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Foreign Competition and Disintermediation: No Threat to the German Banking System?

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**Foreign Competition and Disintermediation:
No Threat to the German Banking System?**

by

Claudia M. Buch and Stefan M. Golder

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Abstract*

The German financial system is characterized by lower degrees of penetration by foreign commercial banks and of (bank) disintermediation than, for instance, that of the United States. These differences between the two countries could be attributed to the fact that universal banking in Germany creates implicit barriers to entry. Yet, regulatory and informational differences which are unrelated to universal banking could be responsible for the observed difference as well. This paper provides a stylized theoretical model of the banking industry, which suggests that market segmentation and limited market entry can be due to a number of factors, including information costs. Preliminary empirical evidence does not provide clear evidence for the hypothesis that universal banking is the reason for the observed differences in financial systems. (124 words)

Keywords: Competition in banking, universal banking, information costs, Germany, United States

JEL-classification: G21, G14

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1 Motivation

The German banking system is one of the prototypes of universal banking structures. German banks can hold equity stakes in non-financial firms, German bankers sit on the boards of large enterprises, and banks cast proxy votes on behalf of their clients. At the same time, the German banking sector is characterized by comparatively low market shares of foreign commercial banks, and financial intermediation has not yet significantly shifted away from banks. This is despite the relatively large degree of openness of the German financial system and the global trend towards disintermediation, which is, in turn, driven by deregulation and technological change.

At first sight, these stylized facts seem to support the view that universal banking creates implicit entry barriers and thus constrains the contestability of markets (Rajan 1998, Boot and Thakor 1997). Having acquired insider information on their clients through long-term banking relationships, universal banks enjoy a certain degree of monopoly power, which gives them a competitive advantage over new market entrants. Aoki and Dinç (1997), in fact, argue that competition from alternative sources of financing, such as the bond market, is likely to strengthen relational financing characteristics of universal banking systems. The issue is thus whether the observed features of the German banking system are due to the presence of universal banks or whether alternative explanations can be found.

The literature so far has provided some possible explanations for structural changes on financial markets in Germany. Results of Borio (1995) and Calomiris (1995) suggest that deregulation since the early 1990s has led to a process of securitization. Still, Allen and Gale (1995) argue that German capital markets remain much less developed as compared to the US. Dziobek and Garrett (1998) argue that the underdevelopment of markets in Germany is mainly the result of the existing universal banking structure rather than a reflection of customer preferences. Domanski (1997) and Schmidt et al. (1998) show that there is no clear trend towards disintermediation, towards the transformation to a market-based financial system, or towards a significant loss in importance of banks.

Another strand of the literature has been concerned with the role of German banks in the corporate governance of firms. Edwards and Fischer (1994) conclude that banks in Germany possess only minor governance power in companies, that relationship-banking creates only little information advantages,

and that relations between banks and non-financial firms in the loan market are characterized by substantial competition. This would suggest that small market shares of foreign banks would have to be explained by factors other than close customer contacts of the incumbents. Yet, other studies have found evidence for a more positive role of commercial banks in the governance of firms and for relationship lending (Elsas and Krahen 1998, Harhoff and Körting 1997, Gorton and Schmid 1996, Schmid 1996).² However, it is not necessarily clear that relationship lending is a specific feature of large (universal) banks. A recent study by Kueppers (1999) rather suggests that savings banks and credit co-operatives also engage in relationship lending.

Despite the large amount of research on the German financial system, issues related to the competition between bank financing and alternative sources of financing, the competition between domestic and foreign banks, as well as the determinants of foreign banks' activities in Germany have received only little attention in the literature. The purpose of this paper is thus to provide evidence on the impact of deregulation, disintermediation, and foreign competition on the German banking system.

We start by giving an overview of the theoretical literature and derive testable implications (Section 2). Section 3 presents stylized facts for the German financial system with regard to the disintermediation process. Evidence from the United States is given as a benchmark. Section 4 provides evidence on the market shares of foreign banks in Germany and in the US, in particular with regard to the determinants of credit supply of domestic versus foreign banks. Section 5 concludes.

