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Kiel Working Paper No. 948

Why Do Banks Go Abroad? — Evidence from German Data

by

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September 1999

Abstract[*]

This paper provides empirical evidence on the determinants of foreign activities of German banks. We use regionally disaggregated panel data for the years 1981–98 and distinguish foreign direct investment from total foreign assets of domestic banks, of their foreign branches and their subsidiaries. Foreign activities are found to be positively related to demand conditions on the local market, foreign activities of German firms, and the presence of financial centers. This supports the hypothesis that German banks follow their customers abroad. Exchange rate volatility has some negative impact. EU membership and the abolition of capital controls seem to have exerted a greater influence on foreign assets than on FDI of German banks, thus weakly supporting the hypothesis that the two are substitutes.

(122 words)

Keywords: foreign activities of commercial banks, Germany, panel cointegration

JEL-classification: F21 (international investment, long-term capital movements), F23 multinational firms, international business), G21 (banks, other depository institutions, mortgages)

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1 Motivation

The introduction of the euro and the globalization of financial markets are shaping the future of the banking industry in Europe. Both tend to increase competitive pressure on incumbent banks, to trigger mergers and acquisitions in the financial services industry, and to be a driving force behind foreign activities of banks. Generally, banks have the option to solely service their home market, to export services to foreign markets, or to establish a presence in that market. In contrast to other industries, however, there are important segments of the banking industry which draw their comparative advantage from client- and location-specific factors. As these advantages are lost in foreign markets, activities of commercial banks may be inherently more nationally oriented than activities of non-financial firms.

Ultimately, the question why, when, and how banks go abroad is an empirical issue. While there is substantial evidence on the foreign activities of US financial institutions (Goldberg and Johnson 1990, Sagari 1992), of foreign banks in the US (Goldberg and Saunders 1981, Goldberg and Grosse 1994, Molyneux et al. 1998) of Japanese banks abroad (Yamori 1998), and of foreign banks in the UK (Fisher and Molyneux 1996), little systematic evidence is available on the determinants of foreign activities of European banks. The empitical literature on banking in Europe has so far been concerned mainly with the efficiency of financial institutions (Molyneux et al. 1996; Vander Vennet 1996), the effects of the Single Market program (EU 1997, Hoschka 1993, Gual and Neven 1993), and mergers and acquisitions in banking (Cybo-Ottone and Murgia 1997).[1] Yet, the motivations of European banks to go abroad are particularly interesting because the creation of a Single Market for capital has eased trade in financial services and has in principle leveled the playing field for financial institutions across Europe.

This contribution looks at the determinants of foreign direct investment decisions and of cross-border activities of German banks. The following Section 2 summarizes theoretical explanations of foreign activities of commercial banks. Section 3 reviews earlier evidence on banks' foreign activities. Section 4 provides an empirical analysis of the foreign direct investment activities of German banks while Section 5 looks at the determinants of cross-border lending and borrowing.

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[1] An exception is the work by Moshirian and Van der Laan (1998) on foreign activities of German, UK, and US banks. In contrast to the present paper, Moshirian and Van der Laan use regionally aggregated data and do not distinguish between FDI and total foreign assets of commercial banks.

Section 6 concludes. The findings are roughly in line with the earlier evidence on foreign activities of banks and support the positive effects of the EU on German banks' foreign assets and liabilities. FDI in the banking sector abroad, in contrast, seems not to have benefitted greatly from the Single Market program.

2 Why Do Banks Go Abroad?

Essentially, banks have two options of expanding their operations in foreign markets. They can either service foreign clients through their domestic offices or they can establish a presence in the foreign markets. This section gives a brief account of the theory of both foreign borrowing and lending of commercial banks and of their foreign direct investment decisions.

2.1 Foreign Borrowing and Lending

Foreign borrowing and lending decisions of commercial banks can be analyzed by adapting a simple portfolio model (Freixas and Rochet 1998) to an international setting (Buch 1999).[2] The objective function of the representative bank i is given by its expected utility:

$$(1) \qquad U_i = U_i\left[E(\Pi_i), \sigma^2(\Pi_i)\right] \qquad\qquad \frac{\partial U_i}{\partial E(\Pi_i)} > 0, \frac{\partial U_i}{\partial \sigma^2(\Pi_i)} < 0$$

where $E(\Pi_i)$ = expected profit of the bank and $\sigma^2(\Pi_i)$ = variance of the profit. We assume banks to be risk averse. This could be motivated by the presence of a risk-based equity requirement or positive costs of insolvency. Banks give out loans and raise deposits on their home market as well as on a foreign market. Assuming perfect competition between banks, interest rates are taken as given.[3] In addition to loans, banks can invest into a riskless security but cannot borrow at the riskless rate. All contracts are denominated in local currency. When calculating returns on activities abroad, exchange rate risks have thus to be taken into account. Furthermore, we consider one period only. At the beginning of the period, the bank chooses its optimal portfolio structure. Hereby, it must observe its balance sheet restriction:

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[2] Notice that the choice of a portfolio model does not unduly constrain our analysis as restrictions such as equity requirements could easily be introduced into the model.

[3] Relaxing this assumption would not affect the qualitative results of this analysis.

(2) $\qquad W_i + D_i + D_i^* = L_i + L_i^* + R_i$

where W = initial wealth, $D(L)$ = domestic deposits (loans), $D*(L*)$ = foreign deposits (loans) in domestic currency terms, and R = riskless asset. At the end of the period, returns are realized. The expected profit of a representative domestic bank i is thus given by:

(3) $\qquad E[\mathrm{P}_i] = (r_L - c_{i,L})L_i + (r_L^* - c_{i,L}^* + \dot{e})L_i^* + r_F R_i - (r_D + c_{i,D})D_i - (r_D^* + c_{i,D}^* - \dot{e})D_i^*$

where $\dot{e}$ = expected rate of change in the exchange rate (price of foreign currency in domestic currency terms), r_L, r_D = expected interest rates on loans and deposits, r_F = interest rate on the risk-free asset, and c = variable costs of making loans and raising deposits.[4] A depreciation of the domestic currency ($\dot{e} > 0$) raises both the return on loans abroad and the costs of deposits abroad. Exchange rate changes are stochastic, with a standard deviation $s_e > 0$, and are taken as exogenous by the banks. At first, we abstract from fixed costs, i.e. there is no FDI in banking.[5] Upon substituting the balance sheet restriction (2) into (3), one obtains:

(3')
$$E[\mathrm{P}_i] = r_F W + (r_L - c_{i,L} - r_F)L_i + (r_L^* - c_{i,L}^* + \dot{e} - r_F)L_L^* - (r_D + c_{i,D} - r_F)D_i - (r_D^* + c_{i,D}^* - \dot{e} - r_F)D_L^*$$

Raising deposits and granting loans is costly for banks because it involves, for instance, the input of resources to assess the quality of investment proposals. Variable costs are assumed to be higher in an international context than domestically as these comprise the costs of cross-border financial transactions ($c_{i,D} < c_{i,D}^*$ and $c_{i,L} < c_{i,L}^*$). The reverse relationship would hold for a representative foreign bank j: $c_{j,D} > c_{j,D}^*$ and $c_{j,L} > c_{j,L}^*$. Domestic (foreign) banks are assumed to have a comparative advantage in the provision of domestic (foreign) financial services, i.e. $c_{i,D} < c_{j,D}$ and $c_{i,D}^* > c_{j,D}^*$. A similar condition applies to the loan market.

Written in matrix form, profits are:

(3'') $\qquad E[\mathrm{P}_i] = \bar{r}_i x_{i,m}$

with $x_{i,m}$ = vector of portfolio shares and $\bar{r}_i$ = vector of net excess returns.

The variance of profits is given by:

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[4] Note that these variable costs add to the interest cost of deposits while they lower the interest rate earned on loans.

[5] This assumption will be relaxed in the following.

$$(4) \qquad s^2(P_i) = \sum_{m=1}^{4} x_{i,m}^2 s_m^2 + 2\sum_{m=1}^{4} \sum_{\substack{n=1 \\ m \neq n}}^{4} x_{i,m} x_{i,n} COV_{mn}$$

where s_m^2 = variance of net excess returns and COV = covariances of returns. Whereas the volatility of domestic returns depends on characteristics of the borrower population only, foreign activities also expose the bank to exchange rate risk. The bank's optimal demand for asset m is then given by maximizing (1) with respect to all $x_{i,m}$:

$$(5) \qquad \frac{\partial U_i}{\partial x_{i,m}} = \frac{\partial U_i}{\partial E(P_i)} \cdot \frac{\partial E(P_i)}{\partial x_{i,m}} + \frac{\partial U_i}{\partial s^2(P_i)} \cdot \frac{\partial s^2(P_i)}{\partial x_{i,m}} = 0.$$

By solving for $x_{i,m}$ and after denoting the degree of the bank's relative risk aversion by:

$$(6) \qquad \lambda_i = -\frac{1}{2} \frac{\partial U_i}{\partial E(P_i)} \frac{\partial s^2(P_i)}{\partial U_i},$$

optimal portfolio shares are given by:

$$(7) \qquad \hat{x}_{i,m} = \lambda_i V^{-1} \bar{r}_i$$

where V^{-1} is the inverse of the variance-covariance matrix of excess returns $\bar{r}_i$. Thus knowing the bank's relative risk aversion, the expected excess returns, and the covariances between risky assets, the bank's optimal demand for each of the assets in terms of mean-variance-efficiency can be determined.

