firms in Europe. They include the number of Japanese affiliates in Europe as a regressor in order to control for agglomeration effects. This variable has a positive and significant impact on FDI, even if a full set of country dummies is included. This indicates that agglomeration effects are present and that these effects dominate possible competition effects. However, the authors also argue that the hypothesis that observed agglomeration merely reflects omitted exogenous location attributes cannot be falsified.

Barry *et al* (2001) try to distinguish empirically between an 'agglomeration' and a 'demonstration' effect. The 'agglomeration' effect is related to knowledge spill-overs, access to a thick labour market, and to the scope for exploiting backward and forward linkages. The 'demonstration' effect is related to the fact that investment takes place under uncertainty and that the presence of other (home or host-country) firms in a given market may be taken as a positive signal for new entrants to enter that market as well. Hence, it is similar to the information spill-over stressed in the model by Barron and Valev (2000). Owing to the differences in the production process of banks and manufacturing firms, it might be expected that 'demonstration effects' and access to specialised labour markets are the most important factors behind a possible clustering of banks. In studying the locational choice of British and US investors in Ireland, Barry *et al* (2001) find evidence of the demonstration effect for investments of both British and US firms. The agglomeration effect, in turn, is found only for US firms.

Finally, Crozet *et al* (2003) take detailed account of the locational choices of foreign investors in France. While also focusing on the investment decisions of manufacturing firms, their study is interesting for the present paper because they show that the nationality of firms matters for location patterns, that there is a learning process in investment decisions, and that firms cluster with their competitors. At the same time, there is heterogeneity in these effects among investors from different countries: while proximity to other foreign and French firms has a positive impact on location choices, proximity to firms from the same home country has a positive effect for some investors (Belgium, UK, Japan), is insignificant for others (Germany, USA, Switzerland), and has a negative effect for a last group of source countries of FDI (Netherlands, Italy).

# 3    The data

The empirical analysis in this paper is based on a new firm-level dataset. This dataset consists of data retrieved from the German foreign direct investment stock statistics and the balance sheet and income-statement statistics for German banks. Since the firm-level information contained in these datasets has not been used previously for an analysis of German banks' foreign direct investments,[2] it is useful to describe the data and some of the main transformations that were necessary to bring the data sources together. We also report descriptive statistics using this dataset.

## 3.1    Construction of the dataset

In addition to information on host-country characteristics which will be described below, data used in this paper are taken from two data sources. We use balance sheet statistics and income statements for German banks and German FDI stock statistics. Individual data, however, are not available for a time period that fully overlaps. Hence, the combined dataset contains data for four years (1997-2000).

The starting point for merging the data from the two sources was the monthly balance sheet statistics for German banks. This supplied the information for constructing a dataset containing all German banks in existence throughout the period under review. For each of these banks, year-end information on equity capital, total assets, yields from operational business (taken from the income statements), and on the claims and liabilities to resident and non-resident banks and non-banks have been retrieved. The latter have been used to calculate the ratio of cross-border claims (liabilities) to total assets as a measure for the internationalisation of the bank in question.

The FDI micro-dataset contains data from annual full sample surveys on direct investment stocks carried out by the Deutsche Bundesbank.[3] The dataset starts in 1989 but includes time series for individual enterprises only from 1996 to 2000. For earlier periods, individual data are available but the data cannot be linked over time because company codes prior to 1996 have been irreversibly recoded. The data collected by the Bundesbank mainly contain information from enterprises' balance sheets that is needed to calculate the primary and secondary direct investment stocks of non-residents in Germany and of residents abroad. From this dataset, the figures for the consolidated amounts of primary and secondary outward

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[2]  One exception is Buch and Lipponer (2004), were we examine the choice between foreign direct investment and cross-border provision of financial services of German banks using the same dataset.

[3]  For further details see Lipponer (2002) and Lipponer (2003).

direct investment per direct investment enterprise (affiliate)[4] have been added. For banks acting as direct investors, loans and trade credits due to the investor by an affiliate (ie loan capital for non-bank-investors) are, in most cases, not counted as FDI. Hence, only data for FDI in equity capital have been used. These data include profits or losses for the current financial year because they are taken from the balance sheet before the allocation of net income. This means that the "original" FDI data include profits to be distributed and thus part of the profits to be repatriated. In order to prevent the latter from entering our FDI data, profits or losses for the current financial year have been deducted. Reinvested earnings therefore appear in next year's revenue reserves or profit carried forward.

Stock data are aggregated by the country of the foreign affiliates. The number of affiliates that a given investor maintains in a specific host country is calculated during the aggregation procedure and is included in the combined data.

Even though FDI data are aggregated by destination country, some 55,000 reports of around 2,600 German banks are included in the dataset. In 2000, these banks returned reports on some 1,150 foreign affiliates residing in more than 60 countries, resulting in around 350 FDI-reports at the country level. Nevertheless, more than 1,000 of the 2,600 banks in the sample do not report FDI. These are the domestic banks that we use as a control group in our empirical analysis below.

## 3.2 Stylised facts

This section provides descriptive statistics for the data used in the analysis. Unless otherwise stated, all data are for year 2000. Table 2 in the appendix provides further summary statistics. We use the sub-sample of banks reporting FDI to distinguish small banks from large banks (see Table 3). Hence, we define small banks as those with total assets below €49.1 billion (53 banks) and large banks as those with assets exceeding €49.1 billion (22 banks). For the period under study, these cut-off points roughly correspond to the 75% quantile of the asset values of the banks that report FDI. In terms of the full sample, *all* of these banks are actually the larger banks.

Of the 192 countries which are included in our analysis, FDI actually takes place in only 64. In the six (three) host countries with the highest amount of German banks' direct investment (that roughly corresponds to a fraction of 10% (5%) of the 64 countries) around 83% (72%) of

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4   The consolidated amount of primary and secondary FDI is calculated by adding secondary FDI held by dependent holding companies to the amount of primary FDI and then deducting primary FDI in these holding companies in order to prevent double counting.

German banks' total FDI is located. These figures give a quite good impression of the concentration or clustering of German banks' affiliates abroad.