As regards the contestability of banking markets, we obtain different results for different segments of the German banking system. Whereas universal banking seems not to have impeded market access into investment banking, the retail market is dominated by domestic financial institutions, mainly savings and cooperative banks. As these banks do not hold equity stakes in non-financial firms, universal banking per se cannot serve as an explanation for this dominance of domestic banks. Rather, differences in information costs between domestic and foreign banks provide an alternative explanation. Also, savings banks have access to relatively low-cost funds and therefore hold a comparative advantage over competitors.

² For a review of the literature see Brichs-Serra et al. (1997).

2 Universal Banking, Foreign Competition, and Disintermediation

This section summarizes theoretical contributions which help us to gauge the likely effects of deregulation and of the on-going process of disintermediation on (universal) banking systems. Hereby, we interpret deregulation as the abolition of regulatory restrictions to the provision of certain financial services as well as to the entry of foreign financial institutions. Disintermediation, in contrast, is considered as a process driven mainly by changes in preferences and in technology. This process is, however, not exogenous, as deregulation through its impact on the variety and on the prices of financial services is likely to foster changes in preferences and in technology. A clearcut distinction between deregulation and disintermediation is thus not possible. We start with a simple illustrative model of a banking sector in which domestic and foreign banks compete in the markets for loans granted to domestic and foreign clients. In a second step, we take specific account of the fact that universal banking systems are characterized by close contacts between banks and their customers.

2.1 Foreign Competition and Banking

To study the impact of increased competition through the entry of foreign banks, we use a model with domestic and foreign banks competing in the markets for loans to domestic and foreign clients. We assume a Cournot-type framework, where n identical domestic and m identical foreign banks maximize their profits given the loan supply of all other banks.³ The intermediation process between savers and borrowers is presumed to be costly, yet banks provide intermediary services at lower costs than other market participants. These savings in

³ The assumption of Cournot competition in banking can be questioned because banks typically compete in prices rather than quantities. Nevertheless, Neven and Roeller (1999) show empirically that the assumption of competition in quantities describes the actual situation for the European banking industry relatively well. Yet, they reject Cournot competition in favor of an industry structure characterized by cartel-like behavior. Helpman and Krugman, (1985) generally defend the assumption of Cournot competition although competition in prices might seem more sensible. Assuming Bertrand competition, in contrast, and taking the interaction of loans supply and deposit demand decisions into account substantially complicates the analysis (see, e.g., Yanelle 1997). Chiappori et al. (1995), Dell'Ariccia (1998), Economides et al. (1996), or Rajan (1998) model price competition in the banking industry using spatial competition models of product differentiation.

transaction costs can be realized as a result of the information on loan applicants that banks acquire through deposit services, and as a result of diversification (see Diamond 1984, and Nakamura 1993).

Domestic banks $i = 1, \dots, n$ and foreign banks $j = 1, \dots, m$ are assumed to provide two types of assets, namely loans to domestic and foreign clients, (L_{iD}, L_{iF}) and (L_{jD}, L_{jF}) , and they finance their activities through deposits (D_i, D_j) and equity (E_i, E_j) . The balance sheet structure of the representative domestic and foreign bank can thus be written as

$$(1) \quad L_i = D_i + E_i \quad \text{with} \quad L_i = L_{iD} + L_{iF}$$

$$(2) \quad L_j = D_j + E_j \quad \text{with} \quad L_j = L_{jD} + L_{jF}.$$

Denoting the shares of deposits in total assets for domestic and foreign banks by (a_i, a_j) , deposits and equity can be rewritten in terms of total loans