Under the maintained assumption that excess returns on loans (deposits) are positive (negative) and that all elements in the variance-covariance matrix are positive, one obtains negative portfolio shares for deposits and positive portfolio shares for loans. An increase in the excess return of an individual security increases the share of this security in the portfolio (and reduces the absolute value if the security is a liability). An increase in the variance of a security reduces its portfolio share (Freixas and Rochet 1998, Hart and Jaffee 1974).

As regards banks' foreign activities, this simple portfolio framework suggests that lending activities of commercial banks should depend positively on the excess return that can be obtained on the foreign market and on market size and negatively on foreign exchange and other risks. Note that the costs of cross-border transactions have been defined in a fairly broad sense. These costs do, on the one hand, capture the proximity of markets and the presence of regulatory entry barriers. On the other hand, these costs also comprise information costs.

Information costs, in turn, provide a rationale for the observation that the presence of banks and of nonfinancial firms in a foreign market often coincide, and that banks may follow their existing customers abroad.[6]

2.2 Foreign Direct Investment

As an alternative to servicing a foreign market from their home base, banks may decide to set up affiliates in foreign markets. Traditionally, such foreign direct investment decisions of banks have been analyzed based on the eclectic paradigm which implies that location-specific factors and ownership-specific factors should affect the decision of banks to set up affiliates in a foreign market (Sagari 1992). Among the location-specific factors are the size of the foreign markets, trade relations, the presence of non-financial firms on the market, and the presence of entry restrictions and other regulations. Among ownership-specific factors are the degree of product differentiation and comparative advantage due to superior skills. Since it is difficult to obtain data on ownership-specific factors, most research on the importance of these determinants to date has focused on location-specific factors (see Section 3).

Yet, traditional explanations of FDI in banking have largely ignored that foreign direct investment decisions of banks are irreversible and are made under conditions of uncertainty. Hence, entry and exit into non-traditional markets are potentially subject to hysteresis. In banking, the issue of irreversibility of investment arises because access to a branch network is crucial for the attraction of deposits and because long-term customer relations are the basis for the lending business. When deciding whether to enter a new market, banks thus have to take three cost components into account (Chen and Mazumdar 1997):[7] fixed costs to enter the new market (which increase with the importance of legal entry barriers), fixed costs to leave the new market, and operating costs. The optimal investment policy of a representative bank must thus consider the value of the

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6 Section 4.2 explains the empirical specification of these variables in more detail.

7 Although Chen and Mazumdar discuss *inter alia* the need for the maintenance of firewalls between traditional and non-traditional banking activities, their main conclusions are applicable to the decision of banks to expand outside their home market as well. Their main assumption is that banks' revenues in the new market are stochastic and follow a geometric Brownian motion. In the context of international banking activities, this factor could be interpreted as exchange rate risk.

Table 1 — Overview of Earlier Work

Paper	Dependent variable	Significant determinants of FDI of banks[a]	Comments
Brealey and Kaplanis (1996)	overseas offices across 37 parent and 82 host countries, data for 1992, n = 1937	home and host country GDP (both +), imports (+), exports (+), FDI from parent country (+)	trade and FDI variables are entered separately
Buch and Lapp (1998)	stock of German FDI in banking, 1992–95, OLS, pooled estimate for 1985, 1992, 1995	FDI (+), financial centers (+), GNP (+)	no impact of EU variable or of foreign trade
Budzeika (1991)	assets of foreign banks in the US, 1973–89	FDI (+), foreign trade (+), exchange rate changes (–), interest rate differentials (–)	branches and agencies finance foreign firms, subsidiaries US firms
Fisher and Molyneux (1996)	number of foreign banks and number of staff of foreign banks in London, 1980–89	FDI out of the UK (+), trade links (+), size of home-country market (+), country risk (–), distance (+)	foreign trade significant only if exports (+) and imports (–) are included separately
Goldberg and Johnson (1990)	(stocks? of) assets and branches of US banks in 22 countries, pooled OLS	exports (+), population (+), (lack of) regulations (+), GNP per capita (–), volume of domestic deposits (–), change in the exchange rate (–)	different impact of exports on assets and branches
Hultman and McGee (1989)	share of assets in US bank subsidiaries (branches and agencies) held by foreigners, 1973–86	FDI (+), price-earnings ratio for US bank stocks (–)	regulatory dummy, trade, and interest rates tended to be insignificant
Miller and Parkhe (1998)	foreign assets of US banks for 1990–95, foreign offices of US banks for 1987–95 (branches and subsidiaries); pooled, cross-section time series estimated by OLS	FDI (+), regulatory framework	different results for branches vs. subsidiaries and for developing vs. developed countries; permission of universal banking affects organizational choice
Moshirian and Van der Laan (1998)	foreign assets of US, UK, and German banks for the years 1985–95, quarterly data, time series analysis	FDI of non-banks (–), real foreign liabilities country *i* (+), domestic loans (–), international bond issues (–), interest rate differential (–), national income country *i* (+)	non-interest export of financial services country *i* has negative impact for UK and US but positive impact for Germany
Nigh, Cho, and Krishnan (1986)	change in US bank branch assets in 30 countries, 1976–82	FDI (+), openness (+)	local market opportunities appear insignificant
Sagari (1992)	(level of) FDI of US banks in 21 countries in 1977, OLS	FDI (+), regulatory framework (–)	GNP insignificant due to multicollinearity (?), principal component method used to determine regulatory variables
Yamori (1998)	log of accumulated FDI of Japanese banks in 44 countries between 1951 and 1994, OLS	FDI (+), GNP per-capita (+), M2 over GNP (+), country risk proxy (+), imports (+), exports (–)	real interest rate, change in exchange rate over past 10 years, change in GNP are insignificant
a) FDI = FDI in the non-financial sector.			

real investment option (Dixit and Pindyck 1994): as information about the economic environment improves over time, it pays to wait and to postpone invest-

ment. The presence of entry and exit costs thus creates a range of inaction: revenue has to increase sufficiently before banks move into the non-traditional market but once having entered the new market, they do not leave unless revenues fall substantially.

When analyzing foreign direct investment decisions of commercial banks, the distinction between greenfield investments and acquisitions of domestic banks becomes crucial. With greenfield investment, new entrants need to build up reputation and a branch network from scratch whereas they can potentially benefit from existing customer contacts when buying up an existing bank. Under perfect information about future business conditions, costs of the two modes of entry should be the same. Under uncertainty, however, greenfield investment is likely to entail higher costs.

This framework holds potential implications for the impact of European integration on FDI in banking because deregulation and the Single Market have tended to lower entry barriers (and thus the irreversibility of investment). This effect could further be strengthened through the introduction of the euro which reduces uncertainty and makes deregulation less easily reversible. Hence, market entry would be promoted. An alternative view would be that these changes may not have been sufficient to move banks out of their „range of inaction", and that we might observe less cross-border banking activity precipitated by the euro than the conventional wisdom might suggest.[8] In addition, by easing the provision of cross-border financial services, the Single Market initiative has reduced the need of banks to be present in a foreign market. Hence, rather than affecting FDI of banks (Dufey and Yeung 1992/93) the effect of the Single Market might have fallen mainly on other cross-border banking activities.[9] The following empirical analysis tries to discriminate between these two views.

3 Earlier Empirical Evidence

Previous empirical work on the foreign activities of commercial banks has primarily focused on US or Japanese banks (Table 1). FDI of banks from both countries has been shown to be positively related to FDI in the non-financial sector. This would support the hypothesis that banks follow their customers

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[8] The fact that large cross-border mergers and acquisitions in the banking industry have thus far hardly been observed in Europe supports this view.