**Figure 1 — Average number of countries and affiliates per country**
– by bank size –



■ small banks ☐ large banks
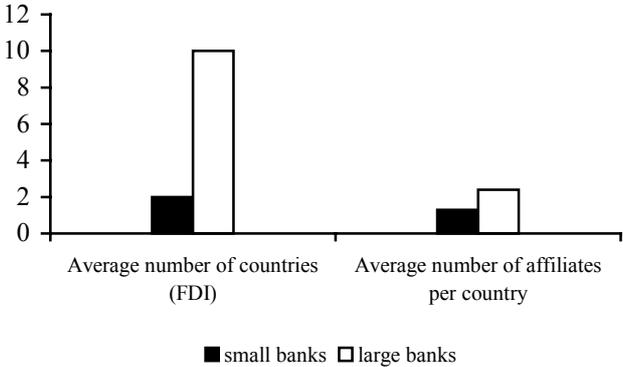
There are a couple of differences between small banks and large banks. First, there are – according to our definition – only five large banks but 2,494 small banks which do *not* report FDI activity abroad. Second, the mean foreign direct investment abroad is much smaller for the smaller banks. On average, FDI of smaller banks is only 10% of the amount invested by large banks. Large and small banks also differ with regard to the average number of countries in which they are active and the average number of affiliates per country (Figure 1). While small banks are active – on average – in only two countries, the corresponding figure for the large banks is ten countries. In terms of the number of affiliates per country which they maintain, the difference is less pronounced (two and three for the small and large banks, respectively).

**Figure 2 — Importance of FDI by bank size**



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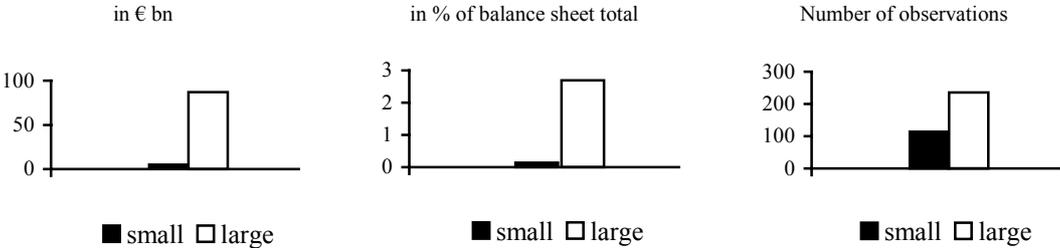
Table 3 describes the importance of FDI relative to the banks' balance sheet total for small and large banks. Figure 2 visualises the differences, using three different measures of the importance of FDI. The interesting observation which may be taken from this graph is that the FDI of small banks is relatively unimportant from the point of view of both the actual amounts invested and the importance of FDI relative to the banks' balance sheet total. According to both measures, the FDI of small banks accounts for only a fraction of total FDI. However, since small banks are more numerous than large banks, the smaller banks in the sample account for a quite significant fraction of the reports on FDI received by the Bundesbank. In fact, about one-third of all reports on FDI are those submitted by smaller banks.

In summary, the first two measures of the importance of FDI of smaller banks presented in Figure 2 suggest that the fixed costs of FDI are indeed important, and it seems to be the larger banks that find it easier to shoulder these costs. The last piece of observation, the number of activities, shows that borders do not generally prohibit smaller banks from expanding internationally, and we will thus shed more light on the determinants of bank FDI in the following section.

## 4    Empirical results

This section analyses the determinants of the foreign direct investments of small compared with large banks. FDI in foreign markets involves substantial fixed costs. Also, banks have a significant degree of uncertainty about the profitability of FDI. Hence, following the logic of the model by Barron and Valev (2000), smaller and presumably more wealth-constrained banks are more likely to try to infer information about investment opportunities from the behaviour of others. This, in turn, might show up in smaller banks displaying a greater propensity to invest in markets where other banks from the same home country are already present. Before we test for evidence of such clustering effects in our data, we describe the empirical model we use and the results of baseline regressions for the determinants of FDI of German banks by bank size.

### 4.1    Empirical model

The empirical analysis of this paper is based on an extended gravity equation. Essentially, gravity equations relate the magnitude of bilateral economic activities between countries to geographical distance and the size of the economies. When applied to cross-border financial transactions, these equations are enriched by a number of variables capturing barriers to the integration of markets, such as regulations and information cost variables, ie by variables that affect the profitability of investing abroad. Hence, we essentially estimate equation (2) above.

In addition to a vector of bank-specific explanatory variables and a vector of country-specific explanatory variables, we include time-fixed effects to control for the time dimension of our data and to capture possible trends. The dependent variables and some of the explanatory variables (assets, distance, GDP, risk) are entered in logs.

Since we have bank-level data for all German banks, we can model not only the determinants of the foreign activities of these banks but also the characteristics of banks which do go abroad in contrast to those banks which stay national. The natural candidate for studying this choice is a Tobit model. This model makes it possible to separate the decision of banks on whether to expand internationally from the decision on how much to invest to a given market.

Unlike coefficient estimates obtained from OLS regressions, Tobit coefficients cannot readily be interpreted in terms of the impact of the explanatory variable on the dependent variable. Rather, we need to obtain the marginal effects of each coefficient that indicates the change in the probability of being uncensored (ie having a positive value) and the change in the amount invested, given an observed activity. According to McDonald and Moffit (1980), the marginal effect of $x_i$ on $y_{ij}$ in a Tobit regression may be decomposed into two components:

$$\frac{\partial E[y_{ijt} \mid x_{it}]}{\partial x_{it}} = \Pr[y_{ijt} > 0]\frac{\partial E[y_{ijt} \mid x_{it}, y_{ijt} > 0]}{\partial x_{it}} + E[y_{ijt} \mid x_{it}, y_{ijt} > 0]\frac{\partial \Pr[y_{ijt} > 0]}{\partial x_{it}} \quad (3).$$

Hence, the impact of a change in $x_i$ on the expected value of the dependent variable $y_{ij}$ can be decomposed into, first, the impact on the conditional mean of $y_{ij}$ given that positive values are observed and, second, the impact on the probability that the observation will fall in the positive part of the distribution.

In terms of the interpretation of the marginal effects, it is important to note that the marginal effects for continuous variables are real "marginal" effects whereas those for dummies are calculated for a change in the variable from 0 to 1. A problem occurs with the marginal effects for ordinal variables, because the software we use calculates standard marginal effects in these cases. Hence, for those variables, the marginal effects given in the tables do not accurately reflect what would happen if the variable were to change from one possible realisation to another. This means that the magnitudes of different marginal effects are difficult to compare, and we refrain from providing such interpretations across variables in the text.