$$(3) \quad D_i = a_i L_i \quad \text{and} \quad E_i = L_i - a_i L_i$$

$$(4) \quad D_j = a_j L_j \quad \text{and} \quad E_j = L_j - a_j L_j.$$

Banks' revenues are determined by the interest received on loans (r_{LD}, r_{LF}) . Costs comprise variable costs of making loans, i.e. $(c_{i,LD}, c_{i,LF})$ for domestic and $(c_{j,LD}, c_{j,LF})$ for foreign banks, as well as the interest (r_D) paid on deposits and the opportunity costs (r_i, r_j) of holding equity. Finally, there are fixed costs of market entry (F_i, F_j) . The profit function for a representative domestic bank can thus be written as

$$(5) \quad \rho_i = (r_{LD} - c_{i,LD})L_{iD} + (r_{LF} - c_{i,LF})L_{iF} - r_D a_i L_i - r_i (L_i - a_i L_i) - F_i.$$

Equivalently, the profit function for a representative foreign bank is given by

$$(6) \quad \rho_j = (r_{LD} - c_{j,LD})L_{jD} + (r_{LF} - c_{j,LF})L_{jF} - r_D a_j L_j - r_j (L_j - a_j L_j) - F_j.$$

To simplify the analysis, we abstract from explicitly modeling information asymmetries or the impact of increased competition on the monitoring incentives

of the incumbent financial institutions.⁴ Yet, the variable operating costs from handling loan applications could be interpreted in terms of information costs. The market for domestic and foreign clients are assumed to represent two market segments that are separable. Also, we assume that domestic and foreign banks are facing identical conditions on the deposit side and that they take the deposit rate as exogenous. Finally, all lenders and borrowers in the two market segments are identical, such that individual demand and supply curves can be added up.

The optimal choice of loan supply and deposit demand by domestic and foreign banks is constrained by the market demand for loans from domestic and foreign firms and by the market supply of deposits. Loans to domestic and foreign clients, respectively, are assumed to represent two homogenous goods, i.e. loans to domestic (foreign) firms by domestic (foreign) banks are perfect substitutes. Assuming linear market demand functions, we can thus write

$$(7a) \quad nL_{iD} + mL_{jD} = L_D(r_{LD}) = d_1 - d_2 r_{LD} + d_3 r_B$$

$$(7b) \quad nL_{iF} + mL_{jF} = L_F(r_{LF}) = f_1 - f_2 r_{LF} + f_3 r_B$$

$$(7c) \quad nD_i + mD_j = D(r_D, r_B), \text{ where } D'(r_D) > 0 \text{ and } D'(r_B) < 0$$

where $d_i, f_i > 0$ with $i = 1, 2, 3$ represent the determinants of domestic and foreign loan demand. The bond rate (r_B), represents the price of an alternative source to finance firm operations. The inverse loan demand functions are

$$(8a) \quad r_{LD} = \frac{d_1 + d_3 r_B - L_D}{d_2}$$

$$(8b) \quad r_{LF} = \frac{f_1 + f_3 r_B - L_F}{f_2},$$

Banks choose lending to domestic and foreign clients as well as the structure of their liabilities to maximize profits. From the optimal supply of loans in the two market segments, the optimal scale of activities and the structure of the banks' assets can be derived. In what follows, we abstract from feedback effects between the optimal values for a_i and L_{iD} , and make the simplifying separation

⁴ For a general discussion of the effects of increased competition in banking on interest rates, welfare, and bank monitoring see Aizenman (1998), Besanko and Thakor (1992), or Gehrig (1998).

assumption that the cross derivatives are zero, i.e. $\frac{\partial^2 p}{\partial L_i \partial a} = \frac{\partial^2 p}{\partial a \partial L_i} = 0$. We

therefore assume that the scale of operations can be determined independently from the optimum balance sheet structure, and vice versa (see Baltensperger and Milde 1987, and Chiang 1984). Based on (5), the first order conditions for the profit maximum of domestic bank i are thus given by

$$(9a) \quad \frac{\partial p_i}{\partial L_{iD}} = -\frac{1}{d_2} L_{iD} + r_{iD} - c_{i,LD} - r_D a_i - r_i(1 - a_i) = 0$$