[9] It is even conceivable that the deregulation of cross-border financial services via a substitution effect might negatively affect FDI.

abroad although the direction of causality is typically not addressed explicitly. Likewise, it is conceivable that omitted factors are driving FDI in both sectors. Most studies thus control for market size (measured by GDP or the size of the population) and foreign trade activities. Typically, market size and foreign trade links exert a positive impact on the foreign direct investment of banks, while the individual impact of export activity may be positive or negative. Entry regulations have the expected negative sign. The study by Budzeika (1991) finds a negative impact of exchange rate volatility on FDI of banks.

A priori, the statistically significant link between FDI in the non-banking sector or foreign trade activities, on the one hand, and FDI in banking, on the other hand, may be taken to support the claim that banks tend to follow their customers abroad. A study by Seth, Nolle, and Mohanty (1998) uses data on the financial sources of affiliates of foreign firms in the US as well as data on the activities of foreign banks in the US to check the validity of this hypothesis.[10] While suppliers and users of funds cannot be matched directly on the basis of these data, the authors compare the total amount of funds received by non-financial firms to the amount of loans granted by foreign banks in the US. Overall, the amount of loans granted by foreign banks exceeded the amount of loans received by foreign affiliates. This implies that foreign banks have granted loans to US firms as well, and that the motivation to "follow their customers" has not been the sole reason to enter the foreign market. Moreover, there seems to have been a trend away from lending to companies from the home country over time. Interestingly, while there was relatively strong evidence that banks from Japan and the UK did not follow their customers, the reverse was true for German banks.

As regards the foreign activities of German banks, the study closest in spirit to the present one is the work by Moshirian and Van der Laan (1998). The authors analyze the determinants of foreign assets of banks from Germany, the UK, and the US in a portfolio framework on the basis of quarterly data for the years 1985–95. In contrast to earlier studies on the determinants of international asset choices of banks, they find that FDI of non-banks has a significantly *negative* influence for all three countries. This would support the hypothesis that FDI abroad is a substitute for bank credits to foreigners. Moreover, they find a positive coefficient on the foreign liabilities of the country under study, suggesting that capital in- and outflows are positively related. Finally, bond issues appear to substitute foreign bank loans, and banks seems to have substituted foreign for domestic lending.

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[10] See DeYoung and Nolle (1996) for an analysis of the profitability of foreign banks in the US.

Using cross-section and pooled data for about 20 host countries, Buch and Lapp (1998) show that the volume of German FDI in the non-banking sector and the fact that a country hosts an international financial center are positive and significant determinants of German banks' FDI. Market size as measured by GDP has a positive impact on FDI. The impact of EU membership is less clear-cut. An EU-dummy seems to have been more important in 1992 than in 1995, which would confirm the hypothesis that the Second Banking Directive has reduced the need to invest abroad.

In addition, Potthoff (1992) analyzes the determinants of short-term foreign claims and liabilities of German banks for the years 1984 to 1989 by distinguishing the currency structure of banks' foreign activities. He finds that, apart from exchange rate changes, net foreign claims of German banks are determined by credit demand of German firms on the Euromarket, activities of foreign investors on the German capital market, and exchange market interventions of foreign central banks. Grüner (1996) studies the international portfolio decisions of German investors for the years 1975–94 on the basis of a multi-sectoral, international portfolio model for investment in the US, Japan, and the rest of the world. However, in this study, the investment decisions of banks and non-banks are not treated separately.

The present study will go beyond those described above by using panel data for up to 38 host countries and 18 years. Moreover, foreign assets and liabilities will be broken down into those of domestic commercial banks, their foreign subsidiaries and branches. Host countries accounting for roughly 90 percent of German banks' foreign activities are covered. Finally, the potential non-stationarity of the time series under study will explicitly be taken into account by using a cointegration framework.

4 Determinants of FDI of German Banks

4.1 Stylized Facts

Outflows of FDI have developed much more dynamically in the US than in Europe since the early 1990s, while trends for Germany quite closely parallel developments in the rest of Europe (Graph 1b). Hence, it is difficult to clearly discern an influence of the Single Market. Inflows of foreign direct investment into the European financial sector have even peaked in 1990, i.e. prior to the creation

of the Single Market (Graph 1a).[11] This could be taken as evidence that the announcement of the Single Market has enhanced the attractiveness of European countries for foreign investors, and that the expected deregulation has created incentives to invest. A comparison of data for Europe and the United States shows, however, that increased FDI in the financial sector has not been a phenomenon confined to Europe in the early 1990s although, in the US, inflows of FDI peaked somewhat later. Hence, effects at the European level are difficult to separate from global trends in financial markets.[12] It is also interesting to note that developments in Germany differ quite substantially from those in the rest of Europe. Since 1992, Germany has even registered a withdrawal of FDI from the financial sector.

Graph 1 — Flows of FDI into the Financial Sector (million US-Dollar), 1985–1997

a) Inflows

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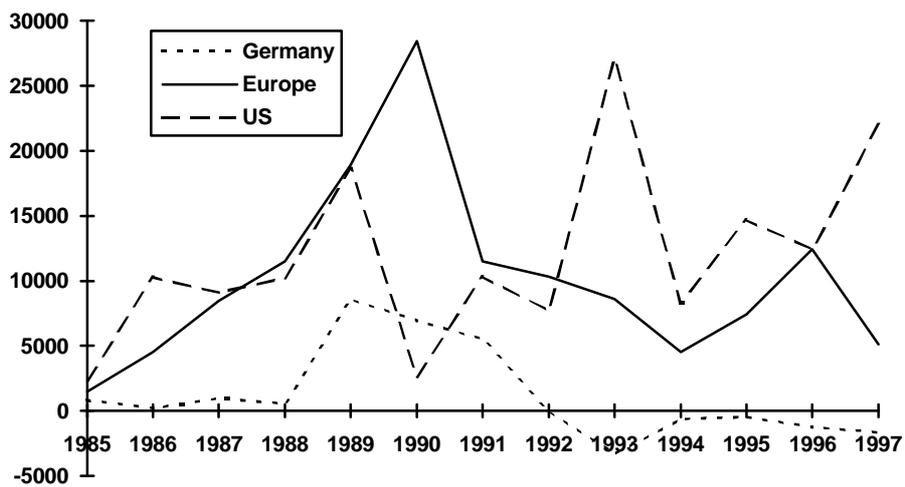
[11] A breakdown into different segments of the financial services sector has not always been possible. Hence, total FDI into the sector is considered in contrast to the German data, which will be the subject of the following analysis, and which cover FDI in the banking sector only.

[12] For a similar conclusion see EU (1997: 49).

b) Outflows
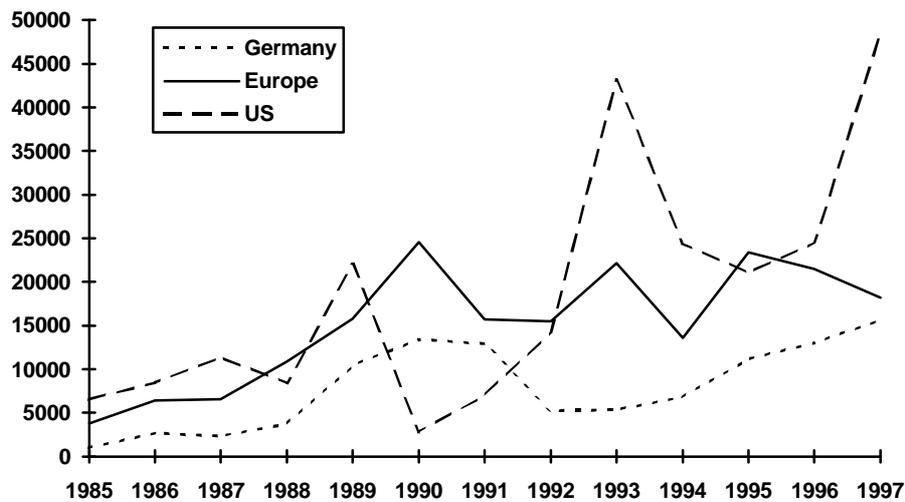
Europe = France, Germany, Italy, Spain, United Kingdom. Cumulated inflows for Spain.

Source: OECD (1999)

As regards the stock of FDI, trends in Europe and in the US also look relatively similar as far as inflows are concerned (Graph 2a). Whereas in Europe the share of the financial sector in the total stock of inward FDI has increased gradually from about 15 to over 20 percent between 1985 and 1996, it increased to only 20 percent in the US. Here, however, values of around 25 percent have been observed in the early 1990s. The picture for Germany is completely opposite to the general trend: the share of FDI in the financial sector has, with less than 10 percent, not only been significantly below average, but it has also declined over time. For FDI abroad, however, developments in Germany and in the rest of Europe are virtually the same but differ from the US (Graph 2b). Investment in the financial services sector had a greater importance for the US as compared to Europe. Although, for both regions, financial sector outward FDI has increased in importance during the period under study, there has been a gap of about 5 percentage points in its share in total FDI.