Generally, in qualitative terms, we obtain the same results for the two marginal effects, ie for the probability of being uncensored and for the expected value of the dependent variable conditional upon being uncensored. Therefore, and in order to save space, we report the two marginal effects only for the baseline regression results and restrict ourselves to the unconditional marginal effect thereafter.

## 4.2 Baseline regression results

Before testing for evidence on agglomeration effects, we run a set of baseline regressions for banks of different size. We regress the amount of FDI abroad on bank-specific and country-specific variables. The analysis is restricted to OECD countries.[5]

### 4.2.1 Bank-level explanatory variables

Table 4 summarises our first set of regression results. We use the *size* of banks, their *profitability*, and their degree of *internationalisation* to capture bank-specific determinants of banks' foreign direct investments.[6] Additionally, we include dummy variables for the *type of bank* (commercial, savings, and cooperative banks). Foreign banks, ie dependent German branches of banks headquartered outside Germany, building and loan associations as well as the Bundesbank, its affiliates and branches have been excluded from our sample. Promotional banks are included; omitting them does not affect any of the results significantly.

Our findings confirm the results of earlier work on the determinants of international mergers and acquisitions in banking. This shows that larger banks tend to maintain larger presences abroad (Focarelli and Pozzolo 2001). We also control for the profitability of the reporting bank by including banks' yields from operational business, scaled by total assets. We find a positive coefficient. One explanation for this is that more profitable banks seek investment opportunities in foreign markets and have more cash flow to finance foreign investments. This result would be consistent with the model by Barron and Valev (2000), which implies that wealth constraints might be major impediments to the international expansion of banks.

We include a measure for the degree of internationalisation of the reporting bank. To compute this measure, we use the sum of cross-border lending and borrowing as reported in the appendices to the balance sheet statistics, scaled by total lending and borrowing. It might be objected that this variable is endogenous because our dependent variables capture proxies for the internationalisation of banks as well. However, we do not believe that endogeneity is a serious concern because we use aggregated data for the individual bank rather than bilateral assets and liabilities in a given reporting country. Our results strongly suggest that more international banks also hold larger investments abroad.

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[5]  In a companion paper (Buch and Lipponer 2004), we show that the determinants of bank FDI in OECD countries and in the full set of countries for which we have data on FDI of German banks are very similar. Restricting the analysis to OECD countries has the advantage that more and more consistent data are available.

[6]  Table 1 in the appendix provides more detailed definitions and data sources.

*4.2.2   Country-level explanatory variables* [7]

FDI of financial institutions may also be expected to respond to characteristics of the host country which can be grouped into proxies for market size, geographical, cultural and economic distance between countries, the degree of (macroeconomic) stability, and the degree of countries' regulatory restrictions.

Gross Domestic Product (*GDP*) (in logs) is included to control for market size in general. Additionally, we use the ratio of bilateral *trade* between Germany and a given host country relative to host-country GDP as a proxy for the intensity of trade relations. Since international banking activities are, to a large extent, related to trade, this variable is a measure of the demand for banking services, and we expect a positive coefficient. Since we are using firm-level data as the dependent variable, potential endogeneity of bilateral trade is not an issue.

Both proxies for the size of the foreign market have a positive sign. Hence, the realisation of economies of scale is one main reason why banks go abroad. A significant impact of trade on the internationalisation of banks has often been interpreted in terms of banks following their customers abroad, although the direction of causality has remained somewhat unexplored. Although we cannot link banks directly to their individual customers, we note that the positive impact of trade would be consistent with such a story.

Some country-specific variables are used to capture gravity-type factors and cultural similarity. Geographical *distance*, measured by the "great circle distance" between Berlin and the capital city in the host country in kilometres, is expected to lower the FDI of banks. Larger distance might be an impediment as it leads to higher communication and information costs and because it restricts face-to-face communication and networking. Moreover, a greater distance also reflects differences in culture, language and institutions (see, for example, Berger *et al* 2003). Results confirm this expectation: distance is negative and significant.

We use different variables to control for the stability of the host economy and its regulatory structure.

The GDP deflator is used as a proxy for inflation. The impact of inflation on FDI is not clear-cut a priori. First, we expect inflation to have a negative impact because of the increased

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[7]  All data denominated in foreign currencies (eg the data retrieved from the World Bank's *World Development Indicators* CD-ROM) are converted into euro. For the period 1997 and 1998, foreign currencies are converted into DM and then into euro, using the fixed conversion rate for the Deutsche Mark which is DM1.95583/€1. For year-end data, year-end exchange rates are used, whereas other data such as the GDP figures are converted using the average exchange rates of the year in question.

macroeconomic instability that it implies. Second, higher inflation might also have a positive impact on the nominal dependent variable we are using. In our data, the second effect dominates, ie higher inflation increases the (nominal) value of FDI in a given host country.

The level of inflation is only one measure of the riskiness of the host economy. Focusing on macroeconomic stability, it does not take into account the risk of expropriation and of political risk in general. Therefore, we include *risk* as a composite index of country risk, taken from various issues of *Euromoney*. This variable has a higher score when country risk is small. We find a positive coefficient, which implies that lower risk indeed encourages the FDI of banks.

The degree of regulation in banking is captured through different indicators.

o   We include the degree of economic *freedom* in banking. The expected sign is negative since the measure assigns a higher index number to countries which have in place regulations on the activities of banks. We find this variable to have an insignificant effect, however.

o   We include a proxy for the severity of regulations on cross-border capital flows. *Capital controls* is a dummy, which is set equal to 1 if countries impose controls on cross-border financial credits. We find that banks conduct less FDI in countries which have capital controls in place and thus a negative coefficient.

o   We include two measures of the quality of the host country's supervisory system. Barth *et al* (2001) have compiled a comprehensive dataset on banking supervision around the globe. From this database, we follow Buch and De Long (2003) and construct two indices which capture the power of the banking supervision authorities to intervene in banks (*supervision*) and the transparency of the supervisory system (*transparency*). Both indicators assume higher values as the quality of the supervisory system improves, ie as supervisory power and transparency increase. German banks seem to appreciate strict regulatory systems: the signs for both of these variables are positive.

In sum, we find three coefficients for the regulatory variables (*supervision*, *transparency*, and *capital controls*) which are in line with expectations, ie the less regulated the capital account regime is and the stricter supervision is, the more FDI takes place.