$$(9b) \quad \frac{\partial p_i}{\partial L_{iF}} = -\frac{1}{f_2} L_{iF} + r_{iF} - c_{i,LF} - r_D a_i - r_i(1 - a_i) = 0$$

$$(9c) \quad \frac{\partial p_i}{\partial a_i} = -r_D L_i + r_i L_i = 0.$$

Taking the respective inverse demand functions (8a) and (8b) into account, the first order conditions can be rewritten as

$$(9a') \quad \frac{\partial p_i}{\partial L_{iD}} = -\frac{1}{d_2} L_{iD} + \frac{d_1 + d_3 r_B - L_D}{d_2} - c_{i,LD} - r_D a_i - r_i(1 - a_i) = 0$$

$$(9b') \quad \frac{\partial p_i}{\partial L_{iF}} = -\frac{1}{f_2} L_{iF} + \frac{f_1 + f_3 r_B - L_F}{f_2} - c_{i,LF} - r_D a_i - r_i(1 - a_i) = 0$$

$$(9c') \quad \frac{\partial p_i}{\partial a_i} = -r_D L_i + r_i L_i = 0.$$

Based on (9a') and (9b'), which are identical for all i domestic banks, we can derive bank i 's reaction functions, i.e. the optimal loan supply of bank i in the two market segments as a function of the loan supply of the foreign bank j

$$(10a) \quad L_{iD}^*(L_{jD}) = \frac{1}{1+n} \left\{ d_1 + d_3 r_B - L_{jD} m - d_2 [c_{i,LD} + r_D a_i + r_i(1 - a_i)] \right\}$$

$$(10b) \quad L_{iF}^*(L_{jF}) = \frac{1}{1+n} \left\{ f_1 + f_3 r_B - L_{jF} m - f_2 [c_{i,LF} + r_D a_i + r_i(1 - a_i)] \right\}$$

Substituting the foreign banks' reaction functions $[L_{jD}^*(L_{iD}), L_{jF}^*(L_{iF})]$ into (10a) and (10b) respectively, we can derive the optimal loan supply for a representative domestic bank

$$(11a) \quad L_{iD}^*(L_{jD}^*) = \frac{1}{1+m+n} \left\{ d_1 + d_3 r_B + d_2 m [c_{j,LD} + r_D a_j + r_j (1-a_j)] \right\} \\ - \frac{1}{1+m+n} \left\{ d_2 (1+m) [c_{i,LD} + r_D a_i + r_i (1-a_i)] \right\}$$

$$(11b) \quad L_{iF}^*(L_{jF}^*) = \frac{1}{1+m+n} \left\{ f_1 + f_3 r_B + f_2 m [c_{j,LF} + r_D a_j + r_j (1-a_j)] \right\} \\ - \frac{1}{1+m+n} \left\{ f_2 (1+m) [c_{i,LF} + r_D a_i + r_i (1-a_i)] \right\}$$

As can be seen from (11a) and (11b), assumptions on the relative cost structures between domestic and foreign banks have to be made in order to determine whether banks service a given market segment. In addition to operating costs, differences in the opportunity costs of raising equity and thus in the structure of banks' liabilities affect relative market shares.⁵ Looking at (11b) shows that domestic (foreign) banks are less likely to provide loans to foreign (domestic) clients the larger their comparative disadvantage of supplying these loans.

Based on comparative static analysis, we can determine the effect of an increase in the costs on the market shares of domestic and foreign bank, which is given by

$$(12) \quad e_i = \frac{nL_{iD}^*}{nL_{iD}^* + mL_{jD}^*}$$

and thus

$$(13a) \quad \frac{\eta e_i}{\eta c_{i,LD}} = \frac{1}{1+m+n} \frac{(-d_2 nm(1+m)L_{jD}^* - d_2 n^2 mL_{iD}^*)}{(nL_{iD}^* + mL_{jD}^*)^2} < 0$$

$$(13b) \quad \frac{\eta e_i}{\eta c_{j,LD}} = \frac{1}{1+m+n} \frac{(d_2 m^2 nL_{jD}^* + d_2 (1+n)mnL_{iD}^*)}{(nL_{iD}^* + mL_{jD}^*)^2} > 0.$$

⁵ In Germany, this issue is relevant for the savings banks, as they can raise equity at significantly lower costs compared to other banks due to their higher corporate ratings. These, in turn, are due to government guarantees on their liabilities. The presence of these guarantees may also explain why savings banks are able to attract deposits at relatively low interest rates.