Graph 2 — Stocks of FDI in the Financial Sector (% of Total FDI), 1985–1997
a) Inward FDI
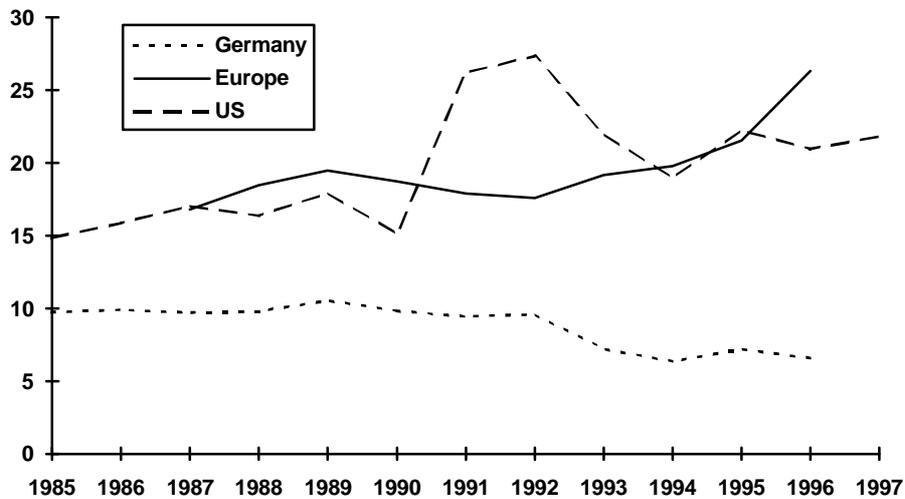
b) Outward FDI
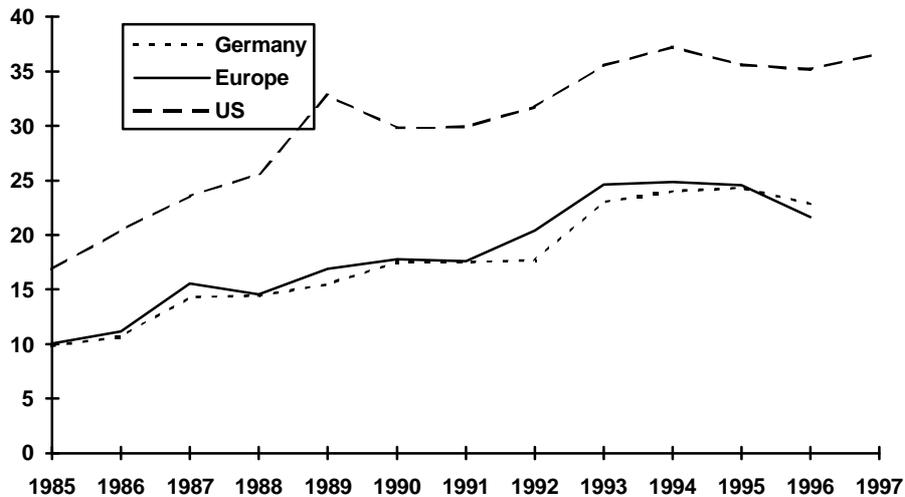
Europe = France, Germany, Italy, Spain, United Kingdom. Cumulated inflows for Spain.
Source: OECD (1999)

The German Bundesbank provides data on the stock of FDI of German banks abroad. For reasons of data protection, such information is available for a significantly smaller number of countries than data on total FDI. The only countries for which a full time series of stocks of FDI, starting at least in 1989, have been available are Austria, Belgium, France, Hongkong, Ireland, Italy, Japan, Luxembourg, the Netherlands, Singapore, Spain, Switzerland, the United Kingdom, and

the United States. This sample includes seven countries which were members of the EU in 1992 and six which were not. As for the stock of FDI of banks abroad in 1997, data are available for 20 countries (Table A2).

Table 2 — Regional Structure of German FDI (%), 1991–1997

	Outward FDI		Inward FDI	
	1991	1997	1991	1997
FDI of banks in % of total	7.1	12.5	7.6	6.6
FDI by banks	100.0	100.0	100.0	100.0
Industrialized countries	86.6	87.1	93.1	90.3
EU countries	34.4	30.5	35.7	45.1
Luxembourg	35.1	22.2	...	...
United States	5.7	27.4	20.8	16.0
Transition economies	0.1	3.4	...	...
Developing countries	13.3	9.5	4.3	6.7
Total FDI	100.0	100.0	100.0	100.0
Industrialized countries	89.3	84.6	97.2	95.9
EU countries	45.9	39.1	34.9	42.2
United States	22.8	26.4	29.1	24.8
Transition economies	0.8	5.4	...	...
Developing countries	9.9	10.0	1.9	3.1
EU countries = Belgium, France, Ireland, Italy, Netherlands, Spain, UK for outward FDI; Belgium, Denmark, France, Italy, Netherlands, UK for inward FDI.				

Source: Deutsche Bundesbank (1999b)

Overall, FDI of banks constituted roughly 13 percent of German outward FDI in 1997, which implies an increase of about 5 percentage points since the early 1990s (Table 2). For both total FDI and FDI of banks, industrialized countries have been the most important destination, accounting for 85–90 percent of the total. EU countries excluding Luxembourg received about 30 percent of FDI of German banks in 1997, which corresponds to a decline by about 4 percentage points. Likewise, Luxembourg's importance as a destination for foreign investments of German banks has declined in relative terms. This decline was more than compensated by a substantial increase in investments in the US, raising its share in outward FDI of financial institutions from 6 to almost 30 percent. In contrast to outward FDI, which does not seem to have benefited from the Single Market, the share of EU countries in inward FDI has increased quite considerably between 1991 and 1997. FDI in the banking sector from EU countries increased by about 10 percentage points to 45 percent of the total, quite closely paralleling trends in total FDI.

Mergers and acquisitions (M&As) are an important channel through which FDI in the banking industry takes place. Gual and Neven (1993) found that M&A activities were quite pronounced in 1989-90, i.e., prior to the Second Banking Directive. This confirms the evidence presented in Graph 1 on an anticipation effect of the Single Market. While the majority of cases involved domestic firms, the main target for non-domestic deals were banks in France, Italy, and Spain. Most of the domestic mergers, in turn, took place in Southern Europe, and the acquirers in international deals tended to be firms from the North.

A more recent dataset for the years 1987 through 1997 shows that M&A-activity in Europe has clearly become more intense in 1997 (Buch and Lapp 1998). Even if the mega-merger between Schweizerische Bankgesellschaft and Schweizerischer Bankverein is not taken into account, announced merger value was more than twice as high as in the previous two years. This would support the view that the Euro serves as a catalyst for competitive pressure in the European banking industry.[13] So far, however, the majority of M&As has involved domestic banks only.

4.2 Regression Results

The data on German FDI in the banking sector abroad (by type of investment object), on which Table 2 is based, have been used for an econometric analysis of the determinants of FDI.[14] The following panel equation has been estimated:

(8) $y_{it} = x_{it}\mathsf{b} + z_i\mathsf{d} + \mathsf{e}_{it}$

where y_{it} = (log of) FDI of German banks or foreign assets of banks in country i, x_{it} = time-varying explanatory variables, z_i = time-invariant, country-specific explanatory variables, and e_{it} = error term. All data are in constant euro.

The theoretical work reviewed in Section 2 has led to a list of possible determinants of cross-border banking activities (including FDI of banks). We capture these variables as follows:[15]

Excess returns: interest rates, interest rate spreads

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[13] A study by Cybo-Ottone and Murgia (1997) sheds some light on the determinants and the efficiency of mergers and acquisitions of financial institutions in Europe.

[14] All estimates have been performed with the statistical software package EViews (Version 3.1). For specification tests (Hausman tests, tests on autocorrelation of the residuals) STATA (Version 5.0) was used.

[15] See Table A1 for details.

Market size: GDP, GDP per capita, foreign trade links, foreign direct investment of non-financial firms, population size

(Foreign exchange) risk: exchange rate volatility, inflation

Proximity of markets: distance

Regulatory restrictions: EU membership, abolition of exchange controls, dummies for financial centers

We have started with a cross-section analysis for the year 1997 (Table 3). The analysis has been extended below to take the time-series dimension of the data into account. A look at the correlation matrix of possible explanatory variables for the cross-section of all countries in 1997 (Table A3) shows that the stock of German FDI of banks is only loosely correlated (absolute values of around 0.2) with a number of variables of interest such as interest rates, population, inflation, or GDP. Relatively high correlations, in turn, are observed for FDI of non-banks, GDP-per-capita, and for distance. Hence, in a first step, these variables have been included in the regression equation. The only variable entering the equation significantly and with a positive sign was FDI of non-banks, which alone explained half of the variation of FDI of banks (Table 3). This contradicts Moshirian and Van der Laan (1998) who found a negative impact of FDI on German banks's foreign assets but confirms most other previous studies on the determinants of FDI of banks.