Finally, we add a dummy variable 'EU' which is set equal to 1 for countries that are members of the European Union. Contrary to expectations that the single market might have promoted cross-border entry, we find an insignificant sign. The reason could be that the single market programme has also eased cross-border lending, thereby reducing incentives to engage in FDI.

Note that we do not include a dummy for the presence of a common border as a proxy for information costs. The same holds for a common language dummy. The reason why we do not include these variables is that countries sharing a common border with Germany, or which are German-speaking, tend to be captured through the EU dummy and are geographically close to Germany. Hence, including additional dummies makes it difficult to interpret the remaining dummies and, in particular, the distance variable. We did, however, test the influence of a common language dummy and found that this is more important for small banks than it is for large banks.

### 4.2.3 *Small banks compared with large banks*

Results in Table 4 also show some differences between the determinants of FDI of small and large banks.[8] Interestingly, differences between these two groups of banks are minor. In fact, there are only three variables for which we obtain different results: The positive impact of the degree of banks' internationalisation on the amount invested in their foreign affiliates is driven by the small banks in the sample. For the large banks, internationalisation is slightly negative or insignificant.

The positive impact of inflation, by contrast, is driven only by the large banks in the sample. For the small banks, this variable is insignificant, possibly because the positive impact on inflation on nominal values and the negative impact in terms of macroeconomic stability cancel out.

Likewise, the positive impact of GDP stems only from the larger banks in the sample. This is consistent with the hypothesis that smaller banks seek their market opportunities in relatively small niche markets. These smaller markets are not attractive from the point of view of the larger banks because they do not provide sufficient opportunity to realise economies of scale.

In terms of explanatory power, we achieve the best fit for the full sample (pseudo $R^2$ of 0.37). The $R^2$ falls to 0.28 and 0.14 for the small and large banks, respectively. Hence, some of the explanatory power that we obtain in the full sample is actually driven by the heterogeneity across banks of different size.

### 4.3 Do banks cluster?

Having shown the general determinants of banks' foreign investment strategies, we next turn to the question of whether clustering is important in international investment decisions by

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8   Please refer to section 3.2 for our definition of "small" and "large".

German banks. More specifically, we test the extent to which banks are attracted to a given host country where other German banks are already active. We use the aggregated FDI of *other* German banks in a given market as an additional explanatory variable (see, for example, Head and Mayer (2002) or Chang *et al* (1997) for a similar strategy). Investment of the bank under study is excluded from this number. To avoid problems of multicollinearity, we use the residual of a regression of aggregated FDI on the remaining explanatory variables.

One interpretation of aggregated FDI is that it captures agglomeration effects, ie the presence of other (German) banks in a given market could create positive spill-overs. It is, however, also conceivable that the presence of other banks captures omitted variables which attract *all* banks to a certain market. Since aggregated FDI might simply be capturing country-fixed effects, we additionally present results including a full set of country-fixed effects (see column 4 of Tables 5, 6, and 7).

### 4.3.1 Proxies for agglomeration effects

In order to proxy for the activities of other (German) banks on foreign markets, we distinguish between the impact of the number of foreign banks abroad and the average amount of FDI invested in a particular market ($\overline{FDI}$). Hence, we split up the investment of other banks in market *j* in period *t* into the following two components:

$$FDI_{jt} = \sum_{\substack{k=1 \\ k \neq i}}^{N} FDI_{kjt} = \overline{FDI} \cdot N \tag{4}$$

By splitting up the investment of other banks into these two components, we address the issue raised by Claessens *et al* (2001) that the impact of foreign entry on the profitability of domestic banks depends on the number of banks entering rather than on their market shares, ie the amount which they have invested. Here, we look at a related issue, namely the impact of the activity of other *German* banks on new entrants.

### 4.3.2 Aggregated FDI

Before splitting up the investment of other banks into its components, we use the sum of FDI of others $(FDI_{jt})$ as an additional regressor. Results for regressions including the sum of the FDI of other banks in addition to the explanatory variables discussed above are given in Table 5. In our data, the presence of other banks in a given market is attracting other banks to this market as well. The FDI of others is significant in all equations, and the pseudo $R^2$ increases slightly.

The next interesting observation that we make after including other banks' aggregated FDI as an additional regressor is that most results for the full sample and for the large banks remain

relatively unchanged (see Table 4 compared with Table 5). The only variable that changes significantly for all sub-groups is the variable capturing banking freedom, which is now negative and significant throughout. Generally speaking, including other banks' FDI has the greatest impact on the macroeconomic variables affecting the FDI of small banks. Distance and transparency, for instance, now become insignificant for the small banks, and risk becomes negative. One interpretation of this result is that smaller banks seek their market niches in those countries which, at first sight, appear to be relatively unattractive.

Next, we include a full set of country dummies (see column 4). This allows testing whether the positive impact of the FDI of others does indeed capture agglomeration effects or is rather the reflection of omitted variables. These are likely to be captured in the country-fixed effects.

One set of variables that is particularly robust against the inclusion of country fixed effects are the bank-specific variables. These remain significant, retain their signs and an almost identical magnitude. This is not very surprising, given that the country-fixed effects are unrelated to bank-specific factors.

Out of the variables capturing country-characteristics, only one variable is quite unaffected by including country-fixed effects: risk remains positive and significant. Most of the remaining country effects, including inflation, freedom, supervision, and transparency, by contrast, become insignificant. Obviously, the country-fixed effects capture the cross-country variation in these variables.

Including country-fixed effects has a significant impact on the sign of the FDI of others as well: this variable switches from being significantly positive to being significantly negative. This result provides an initial indication that the interpretation of activities of other firms in terms of agglomeration or clustering effects might be misleading if country-fixed effects are not included. Our results now suggest that the competition effect dominates.

### 4.3.3   Number of other banks' affiliates

Including the aggregated FDI of other banks in a foreign market as a proxy for agglomeration effects has the disadvantage that it is not possible to distinguish between effects of the number of competitors and effects of the average size of their foreign affiliates. To give an example: there might be a country where only a few German banks are active but where these banks have made large foreign investments. Aggregated FDI in this country might be similar to that in a country where many banks operate but where the average volume of investment is small.