As can be seen in (13a), an increase in the costs of providing loans to domestic clients, *ceteris paribus*, leads to a decrease in the market share of domestic banks in this market. In contrast, as given by (13b), an increase in the costs of the foreign competitors, *ceteris paribus*, leads to an increase in the market share of domestic banks. Symmetric results can be derived for foreign banks. *Inter alia*, the impact of deregulation on market shares of foreign banks thus depends on the effect it has on operating costs:

Based on (11a) and (11b), insights on the impact of disintermediation on the loan supply can be gained. Using bond financing as an alternative way to finance firm operations, a decrease in the bond rate will trigger a shift from loan to bond financing, and thus a decline in the loan supply of domestic and foreign banks. As can be seen from (7c), this effect is reinforced by the decline in deposits that arises from a shift to bond investments.

Finally, (fixed) costs of market entry need to be taken into account. If operating profits do not cover these costs, foreign banks may not enter the domestic market. Hence, a relatively small change in variable costs through deregulation may leave relative market shares unaffected. This holds in particular to the extent that investment decisions of banks are irreversible and are made under conditions of uncertainty. The optimal investment policy of a representative bank must thus consider the value of the real investment option: as information about the economic environment improves over time, it pays to wait and to postpone investment (Chen and Mazumdar 1997).⁶ 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.

2.2 Universal Banking and Disintermediation

The previous discussion has not taken account of specific features of the German banking system, namely the fact that, in contrast to specialized banks, German universal banks are allowed to underwrite securities and to hold equity in non-financial firms. *Inter alia*, this gives them the potential to perform corporate governance functions in non-financial firms and to build up long-term customer relationships. Equity holdings of commercial banks play a particularly important

⁶ 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.

role in this contexts as they, on the one hand, enable banks to impose optimal governance structures on firms but, on the other hand, can also lead to conflicts of interests within the banks.⁷

The global trend towards disintermediation of financial services has potentially threatened the role of universal banks. While the term disintermediation is used to describe a variety of different developments, it is properly defined as a move from the intermediated provision of financial services via (universal) banks to direct financial relations between borrowers and lenders. In a world of complete markets, this process would lead to a situation where there would be no need for financial intermediaries anymore. As a result of the existence of transaction and information costs, however, financial intermediation is unlikely to become redundant. Hence, disintermediation can more properly be defined as a loss in importance of traditional banking activities, such as the collection of deposits from households and the provision of bank loans to companies. In this scenario, the role of financial institutions shifts to the provision of financial services on a fee basis. This development, which could rather be characterized as 'bank disintermediation', does not necessarily imply that there is an overall decrease in financial intermediation.

Facing increased competition through non-bank financial institutions, universal banks must devise strategic responses. As the benefits of universal banks are allegedly due to their ability to reduce problems related to information asymmetries and to establish close customer relationships, universal banking creates a certain degree of monopolistic market power and allows the banks to capture (information) rents. Rajan (1998) thus argues that the presence of universal banks reduces the contestability of markets and may impede competition.⁸ One result of the model is that, although it may be optimal to separate lending and underwriting from a social planner's point of view, in order, for instance, to reduce conflicts of interest, banks would combine the two in order to extract rents. One of the implications of this model is that universal banks are able to "starve independent investment banks of a profitable clientele and force them to exit the market" (p. 23). Such an outcome would be observed despite the

⁷ See Brichs Serra et al. (1997) for a discussion of the costs and benefits of universal banking.