In a second step, dummy variables for countries hosting financial centers and an individual dummy variable for Luxembourg have been added. The financial sector variable has been defined as described in Table A1. Brealey and Kaplanis (1996) determine empirically which country hosts a financial center. They define a financial center as a country in which banks locate to access the domestic capital market rather than to support bilateral trade. By identifying countries in which foreign bank presence exceeds the "normal" level, they find that out of a sample of 33 developed and developing countries Indonesia, Singapore, Switzerland, the United Kingdom, and the United States can be classified as financial centers. Using the results of Brealey and Kaplanis and including also Indonesia and the United States as financial centers did not change our estimates substantially.

A dummy to account for EU membership has been constructed. The variable takes the value 0 for non-EU-members, 1 for members which have not yet fully abolished capital controls, and 2 for members which have abolished controls. Yet, this dummy was found to be insignificant and has thus not been included in the final specification.

A parameter capturing exchange rate volatility, measured as the average percentage change of the D-mark exchange rate over five years, entered with a significantly negative sign (see Table A1 for details). Including the financial sector variables and the volatility measure increased the explanatory power of the estimated equation, raising the $\bar{R}^2$ to about 0.75. Moreover, the significance of per-capita GDP increased. The (insignificant) distance variable has been dropped.

Table 3 — Determinants of Stock of German FDI in Banking (Cross Section, 1997)

Explanatory variables	dependent variable: log *FDI_BANK*		
	Equation 1	Equation 2	Equation 3
constant	1.30	–3.47**	–2.19
	(0.46)	(–2.63)	(–1.06)
log *FDI_NONBANK*	0.52*	0.79***	
	(2.01)	(4.93)	
log (*EX* + *IM*)			0.57**
			(2.42)
log *GDPCAP*	0.19	0.29*	0.26[a]
	(1.09)	(1.90)	(1.66)
log *MILES*	–0.17		
	(–1.01)		
VOLATILITY		–7.13*	
		(–1.77)	
DUMFIN		1.01**	0.76[a]
		(2.62)	(1.49)
DUMLUX		3.22***	3.74***
		(4.67)	(3.45)
$\bar{R}^2$	0.42	0.77	0.53
White-test (obs. * $\bar{R}^2$)	13.8	–12.35	–8.20
Number of observations	20	19	20

t-values in brackets. ***(**,*) = significant at the 1 (5, 10) percent level. — a) significant at the 20-percent level.

Source: Own calculations.

In view of the unresolved debate whether banks follow their customers, or vice versa, it might be objected that the FDI variable on the RHS is not exogenous. In fact, FDI of banks has entered significantly in a regression equation explaining FDI of non-banks. Hence, as an alternative measure of foreign activities of non-financial firms, foreign trade turnover (exports plus imports) has been used as an

explanatory variable.[16] The results modified slightly. As FDI of non-banks, foreign trade enters with a highly significant positive coefficient. The remaining results were essentially unchanged but the $\bar{R}^2$ fell. Since we find it difficult to argue that FDI of banks is causal to foreign trade turnover, we take this as evidence for the follow-their-customer hypothesis.

To test for heteroskedasticity of the residuals, the squared residuals of (8) were regressed on the explanatory and the squared explanatory variables (including cross-terms):

(9) $\qquad e_{it}^2 = x_{it}g + z_i j + x_{it}^2 \tilde{g} + z_i^2 \tilde{j} + x_{it} z_i d + u_{it}$

and the White test statistic was computed as the number of observations times the $\bar{R}^2$ of (9). The test statistics is c^2-distributed with the degrees of freedom equaling the number of slope coefficients (including cross-terms). White heteroskedasticity-consistent standard errors and covariances are reported where appropriate.

In summary, the cross-section results for 1997 show that demand for financial services of German firms abroad, measured either by the volume of FDI in the non-banking sector or by foreign trade activities, are positive and significant determinants of the stock of FDI by German banks. The strength of demand from the foreign market, measured by GDP-per-capita, likewise exerts a positive, yet less important influence as lower elasticities and lower significance levels show. Not very surprisingly, the fact that a country hosts a financial center attracts German banks to that market. The hypothesis that EU membership has had a significant impact on FDI activities of banks is, in contrast, not supported by the data. Also, additional variables measuring conditions on local banking markets, such as interest rate spreads, did not enter significantly.

Additionally, the time series properties of the data have been exploited. As in standard time series regressions, ignoring the non-stationarity of the data in panel regressions may lead to the acceptance of a significant relationship even if the variables are not cointegrated (Pedroni 1995: 11). Hence, we have tested for the degree of integration of the parameters of interest. Table A5 in the Appendix

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[16] Because of the high correlation between foreign trade and FDI of non-banks (correlation coefficient of about 0.8), using these two variables simultaneously also causes multicollinearity problems (see also Brealey and Kaplanis 1996). In fact, in this case, the coefficient on the foreign trade variable became negative, which may point to similar multicollinearity problems in earlier studies which found negative coefficients for trade variables (cf. Table 1). Hence, we have used these variables separately.

summarizes the results of ADF-tests for a unit root. These were obtained by re-gressing the first difference of each variable on its lagged values:

$$(10) \qquad Dx_{it} = gx_{i,t-1} + \sum_{m=1}^{3} Dx_{i,t-m} + h_{it}$$

and testing for H_0: $g = 0$. For each variable, two specifications, one involving a common constant and one allowing for individual fixed effects, have been used. Critical values for the panel specifications with a cross-section dimension of $i = 20\text{-}40$ countries and the time series dimension of $t = 16$ years were taken from Levin and Lin (1992). The results strongly suggest that the time series under study are I(1).

As for time series data, consistent panel data estimates with non-stationary variables require the use of an estimation method which takes the non-stationarity of the data into account. Hence, equation (8) has been estimated in the form of an error-correction model, implying that banks adjust the stock of their FDI if it de-viates from the long-run equilibrium.[17] As Breitung and Meyer (1994) have ar-gued, tests for cointegration of non-stationary variables can be performed in such a framework also for panel data. More specifically, the following error-correction equation has been estimated:

$$(11) \qquad Dy_{i,t} = (a_0 - 1)\left[y_{i,t-1} - b_i x_{i,t-1} \right] - \sum_{j=1}^{n} a_i \, Dy_{i,t-i} - \sum_{j=0}^{m} g_i \, Dx_{i,t-j} + e_{i,t}$$

Changes in the dependent variable $y_{i,t}$ thus depend (i) on deviations from the long-run-equilibrium, i.e. on the error-correction term in brackets,[18] (ii) on short-run effects of changes in the current and lagged dependent and in the lagged in-dependent variable, and (iii) on an error term. If the coefficient $(a_0 - 1)$ is signifi-cantly less than zero, the Null that the variables are not cointegrated can be re-jected, and there would be a stationary long-run relationship between the series.

Tests for autocorrelation, the residuals $e_{it} = m + v_{it}$ from equation (8) were used to run the regression

$$(12) \qquad v_{it} = r v_{i,t-1} + e_{it}$$

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[17] For a general derivation of the error-correction equation see Hansen (1993).

[18] Note that the „long-run" in this model covers a time period of 15 years.

and to use an LM-test to test the Null $r = 0$ and $r > 0$, respectively (Baltagi 1995: 93). In cases where the null of no autocorrelation could be rejected, additional lagged endogenous variables were included.

The lagged stock of FDI of non-banks entered with a significantly negative sign. Significant explanatory variables, entering with a positive sign, were the stock of FDI of non-banks, per-capita GDP, the spread between lending and deposit rates, and a variable capturing EU membership. Again, FDI of non-banks has in a second step been replaced by a variable capturing trade links (imports), and similar results were obtained. Exchange rate volatility had no significant impact on FDI of banks. However, both autocorrelation and heteroskedasticity were present in the residuals. When additional lagged endogenous variables were included, the variables in the cointegration relationship as well as the EU dummy became insignificant. This could be an indication of the fact that these variables pick up the autoregressive component of the model. Hence, unlike in the cross-section study, we have failed to find convincing evidence for a significant long-run relationship between FDI of banks and the explanatory variables under study.