In order to differentiate these effects, we thus include the number of banks, ie a count variable, instead of the aggregated FDI of other German banks as a regressor. Again, we use

the residual of this variable of a regression on the remaining explanatory variables in order to reduce multicollinearity in the data. Results are presented in Table 6.

As for aggregated FDI, we find strong evidence for a positive effect of the other banks' presence: the number of other banks' affiliates is strongly significant for the full sample as well as for the sub-samples of small and large banks. Including the number of other banks' affiliates also leaves most coefficients unchanged compared with the baseline regression (Table 4). The only exception is GDP, which is now significant and positive for the small banks as well. Essentially, the same effects are obtained when we include the number of affiliates of other small or large banks rather than the number of affiliates of all other banks (results not reported).

As before, we also include a full set of county-fixed effects (see column 4 of Table 6). The before positive impact of the number of other banks' affiliates becomes negative and significant, however, as we add these country effects. This effect is somewhat stronger for the large banks than for the small banks but in both cases not significant. Using only other banks' FDI and the country-fixed effects as explanatory variables the impact becomes significantly negative for the large banks and insignificant for the small banks (not reported).

These results are consistent with the hypothesis that the activities of other banks do not capture agglomeration effects but rather competition effects. The more German banks are active in a foreign market (measured either in terms of their investments or their number), the less attractive this market seems to be for further entrants from Germany. The positive coefficient found in the baseline regression is likely to reflect country effects that are not captured in the remaining macro-variables.

In addition to the number of other banks' affiliates, we also include a similar measure for the number of non-banks' affiliates (not reported). This variable comes in with a positive and significant sign for both groups of banks, and the remaining variables do not change. This is an additional piece of information that banks follow firms to foreign markets.

### 4.3.4 Number of other banks' affiliates and mean FDI

In a final step, we split up aggregated investment into the number of other German banks' affiliates which are present in a foreign market and the mean amount of FDI of those banks abroad. Results are given in Table 7. Compared with the baseline specification, we obtain similar qualitative results for the remaining explanatory variables.

These results may be interpreted in the light of the competition-versus-agglomeration debate. A positive impact of the activity of other banks implies that there are positive spill-overs and thus agglomeration effects. A negative impact, by contrast, indicates that the dominant effect

is that the activities of others lead to increased competition. Finding insignificant effects indicates that these effects just cancel out. According to this interpretation, the competition effects arise through similar channels for the small and for the large banks. In both cases, many other German banks which are active abroad potentially create positive agglomeration effects. However, these effects seem to be more important for the large banks than for the small ones.

Again, we include a full set of country dummies to check to what extent FDI of others may capture agglomeration effects. As before the impact of the variables capturing the activity of other banks changes. First, the effect of other banks' mean investment shifts from significantly positive to significantly negative and second, the impact of the number of other banks' affiliates becomes insignificant after having been significantly positive before.

*4.3.5    Robustness Tests*

The degree of competitive pressure due to the presence of other banks is not only related to the presence of other German banks. Rather, the presence of other banks and, in particular, of other (non-German) foreign banks might have an impact on the profitability of additional German banks as well. The competitive impact of the presence of other banks may differ from that of German banks though. On the one hand, German banks may be expected to have a comparative advantage in servicing German non-financial firms rather than non-financial firms from other source countries. On the other hand, recent empirical findings suggest that nationality plays a less important role in international banking relationships than might be thought. Berger et al (2002) provide evidence on the importance of nationality in the bank relationships of multinational (non-financial) firms' foreign affiliates. They find that the foreign offices of multinationals are more likely to use a host nation, rather than a home-nation bank, for the financial services they require. Seth, Nolle, and Mohanty (1998) also find evidence that foreign bank offices do not generally follow their customers abroad.

In order to test better whether the presence of other banks proxies agglomeration or competition effects, information on the total number of banks present in a given country would have to be included. Unfortunately, consistent information on the number of banks is available only for the OECD countries. And, even for those countries, the data often fail to make an adequate distinction between domestic and foreign banks or between domestic commercial banks and savings institutions. Nevertheless, we use that data and find that the total number of banks in a country has no significant impact on the activity of German banks in that respective country (results not reported). Only if both, the total number of banks and the number of affiliates of other German banks, are included in our regressions both coefficients are significantly negative (not reported). Hence, the presence of other German banks seem to matter most in terms of deterring entry.

Finally, we use the number of German non-banks' affiliates in a given market as an additional explanatory variable (results not reported). The positive effect we obtain for this variable survives including country-fixed effects, at least for the full sample and at a 10% significance level. This is evidence in support of the hypothesis that banks are more active in those markets where their customers are. It would be interesting to obtain further evidence on the causality patterns in these internationalisation decisions and on the direct links between banks and their customers, but that is beyond the scope of this paper.

## 5   Summary of results

The purpose of this paper has been to test whether there are differences in the internationalisation patterns of small and large banks and, in particular, whether small banks are more prone to locate where other German banks are already present. Finding such differences in the behaviour of banks of different size might be taken as indirect evidence that costs of obtaining information on foreign markets are shouldered more easily by wealthy investors.

We have used detailed bank-level data on the foreign direct investment patterns of German banks. We find that the behaviour of small and large banks is surprisingly similar. This also holds if we include the number of other German banks' affiliates in a foreign market as a proxy for agglomeration. However, the determinants of the size of foreign direct investments of small and large banks differ to some extent if the aggregated sum of foreign direct investments of other banks is included. One interpretation of the differences is that small banks may have their comparative advantages in market niches and that they actively attempt to distinguish themselves from the behaviour of others.

Independently of the different measures we use for the activities of other banks, there is strong evidence that individual banks have higher investments in markets where other German banks are active as well. While this result could be taken as evidence for clustering effects, it does not survive the inclusion of country-fixed effects. If country-fixed effects are included, activities of other banks instead have a negative impact on the foreign investments of German banks. These results are consistent with a competition effect rather than a clustering or agglomeration effect.

If anything, results suggest that clustering might be somewhat more important for the small banks than it is for the large banks. This is because, after the inclusion of country-fixed effects the appearing negative competition effect only offsets the formerly positive agglomeration effect for this group of banks. For large banks (and for the full sample), by contrast, the competition effect overcompensates the agglomeration effect which shows up in a switch of the effect of other banks' activities from plus to minus.