⁸ Although universal banks in his model are assumed to have no information advantage over specialized banks, they have a timing advantage and can offer services to firms prior to specialized banks. This, together with the assumption of increasing returns to scale in underwriting, implies that firms may be monopolized by universal banks.

fact that investment banks may have comparative advantages in the underwriting business.

The issue of how commercial (universal) banks optimally respond to increased competition is taken up by Boot and Thakor (1997), who analyze competition between commercial and investment banks. Both provide relationship loans (which are monitoring intensive) and transaction loans (which are not). The banks are distinguished by the fact that only commercial banks have access to a federal deposit insurance system and that investment banks need to incur search costs if they want to provide loans to companies. Increased competitive pressure on commercial banks can arise either from other commercial banks or from the capital market (i.e. via market access of investment banks). In both cases, commercial banks can be expected to increase relationship relative to transaction lending. Rather than expanding into new fields of activities, commercial banks' optimal response to increased competition would thus be to focus operations. Because of the competitive advantage that commercial banks have vis-à-vis investment banks, the relative increase in importance of relationship lending is greater when competition through investment banks increases. As competition reduces the marginal return on banks' lending activities, it reduces the optimal level of operation. Relationship lending is thus likely to shrink as competition becomes sufficiently intense. In absolute terms, the volume of relationship lending thus behaves in a non-monotonic way: it first increases as competition from both types of banks increases, and it falls later on.

The conclusion that increased competition is not necessarily harmful to relational financing is also reached by Aoki and Dinç (1997), and Puri (1999). Relational financing is understood as a type of financing where the bank is "expected to make additional financing in a class of uncontractible states in the expectation of future rents over time" (Aoki and Dinç 1997, p. 5). The point made by Aoki and Dinç is that competition from complementary sources of funding, such as bond markets, is likely to strengthen relational financing, in contrast to competition from other banks, as bonds are closer substitutes to arm's length loans than to relational loans. Furthermore, countries whose financial systems and regulatory frameworks differ need not converge after deregulation. As relational financing is likely to require skills and expertise different from arm's length financing, old structures are likely to proliferate. If two countries, such as Germany and the US, are starting with different financial market regulations, such as on banking entry and security issues, and if these regulations remain in place for a sufficient period of time, the existing types of financing are not only likely to

prevail, but are also to survive deregulation and thus establish a form of institutional path dependency (Aoki and Dinç 1997).

2.3 Implications

Banking markets in the past decades have been characterized by increased deregulation and technological innovation, which have increased the supply of alternative sources of finance and the number of potential competitors. The discussion in this section has shown the implications of these developments for the structure of banking markets:

- Handling credit applications and assessing the credit risk of a customer is costly. If these costs are positively related to the 'institutional proximity' of a bank and a client company, we would expect foreign banks to service a different market segment than domestic banks and to deal mainly with foreign clients. Entry of foreign banks into market segments traditionally serviced by domestic (commercial) banks will occur only if deregulation has a sufficiently large impact on relative cost structures.
- The impact of increased competition through (foreign) investment banks on the market shares of (domestic) commercial banks is unclear from a theoretical point of view. On the one hand, if foreign banks have comparative advantages over domestic financial institutions in investment banking activities, we would expect them to have a higher market share in the wholesale than in the retail segment of the domestic market. In this case, disintermediation and market entry of foreign banks would be complementary processes and could not be viewed in isolation. On the other hand, incumbent universal banks could be able to successfully restrict the market access of investment banks if they have close customer contacts and monopolistic power over firms.
- Facing increased competitive pressure, both through investment and commercial banks, universal banks can be expected to focus on relationship lending. The incumbent banks may lose market shares only if competitive pressure exceeds a certain threshold level, as the overall profitability of lending declines.

In what follows, these hypotheses will be confronted with stylized facts of the German banking system. We focus on the disintermediation process and on the activities of foreign banks. Whenever appropriate, we present evidence from the US, where universal banking has been banned until very recently since the enactment of the Glass-Steagall Act in the early 1930s. Also, if possible, long-run

time series are used to track the evolution of the German financial system since the 1950s.