5 Determinants of Cross Border Lending and Borrowing

Foreign direct investment of banks is only one mode to enter a new market. In fact, as has been argued above, banks may prefer to engage in cross-border lending without establishing a physical presence abroad. Hence, foreign borrowing and lending can be performed through the domestic headquarter, through foreign subsidiaries, or through foreign branches. Regulatory changes on the EU-level are likely to have affected these choices. More specifically, the Second Banking Directive of 1993 has eliminated the need to get a local banking charter for branches in a foreign country, has subjected foreign branches to home country supervision, and has abolished the need for foreign branches to hold a certain amount of endowment capital (EU 1997). Activities of foreign branches in Europe have thus benefited particularly from the Single Market program.

This section presents some stylized facts on the cross-border activities of German banks, drawing on the balance of payments statistics of the Deutsche Bundesbank. This source allows a much broader assessment of German banks' foreign activities in terms of country coverage.[19] At the same time, FDI of German banks abroad is included in these data as they comprise claims on banks and non-

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[19] For a complete list of the countries covered see Table A2 in the Appendix.

banks and foreign security holdings. These security holdings, in turn, comprise shares and participations and thus FDI abroad. However, a disaggregation into the individual components is not possible.[20] A potential shortcoming of this database is that it does not include any off-balance sheet activities of commercial banks which reportedly have increased quite substantially after the initiation of the Single Market program (EU 1997: 46).

Throughout the section, aggregated foreign activities of German banks are considered. It could be argued that such aggregation clouds important differences between the determinants of borrowing and lending towards banks and non-banks, for instance. Yet, as this paper focuses on different modes of entry, the data will be split into activities of German domestic banks, their branches, and their subsidiaries abroad. Moreover, aggregated data suggest that foreign claims and liabilities vis-à-vis banks and non-banks are highly correlated.

5.1 Stylized Facts

For German banks, their subsidiaries and branches abroad, total activities in countries of the EU have become increasingly important since the mid-1980s (Graph 3). Whereas in 1985, assets and liabilities vis-à-vis EU countries accounted for about 45 percent of total foreign activities, these shares had increased to around 60 percent by the mid-1990s for liabilities but only to about 50 percent for assets. Since then, the importance of EU countries has declined in relative terms.

At the same time, there has been a shift of activities away from domestic banks and their subsidiaries towards foreign branches (Graph 4). This relocation of activities has started after 1992 and can be attributed to the Single Market program which lowered the costs of establishing and operating through foreign branches. This contrasts to developments outside the EU where assets of subsidiaries *and* branches have gained in importance relative to those of domestic banks (Graph 4b).

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[20] For the domestic banks, participations have accounted for 4 percent of total foreign assets. For their branches and subsidiaries, total securities have accounted for about 18 percent of foreign assets at the end of 1998. See Deutsche Bundesbank (1999a).

Graph 3 — Share of the EU in Assets and Liabilities of German Banks (in %), 1986–98
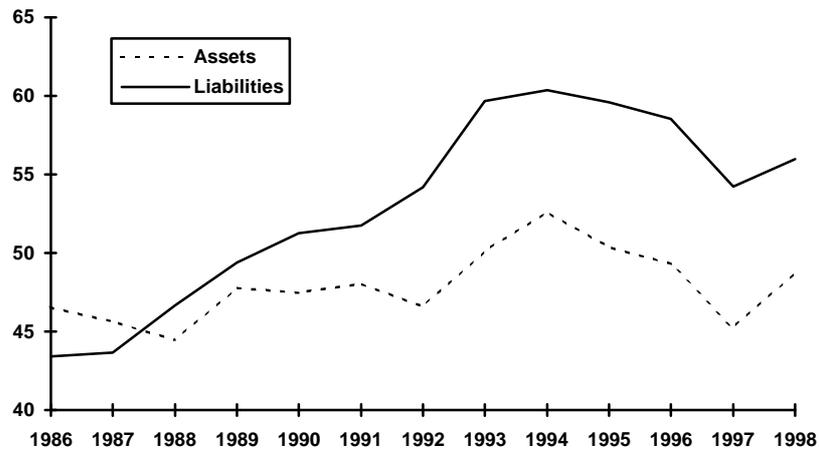
German banks = domestic banks, foreign subsidiaries, and branches. EU = Belgium, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK.

Source: Deutsche Bundesbank (1999a)

Graph 4 — Structure of Foreign Assets (in % of total), 1986–98
a) EU
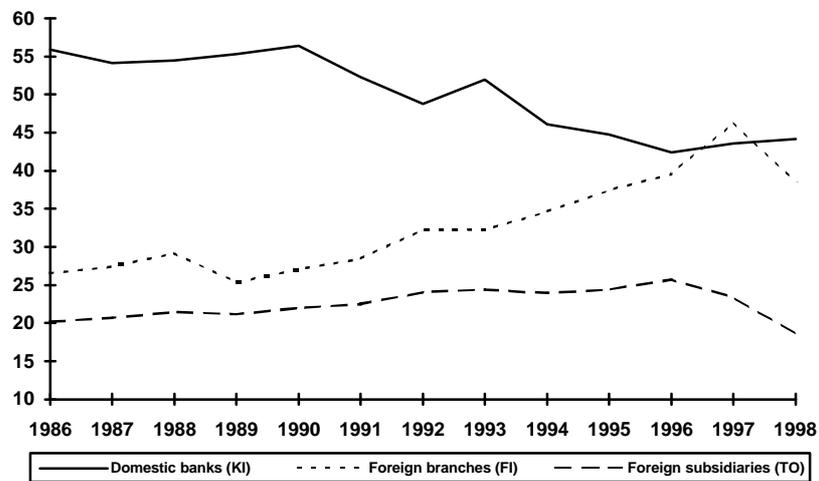
b) Non-EU
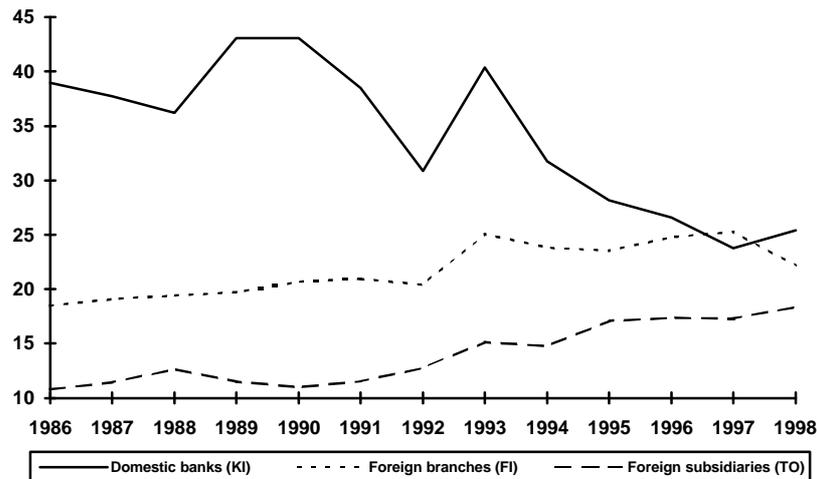
EU = Belgium, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK.
Source: Deutsche Bundesbank (1999a)

5.2 Regression Results

Regressions similar to those for German FDI in the banking sector abroad have been run for the foreign claims of German banks, their subsidiaries and branches. Data for all three subcategories were available for a sample of 37 countries (Table A2). The correlation matrix again shows a high correlation of foreign assets of banks, on the one hand, and total FDI or the foreign trade variables, on the other hand (Table A4). In addition, GDP, interest rate variables, and dummies for financial centers and for the EU were included.

The final regression results show a clear positive and significant link between the stock of assets of German banks abroad in 1997 and total FDI of German firms (Table 4). Unfortunately, data on FDI in the non-financial sector only were not available for all countries. Hence, the positive link between banks' assets and FDI might to a certain extend be spurious. Yet, similar results (not reported) were obtained when the trade variables were used instead of FDI.[21] Likewise, host-country GDP enters with a significant positive sign, except in the equation explaining the assets of foreign subsidiaries.

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[21] In the specification for domestic banks, the volatility variable turned out to be insignificant when FDI was replaced by trade turnover.