There are a number of interesting routes along which this paper could be extended. So far, we have restricted our analysis to the impact of other banks' foreign investment on the incentives of additional German banks to locate in a particular market. It would be interesting to extend this analysis to additional aspects of the bank internationalisation such as employment in their foreign affiliates or their provision of services to foreign markets. In addition, it would be interesting to obtain better measures of the activities of banks from other source countries abroad in order to better proxy the impact of nationality for clustering and competition effects in banks' internationalisation decisions.

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## Table 1 — Data definitions

| Variable | Definition | Source |
|---|---|---|
| *Bank-level variables* | | |
| FDI | Sum of primary and secondary direct investment in equity capital minus profits/losses for the current financial year (in €). | Deutsche Bundes-bank (International Capital Links) |
| Internationalisation | Sum of cross-border claims and liabilities over total claims and liabilities (both in €). | Deutsche Bundes-bank (Monthly Banking Statistics) |
| Profitability | Yields from operational business (interest income plus current income from shares/securities plus provisions) over total assets (all in €). | Deutsche Bundes-bank (Monthly Banking Statistics) |
| Assets | Total assets (in €). | Deutsche Bundes-bank (Monthly Banking Statistics) |
| Savings bank | Dummy: 1 for savings banks; otherwise 0 | Deutsche Bundes-bank (Monthly Banking Statistics) |
| Co-operative Bank | Dummy: 1 for cooperative banks; otherwise 0 | Deutsche Bundes-bank (Monthly Banking Statistics) |
| *Market size* | | |
| Trade | Sum of bilateral trade (exports plus imports) (in €) over GDP (in USD converted to €). | Deutsche Bundes-bank, World Bank (WDI 2002) |
| GDP | Gross domestic product (in USD converted to €) | World Bank (WDI 2002) |
| *Geographical and cultural distance* | | |
| Distance | Great circle distance between Berlin and the respective capital cities (in km). | U.S. Dept. of Agri-culture, http://www.wcrl.ars.usda.gov/cec/java/capitals.htm |
| Border | Dummy: 1 for countries with share a common borderline with Germany; otherwise 0 | – |
| Common language | Dummy: 1 for countries with German as the first language; otherwise 0 | – |
| *Stability and regulations* | | |
| Inflation | GDP deflator | World Bank (WDI 2002) |
| Risk | Composite index of country risk, ie the political risk index taken from various issues of Euromoney. It is defined as the risk of non-payment or non-servicing payments for goods or services, loans, trade-related finance and dividends and the non-repatriation of capital. This variable takes values from 10 (no risk of non-payment) to 0 (no repayment expected). This risk index has a higher score when country risk is small. Since lower risk should encourage FDI, the expected coefficient is positive. | Euromoney |
| Freedom | Index of Economic Freedom in Banking. Index runs from 1 to 5, and a higher value indicates a more regulated system. | Heritage Foundation (www.heritage.org) |
| Capital controls | 0-1-dummy Variable for the existence of controls for cross-border financial credits. | IMF (1998) |

| Variable | Definition | Source |
|---|---|---|
| EU | Dummy: 1 for EU member countries; otherwise 0 | – |
| Supervision | Index of toughness of banking supervisors which has been computed as the sum of 1-0-dummies capturing the following aspects: (i) Are supervisors legally liable for their actions?, (ii) Can the supervisory agency supersede bank shareholder rights and declare bank insolvent?, (iii) Can the supervisory agency order directors/management to constitute provisions to cover actual/potential losses?, (iv) Can the supervisory agency suspend dividends?, (v) Can supervisory agency suspend bonuses?, (vi) Can supervisory agency suspend management fees?. The index runs from 0 to 6, and a higher index indicates greater supervisory power. | Barth *et al* (2001), own calculations |
| Transparency | Index of disclosure requirements in the banking industry which has been computed as the sum of 1-0-dummies capturing the following aspects: (i) Are consolidated accounts covering bank and any non-bank financial subsidiaries required?, (ii) Are off-balance sheet items disclosed to public?, (iii) Must banks disclose risk management procedures to public?, (iv) Do regulations require credit ratings for commercial banks? The index runs from 0 to 4, and a higher index indicates greater transparency. | Barth *et al* (2001), own calculations |
| Offshore | Dummy: 1 for Anguilla, Aruba, Bahamas, Bahrain, Barbados, Bermuda, British Virgin Islands, Hong Kong, Cayman Islands, Lebanon, Liberia, Montserrat, Netherlands Antilles, Panama, Singapore, St. Kitts and Nevis, Vanuatu; otherwise 0. | Deutsche Bundes-bank (definition according to BoP statistics) |

## Table 2 — Summary statistics for year 2000

|  | Variable | Obs. | Mean | Std. Dev. |
|---|---|---|---|---|
| Total | FDI | 350 | 2.59E+08 | 2.28E+09 |
|  | Profitability | 494208 | 6.67 | 1.80 |
|  | Internationalisation | 494208 | 2.42 | 8.26 |
|  | Distance | 494208 | 8.40 | 0.92 |
|  | Inflation | 453024 | 1.26E+11 | 1.67E+12 |
|  | Freedom | 409266 | 3.12 | 1.04 |
|  | Supervision | 288288 | 3.89 | 1.56 |
|  | Transparency | 288288 | 1.77 | 0.81 |
|  | GDP | 453024 | 23.12 | 2.36 |
|  | Risk | 458172 | 46.26 | 22.88 |
|  | Trade | 450450 | 6.09 | 11.37 |
| Small banks | FDI | 114 | 3.04E+07 | 5.04E+07 |
|  | Profitability | 489024 | 6.67 | 1.80 |
|  | Internationalisation | 489024 | 2.23 | 7.98 |
| Large banks | FDI | 236 | 3.69E+08 | 2.77E+09 |
|  | Profitability | 5184 | 6.44 | 1.89 |
|  | Internationalisation | 5184 | 20.01 | 13.33 |

## Table 3 – FDI by bank size

We define small banks as those with total assets below €49.1 billion and large banks with assets exceeding that value. For the period under study, these cut-off points roughly correspond to the 25% and the 75% quantile of the banks reporting FDI. For more details see section 3.2. Data are for year 2000.

|  | Small | Large | All |
|---|---|---|---|
| Number of banks |  |  |  |
| Total sample | 2547 | 27 | 2574 |
| FDI sub-sample | 53 | 22 | 75 |
| FDI |  |  |  |
| Amount (billion €) | 3.5 | 87.1 | 90.6 |
| Observations | 114 | 236 | 350 |
| FDI / total assets (%) | 0.14 | 2.69 | 1.58 |
| FDI / yields from operational business (%) | 2.17 | 38.39 | 23.42 |

## Table 4 — Regression results: baseline specification

The following Table gives the results of Tobit regressions for FDI of German banks as a function of the explanatory variables defined in Table 1. M.E.1 gives the marginal effect on the probability of being uncensored, M.E.2 gives the marginal effect on the expected value, conditional on being uncensored. All regressions include time dummies as well as dummies for savings banks and co-operatives. The dependent variable, total assets, distance, GDP, and risk are in logs. N = Number of observations in the sample, Uncensored observations = Number of observations that are not censored. All censored observations are left-censored at zero. Only OECD countries are included.

| | Full sample | | Small banks | | Large banks | |
|---|---|---|---|---|---|---|
| | M.E.1 | M.E.2 | M.E.1 | M.E.2 | M.E.1 | M.E.2 |
| Internationalisation | 4.52e-07 | 8.41e-03 | 4.36e-07 | 7.73e-03 | -1.35e-03 | -1.93e-02 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.083)* | (0.083)* |
| Assets | 2.80e-05 | 5.20e-01 | 2.82e-05 | 5.01e-01 | 2.75e-01 | 3.94e+00 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Profitability | 3.72e-06 | 6.92e-02 | 3.13e-06 | 5.56e-02 | 4.53e-02 | 6.50e-01 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Distance | -7.09e-06 | -1.32e-01 | -9.01e-06 | -1.60e-01 | -4.27e-02 | -6.11e-01 |
| | (0.001)*** | (0.001)*** | (0.030)** | (0.030)** | (0.002)*** | (0.002)*** |
| Inflation | 5.89e-10 | 1.10e-05 | -6.98e-12 | -1.24e-07 | 2.45e-06 | 3.51e-05 |
| | (0.000)*** | (0.000)*** | (0.996) | (0.996) | (0.005)*** | (0.005)*** |
| GDP | 5.74e-06 | 1.07e-01 | 2.84e-06 | 5.05e-02 | 5.92e-02 | 8.48e-01 |
| | (0.000)*** | (0.000)*** | (0.156) | (0.156) | (0.000)*** | (0.000)*** |
| Trade | 7.33e-07 | 1.36e-02 | 9.07e-07 | 1.61e-02 | 4.03e-03 | 5.77e-02 |
| | (0.003)*** | (0.003)*** | (0.071)* | (0.071)* | (0.012)** | (0.012)** |
| Risk | 1.33e-06 | 2.47e-02 | 2.50e-06 | 4.43e-02 | 4.16e-03 | 5.95e-02 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Freedom | 1.38e-06 | 2.56e-02 | 2.58e-06 | 4.59e-02 | -1.01e-02 | -1.45e-01 |
| | (0.536) | (0.536) | (0.567) | (0.567) | (0.468) | (0.468) |
| Supervision | 1.07e-05 | 1.99e-01 | 1.27e-05 | 2.26e-01 | 5.26e-02 | 7.54e-01 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Transparency | 1.62e-05 | 3.01e-01 | 2.24e-05 | 3.98e-01 | 7.86e-02 | 1.13e+00 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Capital controls | -9.69e-05 | -7.16e-01 | -9.68e-05 | -8.24e-01 | -1.85e-01 | -2.52e+00 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| EU | -9.30e-07 | -1.73e-02 | 2.61e-06 | 4.63e-02 | -2.42e-02 | -3.46e-01 |
| | (0.816) | (0.816) | (0.729) | (0.729) | (0.380) | (0.380) |
| Constant | -1.06e-03 | -1.98e+01 | -1.16e-03 | -2.06e+01 | -9.24e+00 | -1.32e+02 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Observations | 285,714 | | 283,330 | | 2,384 | |
| R² | 0.37 | | 0.28 | | 0.14 | |

p-values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 5 — Regression results: including aggregated FDI

See also Table 1 and 4. 'Sum_FDI' is the residual of a regression of the FDI of other German banks in a given market on the remaining explanatory variables. Note that investment of the bank under study has been excluded from that aggregate. Only OECD countries are included Only unconditional marginal effects are shown.

| | Full sample | Small banks | Large banks | Full sample; Country fixed effects included |
|---|---|---|---|---|
| Sum_FDI | 1.57e-05 | 9.75e-06 | 1.80e-01 | -1.50e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Internationalisation | 1.47e-06 | 2.29e-07 | -1.52e-02 | 5.97e-08 |
| | (0.000)*** | (0.000)*** | (0.069)* | (0.000)*** |
| Assets | 8.99e-05 | 1.48e-05 | 3.08e+00 | 3.76e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Profitability | 1.22e-05 | 1.66e-06 | 5.28e-01 | 4.97e-07 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Distance | -7.65e-06 | -1.33e-06 | -2.52e-01 | -5.61e-06 |
| | (0.253) | (0.651) | (0.086)* | (0.051)* |
| Inflation | 1.11e-09 | -3.49e-09 | 1.97e-05 | 4.65e-11 |
| | (0.031)** | (0.817) | (0.035)** | (0.312) |
| GDP | 4.19e-05 | 2.28e-05 | 8.22e-01 | -7.82e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.021)** |
| Trade | 3.68e-06 | 1.43e-06 | 5.65e-02 | -3.93e-07 |
| | (0.000)*** | (0.000)*** | (0.001)*** | (0.000)*** |
| Risk | 1.71e-06 | -6.32e-07 | 2.16e-02 | 2.13e-07 |
| | (0.002)*** | (0.036)** | (0.046)** | (0.000)*** |
| Freedom | -1.76e-05 | -1.97e-05 | -3.37e-01 | -2.75e-05 |
| | (0.038)** | (0.000)*** | (0.037)** | (0.293) |
| Supervision | 3.23e-05 | 6.07e-06 | 5.86e-01 | -8.33e-07 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.957) |
| Transparency | 3.81e-05 | -3.27e-06 | 7.14e-01 | -1.24e-05 |
| | (0.000)*** | (0.346) | (0.000)*** | (0.705) |
| Capital controls | -5.03e-04 | -6.75e-04 | -2.67e+00 | 1.90e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.009)*** |
| EU | 4.82e-05 | 3.48e-05 | 3.62e-01 | 5.57e-04 |
| | (0.001)*** | (0.000)*** | (0.246) | (0.687) |
| Constant | -3.87e-03 | -9.63e-04 | -1.07e+02 | 1.71e-04 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.303) |
| Observations | 285714 | 283330 | 2384 | 285714 |
| R² | 0.38 | 0.31 | 0.15 | 0.41 |

p-values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 6 — Regression results: including number of other banks' affiliates