Table 4 — Determinants of Foreign Assets of German Banks (Cross Section, 1997)

Explanatory variables	dependent variable		
	Domestic banks log *KIF*	Foreign branches log *FIF*	Foreign subsidiaries log *TOF*
constant	3.42***	3.23***	1.83**
	(5.47)	(3.71)	(2.72)
log *FDI*[a]	0.39***	0.42**	0.63***
	(3.75)	(2.97)	(5.70)
log *GDP*	0.29**	0.29**	0.07
	(3.05)	(2.29)	(0.76)
VOLATILITY	–2.84**		
	(–1.90)		
DUMFIN	1.56*** [b]	1.88***	1.12***
	(3.88)	(3.45)	(2.66)
DUMLUX	2.76***	2.76***	1.84**
	(3.28)	(2.37)	(2.04)
DUMEU	0.41***	0.13	0.44***
	(2.88)	(0.69)	(2.96)
$\bar{R}^2$	0.72	0.53	0.73
F-test (prob.)	0.00***	0.00***	0.00***
White-test (obs. * $\bar{R}^2$)	15.16	9.47	–1.42
Observations	35	38	37

t-values in brackets, ***(**,*) = significant at the 1 (5, 10) percent level. White-test = White heteroskedasticity test (F-value, probability in brackets). — a) Total FDI, including FDI of banks. — b) Financial centre dummy includes also Indonesia and the United States (cf. Brealey and Kaplanis 1996).

Source: Own calculations.

The financial center dummies have the expected positive signs. EU membership and the abolition of capital controls have positively affected assets of German banks and of their subsidiaries abroad, and the strength of this effect is roughly similar. Activities of bank branches, in contrast, seem not to be significantly higher in EU than in non-EU countries, after controlling for market size. Very similar results were obtained when, instead of the EU dummy described above, a dummy capturing the passage of the Second Banking Directive of the EU in 1993 was used.[22] Note that these results are not necessarily at odds with those reported in Graph 4. While in Graph 4 we have looked at the trend in the structure of total assets on EU countries over time, here we consider the stock of assets as of 1997 only.

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[22] This dummy was set to zero prior to 1993, and to one after 1993 for EU-members.

Table 5 — Determinants of Foreign Assets of German Banks (Time Series 1981–98)

Explanatory variables	dependent variable (X)		
	Domestic banks dlog *KIF*	Foreign branches dlog *FIF*[a]	Foreign subsidiaries dlog *TOF*[a]
Error correction term[d]			
log X (–1)	–0.14*** (–5.87)	–0.18*** (–4.74)	–0.29*** (–6.18)
log *FDI* (–1)[b]		0.61*** (4.29)	
log *EX + IM* (–1)	0.60* (1.90)		0.83** (2.56)
log *GDP* (–1)	1.81** (2.42)	1.34*** (2.77)	1.19** (2.54)
M2 / GDP (–1)		2.36*** (3.22)	
dlog X (–1)	0.16*** (3.33)		0.06 (0.93)
dlog *FDI*[a]		0.35*** (2.95)	
dlog *EX + IM* (–1)	0.23* (2.24)		
dlog *GDP*	0.54*** (5.79)	0.35*** (2.51)	0.54*** (3.31)
dlog *GDP* (–1)	–0.32** (–3.19)		
DUMEU	0.07** (2.81)	0.08*** (2.61)	0.09** (2.36)
$\overline{R}^2$	0.12	0.21	0.22
F-test (prob.)	0.00***	0.00***	0.00***
LM-test r = 0 (prob.)	0.40	0.42	0.72
LM-test r > 0 (prob.)	0.20	0.21	0.36
White-test[c] (obs. * $\overline{R}^2$)	16.40	94.57***	46.38***
Number of observations	462	477	390
Time period	1982–98	1981–97	1987–98

t-values in brackets, ***(**,*) = significant at the 1 (5, 10) percent level. For the lagged dependent variable, critical value for T = 25, specification with constant, and three independent variables are –4.92 (–4.91, –3.46) at the 1 (5, 10) percent level of significance and were taken from Banerjee et al. (1992). — a) White heteroskedasticity-consistent standard errors and covariance. — b) Total FDI, including FDI of banks. — c) No cross-terms. — d) Long-run coefficients. t-values for lagged exogenous variables have been obtained from the Bewley-transformed equation. See Hansen (1993: pp. 143) for details.

Source: Own calculations.

Additional parameters have been included. Using the alternative definition of financial centers (Brealey and Kaplanis 1996), slightly better results were obtained for domestic banks and their branches. The volatility parameter had the expected significant and negative impact on assets of German banks but not of their subsidiaries or branches. Inflation or interest rates were either insignificant or had the wrong sign.

Similar regressions were run for the foreign liabilities of German banks.[23] Results show that foreign assets and liabilities follow approximately the same pattern: the demand factors, financial center variables, and EU membership are positive and significant factors influencing the foreign liabilities of banks. This result is interesting because it might be taken as evidence against the hypothesis that the lending activities of commercial banks involve relatively high information costs and thus require closer customer contacts than raising liabilities. At the same time, there are other cost factors such as operating costs which suggest that banks would both lend and raise deposits on the local market. A more detailed analysis of the link between foreign assets and liabilities and of the causality between the two would thus be needed but is beyond the scope of the present paper.

Subsequently, the equations reported in Table 4 were run as an error-correction model, using time series data (Table 5). At most 22 percent of the variation of banks' foreign assets can be explained. In all equations, country-specific fixed effects have been included. With a few exceptions, these fixed effects have been significant. Hausman tests rejected the hypothesis that the fixed and random effects coefficients from estimating (12) were identical. We are using the fixed effects models because they provided the economically more meaningful coefficients and because we are using a relatively closed and exhaustive sample, thus making inferences with respect to this sample (Balestra 1996: 31).[24]

Since the assumption of heteroskedastic residuals could not be rejected for the subsidiaries of German banks, the corresponding equation was estimated by making use of the White-correction for heteroskedasticity. In the other cases, autocorrelation in the residuals was eliminated by including lagged endogenous variables.

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[23] To save space, the results are not reported but are available from the author upon request.

[24] Because the inclusion of country-specific fixed effects may bias the results of the cointegration test, Breitung and Meyer (1994) propose to subtract the first observation from each variable before performing cointegration tests.

As for the stock data, real GDP and foreign activity of non-financial firms, measured either by total FDI or by foreign trade turnover,[25] have been important determinants of banks' foreign activities. For all three sub-categories of German banks, the elasticity of assets with respect to GDP has been clearly above one (long-run coefficients of almost two) while foreign trade links have been somewhat less important (long-run coefficients below one). The EU dummy has entered with a significantly positive sign in all three equations, i.e. also for foreign branches. This result is more in line with the fact that branch activity has benefited the most from the Single Market program but yet fails to explain the relative decline in lending by domestic banks and their subsidiaries. One possible explanation is that the EU dummy could capture geographic and cultural proximity of markets, which would be expected to affect all foreign activities alike. Additionally, we have used the share of lending by foreign branches and subsidiaries of domestic banks as a dependent variable but have failed to find a statistically significant impact of the EU dummy. Hence, the differences in the trends in EU and non-EU countries shown in Graph 4 are not statistically significant.

Again, parameters capturing interest rates, spreads, inflation, and the volatility of exchange rates have been insignificant or had the wrong sign. In one specification, the ratio of M2 over GDP, measuring the size of the foreign financial sector, had a significant positive coefficient.

6 Conclusions

This paper has studied the determinants of German banking activities abroad. The results show a strong and positive correlation between foreign activities of banks and demand conditions as captured by (per capita) GDP and foreign activities of German firms, i.e. FDI in the non-banking sector or foreign trade activities. This supports the hypothesis that German banks follow their customer abroad. Exchange rate volatility seems to have a negative impact on FDI of banks and on foreign claims of German banks but not on the claims of subsidiaries and branches. There is evidence that EU membership and the abolition of capital controls have promoted foreign lending but not FDI of banks, thus weakly supporting the hypothesis that the two are substitutes. Conditions on local banking markets such as returns and interest rate spreads, in contrast, have been much

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[25] Similar results were obtained for the foreign branch equation when foreign trade was used instead of FDI.

more difficult to single out as statistically significant determinants of foreign activities of German banks. Likewise, after controlling for membership in the EU, the distance variable was insignificant.

The fact that financial centers more than proportionally attract foreign banking can be interpreted as evidence for a positive impact of a liberal regulatory regime on foreign activities of banks. The positive effect of EU membership, in contrast, is somewhat more difficult to interpret. On the one hand, membership in the EU has lowered regulatory barriers to enter a new market. On the other hand, the impact of EU membership goes beyond the direct regulatory impact as informational asymmetries tend to be smaller in nearby and integrated markets. Both of these effects are potentially captured by the EU dummy. One possible implication would be that the future enlargement of the EU could be expected to increase the presence of German banks in the markets of the accession states.

Finally, the results of this paper point to likely effects of the introduction of the euro. To the extent that the euro promotes FDI in the non-banking sector and the importance of traditional financial centers within Europe and that it has eliminated exchange rate volatility, it is likely to increase activities of German banks abroad. Similar conclusions can be drawn for investments of non-European financial institutions in Europe. Earlier empirical studies on the determinants of FDI of US or Japanese banks find a strong correlation between foreign trade, financial centers, market size, on the one hand, and FDI in banking, on the other hand.