See also Table 1, 4 and 5. ‚Affiliates of other banks' is the residual of a regression of the number of other German banks' affiliates in a given market on the remaining explanatory variables. Note that investment of the bank under study has been excluded from that aggregate. Only OECD countries are included.

| | Full sample | Small banks | Large banks | Full sample; Country fixed effects included |
|---|---|---|---|---|
| Affiliates of other banks | 1.78e-06 | 4.15e-06 | 3.32e-02 | -2.21e-08 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.044)** |
| Internationalisation | 1.40e-06 | 2.14e-06 | -1.32e-02 | 6.53e-08 |
| | (0.000)*** | (0.000)*** | (0.106) | (0.000)*** |
| Assets | 8.52e-05 | 1.37e-04 | 3.05e+00 | 4.10e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Profitability | 1.15e-05 | 1.53e-05 | 5.17e-01 | 5.53e-07 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Distance | -2.88e-05 | -8.58e-05 | -4.84e-01 | -2.75e-06 |
| | (0.000)*** | (0.000)*** | (0.001)*** | (0.003)*** |
| Inflation | 1.65e-09 | -1.48e-09 | 2.66e-05 | -2.81e-11 |
| | (0.001)*** | (0.896) | (0.003)*** | (0.555) |
| GDP | 2.21e-05 | 2.86e-05 | 6.80e-01 | -1.13e-06 |
| | (0.000)*** | (0.007)*** | (0.000)*** | (0.753) |
| Trade | 2.82e-06 | 5.98e-06 | 5.17e-02 | -1.75e-07 |
| | (0.000)*** | (0.018)** | (0.002)*** | (0.114) |
| Risk | 3.83e-06 | 1.19e-05 | 4.38e-02 | -2.51e-08 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.676) |
| Freedom | 8.57e-06 | 3.30e-05 | -6.41e-02 | 2.79e-06 |
| | (0.215) | (0.183) | (0.665) | (0.282) |
| Supervision | 2.46e-05 | 3.65e-05 | 5.16e-01 | -1.97e-07 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.850) |
| Transparency | 5.37e-05 | 1.24e-04 | 9.15e-01 | 1.31e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.413) |
| Capital controls | -2.05e-04 | -2.39e-04 | -2.08e+00 | -1.02e-05 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.001)*** |
| EU | -1.96e-05 | -6.65e-05 | -3.54e-01 | 1.02e-05 |
| | (0.126) | (0.108) | (0.231) | (0.241) |
| Constant | -3.28e-03 | -5.71e-03 | -1.03e+02 | -6.98e-05 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.455) |
| Observations | 285714 | 283330 | 2384 | 285714 |
| R² | 0.38 | 0.30 | 0.15 | 0.40 |

p-values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 7 — Regression results: including affiliates of other banks and mean investment of other banks

See also Table 1, 4 and 5. 'Affiliates of other banks' is the residual of a regression of the number of other German banks' affiliates in a given market on the remaining explanatory variables. 'Mean investment others' is the corresponding mean amount of investment per banks. Investment of the bank under study has been excluded from that aggregate. Only OECD countries are included.

| | Full sample | Small banks | Large banks | Full sample; Country fixed effects included |
|---|---|---|---|---|
| Affiliates of other banks | 1.59e-06 | 3.34e-06 | 3.23e-02 | -1.24e-08 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.125) |
| Mean investment others | 1.19e-05 | 3.12e-05 | 1.38e-01 | -1.49e-06 |
| | (0.012)** | (0.059)* | (0.179) | (0.001)*** |
| Internationalisation | 1.45e-06 | 2.04e-06 | -1.12e-02 | 4.75e-08 |
| | (0.000)*** | (0.000)*** | (0.212) | (0.000)*** |
| Assets | 8.65e-05 | 1.29e-04 | 3.28e+00 | 2.95e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Profitability | 1.15e-05 | 1.44e-05 | 5.51e-01 | 3.90e-07 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Distance | -2.97e-05 | -7.74e-05 | -5.38e-01 | -1.08e-05 |
| | (0.000)*** | (0.000)*** | (0.001)*** | (0.369) |
| Inflation | 2.34e-09 | -1.11e-09 | 4.34e-05 | -1.79e-11 |
| | (0.000)*** | (0.943) | (0.000)*** | (0.609) |
| GDP | 1.62e-05 | 1.86e-05 | 6.07e-01 | -1.83e-06 |
| | (0.000)*** | (0.131) | (0.000)*** | (0.507) |
| Trade | 3.19e-06 | 6.50e-06 | 6.10e-02 | -1.93e-07 |
| | (0.000)*** | (0.010)*** | (0.001)*** | (0.021)** |
| Risk | 5.07e-06 | 1.28e-05 | 7.15e-02 | -1.53e-08 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.734) |
| Freedom | 3.28e-05 | 8.60e-05 | 3.72e-01 | -2.36e-06 |
| | (0.000)*** | (0.003)*** | (0.040)** | (0.399) |
| Supervision | 2.35e-05 | 3.19e-05 | 5.67e-01 | -6.64e-07 |
| | (0.000)*** | (0.002)*** | (0.000)*** | (0.838) |
| Transparency | 7.50e-05 | 1.57e-04 | 1.41e+00 | -1.90e-06 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.760) |
| Capital controls | -9.63e-05 | -1.06e-04 | -1.42e+00 | -3.57e-06 |
| | (0.000)*** | (0.011)** | (0.000)*** | (0.026)** |
| EU | -2.99e-05 | -7.27e-05 | -5.50e-01 | -1.96e-06 |
| | (0.032)** | (0.078)* | (0.102) | (0.669) |
| Constant | -3.58e-03 | -6.08e-03 | -1.14e+02 | 7.84e-05 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.544) |
| Observations | 262530 | 260350 | 2180 | 262530 |
| R² | 0.38 | 0.30 | 0.16 | 0.40 |

p-values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

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