Several further lines of research are conceivable. First of all, more direct tests of the complementarity between FDI and trade in financial services are needed by, for instance, by explicitly including FDI as a determinant of bank lending and borrowing abroad. Also, the decision of banks to enter a new market could be split up by separating the decision which country to enter from the decision which mode of entry to choose. Also, the causality and links between foreign assets and liabilities of commercial banks could be explored in more detail. Finally, in view of the sharply diverging trends of German in- and outward FDI in banking, additional evidence from other EU countries would be needed to determine the impact of the Single Market program on the German banking market.

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Table A1 — Data Definitions and Sources

Variable	Definition	Source
DEP	deposit rate	IMF (1999)
DUMEU	dummy variable for EU members (= 0 before membership and abolition of capital controls, = 1 membership but capital controls remain, = 2 membership and full abolition of capital controls)	
DUMFIN	dummy variable for financial centres (Great Britain, Hong Kong, Ireland, Switzerland, Singapore)	
DUMLUX	dummy variable for Luxembourg	
EX	German merchandise exports; in million euro	Deutsche Bundesbank (1999a)
FDI_BANK	direct („unmittelbar") and indirect („mittelbar") foreign direct investment of German banks abroad by type of investment object; in million euro	Deutsche Bundesbank (1999b)
FDI_NONBANK	direct („unmittelbar") and indirect („mittelbar") foreign direct investment of German firms abroad by type of investment object, excluding foreign direct investment of banks; in million euro	Deutsche Bundesbank (1999b)
FIF (FIV)	total claims (liabilities) of branches of German banks („Filialen") abroad (stocks), in million euro	Deutsche Bundesbank (1999a)
GDP	gross domestic product in billion current national currency, converted into euro with the average annual euro/US-dollar exchange rate; in million euro	IMF (1999)
GDPCAP	GDP per capita, in euro	IMF (1999)
IM	German merchandise imports; in million euro	Deutsche Bundesbank (1999a)
INF	annual consumer price inflation	IMF (1999)
KIF (KIV)	total claims (liabilities) of German banks abroad (stocks), in million euro	Deutsche Bundesbank (1999a)
LEND	lending rate (if not available: discount rate)	IMF (1999)
MILES	distance in miles between Germany and the respective country (Great Circle distance between capital cities), taken from the International Trade Data webside of Jon D. Haveman, Purdue University	http://intrepid.mgmt.purdue.edu/Trade.Resources/Data/Gravity/dist.txt
POP	population	IMF (1999)
SPREAD	domestic lending rate minus domestic deposit rate	IMF(1999)
TOF (TOV)	total claims (liabilities) of subsidiaries of German banks („Töchter") abroad (stocks), in million euro	Deutsche Bundesbank (1999a)
VOLATILITY	average percentage change of the D-mark exchange rate (annualized, current and past four years)	IMF (1999), own calculations

Note: Single missing observations in stock data have been extrapolated. Data in constant prices of 1980, deflated by German consumer price index.

Table A2 — Country Samples

Foreign direct investment	Domestic banks, branches, and subsidiaries
Australia	Argentina (ARG)
Austria	Australia (AUS)
Belgium	Austria (AUT)
Brazil	Belgium (BEL)
Canada	Brazil (BRA)
China	Canada (CAN)
Czech Republic	China (CHN)
France	Czech Republic (CZE)
Great Britain	Denmark (DNK)
Hong Kong	Finland (FIN)
Hungary	France (FRA)
Ireland	Great Britain (GBR)
Italy	Greece (GRE)
Japan	Hong Kong (HOK)
Luxembourg	Hungary (HUN)
Malaysia	India (IND)
Netherlands	Indonesia (INO)
Poland	Ireland (IRL)
Singapore	Italy (ITA)
Spain	Japan (JPN)
Switzerland	Luxembourg (LUX)
United States	Malaysia (MAL)
	Mexico (MEX)
	Netherlands (NLD)
	New Zealand (NZL)
	Norway (NOR)
	Panama (PAN)
	Poland (POL)
	Portugal (PRT)
	Russia (RUS)
	Singapure (SIN)
	South Korea (SKO)
	Spain (ESP)
	Sweden (SWE)
	Switzerland (SWI)
	Thailand (THA)
	Turkey (TUR)
	United States (USA)

Table A3 — Correlation Matrix for FDI-Panel, 1997

	DEP	EX	FDI_NON-BANK	GDPCAP	GDP	IM	IM+EX	INF	FDI_BANK	LEND	SPREAD	MILES	POP
DEP	1.00												
EX	–0.14	1.00											
FDI_NON-BANK	–0.33	0.79	1.00										
GDPCAP	–0.34	0.38	0.52	1.00									
GDP	–0.17	0.61	0.57	0.63	1.00								
IM	–0.22	0.92	0.78	0.29	0.61	1.00							
IM+EX	–0.19	0.98	0.80	0.35	0.64	0.98	1.00						
INF	0.93	–0.11	–0.29	–0.28	–0.20	–0.15	–0.14	1.00					
FDI_BANK	–0.22	0.32	0.66	0.54	0.20	0.30	0.31	–0.14	1.00				
LEND	0.97	–0.14	–0.31	–0.32	–0.17	–0.21	–0.19	0.92	–0.19	1.00			
SPREAD	0.37	–0.09	–0.04	–0.08	–0.08	–0.09	–0.08	0.40	–0.01	0.58	1.00		
MILES	0.06	–0.43	–0.48	–0.40	0.02	–0.43	–0.43	–0.06	–0.50	0.03	–0.10	1.00	
POP	0.09	0.45	0.27	–0.07	0.73	0.53	0.51	–0.01	–0.22	0.07	–0.04	0.38	1.00

For country coverage see Table A2. Data in logs (except for interest and inflation rates).

Table A4 — Correlation Matrix for Total Panel, 1997

	KIF	TOF	FIF	GDP	GDPCAP	IM	EX	IM+EX	DEP	LEND	INF	FDI	SPREAD
KIF	1.00												
TOF	0.82	1.00											
FIF	0.82	0.71	1.00										
GDP	0.48	0.37	0.56	1.00									
GDPCAP	0.45	0.51	0.52	0.12	1.00								
IM	0.62	0.70	0.50	0.61	0.33	1.00							
EX	0.59	0.71	0.49	0.65	0.36	0.94	1.00						
IM+EX	0.61	0.72	0.50	0.64	0.35	0.99	0.99	1.00					
DEP	–0.45	–0.35	–0.51	–0.08	–0.65	–0.31	–0.21	–0.26	1.00				
LEND	–0.53	–0.37	–0.55	–0.11	–0.63	–0.30	–0.20	–0.25	0.93	1.00			
INF	–0.40	–0.23	–0.45	–0.10	–0.53	–0.18	–0.05	–0.12	0.75	0.84	1.00		
FDI	0.72	0.81	0.64	0.50	0.47	0.73	0.77	0.76	–0.31	–0.32	–0.13	1.00	
SPREAD	–0.40	–0.19	–0.31	–0.11	–0.22	–0.11	–0.06	–0.09	0.22	0.57	0.53	–0.15	1.00

For country coverage see Table A2. Data in logs (except for interest and inflation rates).

Table A5 — ADF Tests

	Levels		First differences		Number	Degree of integra-tion
	Common constant	Fixed effects	Common constant	Fixed effects	of observations	
DEP	−1.34	−5.77	−23.07***	−29.97***	459	I(1)
FDI_BANK	−1.08	−2.95	−10.25***	−11.88***	155	I(1)
FDI_NONBANK	1.37	−0.17	−9.98***	−9.57***	173	I(1)
FDI_TOTAL	6.74	2.12	−16.32***	−18.93***	324	I(1)
FIF	3.66	2.26	−16.30***	−17.07***	387	I(1)
GDP	3.21	0.08	−18.95***	−19.13***	475	I(1)
GDPCAP	3.43	−0.42	−18.62***	−18.95***	471	I(1)
KIF	2.63	0.33	−17.94***	−18.78***	437	I(1)
TOF	2.17	−1.53	−15.92***	−16.73***	362	I(1)

Equations have been estimated with three lags and no trend and are based on the maximum sample available (see Table A2). Critical values at the 1 (5. 10) percent level of significance for 25 cross sections and 10 time periods are −2.60 (−1.90. —1.53) for the specification with a common inter-cept and −8.21 (−7.76. −7.51) for the individual-specific intercepts (Levin and Lin 1992).