3 Changing Financial Structures of Households and Firms: Germany versus the US

Disintermediation as well as deregulation of markets have affected both the supply and the demand for banking services. In this section, we focus on structural shifts in the demand for financial assets by households and in the sources of finance of non-financial firms. The increasing variety of investment instruments available to households is likely to reduce the share of savings held in bank deposits. At the same time, the larger scope of funding opportunities available to firms is likely to lead to a shift from bank borrowing to other forms of financing.

Based on annual data from 1950 until 1998, we present evidence on the degree of bank disintermediation in Germany, using evidence on the US as a benchmark. For each time series under review, regressions were run to capture time trends and liberalization effects. The time trend, in turn, can be interpreted to capture technological change as a driving force behind (bank) disintermediation whereas the liberalization dummy captures the deregulation of financial markets. At least since the mid-1970s, the German financial system has been comparatively open with respect to foreign competition and capital flows (EC 1997: 25). Since 1976, foreign financial institutions have in principle had the freedom to establish, remaining capital controls and interest rate regulations were fully abolished in 1981, and the EU's Second Banking Directive had been implemented by 1992 (Table 1).⁹ Hence, we are setting the liberalization dummy for Germany equal to zero up until 1980, equal to 1 between 1981 and 1991, and equal to 2 subsequently. Deregulation in the US has taken a similar path with the deregulation of interest rates at the beginning of the 1980s and the permission of interstate branching towards the mid-1990s. The largest impact on the banking industry is yet to come, when the abolition of the Glass-Steagall Act will become

⁹ An overview on the institutional structure of the German banking system can be found in Baums and Gruson (1993), Clarich (1987), Danthine et al. (1999) or Edwards and Fischer (1994).

effective. Due to the differences in the timing of deregulation, the liberalization dummy for the US is set equal to zero up until 1979, equal to 1 between 1980 and 1993, and equal to 2 subsequently.¹⁰

Table 1 — Liberalization of Capital Flows and of Banking Activities

<i>Germany</i>	
1967	Abolition of majority of capital controls
1976	Freedom of establishment
1978	First Banking Directive implemented
1981	Capital controls fully abolished, interest rate deregulation completed
1988	Proposal for a Second Banking Directive of the European Union (EU)
1992	Second Banking Directive and other EU Directives regulating financial markets become effective; principles of home country control, mutual recognition of banking licenses, and of minimum harmonization are being established
<i>United States</i>	
1933	Glass-Steagall Act, prohibition of banks from underwriting corporate securities
1956	Bank Holding Act, regulatory approval of interstate banking, restriction of non-banking activities of bank holding companies.
1980	Depository Institutions Deregulation and Monetary Control Act, elimination of interest ceilings and increase in allowed activities of savings and loan associations
1994	Interstate and Branching Efficiency Act, permission of interstate branching and nationwide acquisition of banks
1999	Abolition of the Glass-Steagall Act, permission of full affiliations among US banks, insurance companies and securities companies

Source: Bakker (1994), EC (1997), Santomero and Babbel (1997)

3.1 Financial Assets of Households

A substantial shift in the structure of financial assets of German households has occurred over time (Table 2). While the share of bank deposits has been rather stable and even increased somewhat up until 1980, the past two decades have seen a marked decline of almost 16 percentage points in the share of household financial assets held with banks. While the share of financial assets held with insurance companies, mainly in the form of life insurances to provide private old age insurance was 15 percent in 1950, a significant increase to over 20 percent occurred in the past two decades. It is interesting to note that German households

¹⁰ It should be noted that regulations in other areas, such as in taxation is not captured in the liberalization dummy.

in the 1950s held about a quarter of their financial assets in shares. Over time, however, households shifted from shares to fixed income assets. Finally, investment certificates have become an increasingly attractive instrument for households to allocate their savings.

Table 2 — Financial Assets of German and US Households in Percent of Total Financial Assets 1950–98

	1950	1960	1970	1980	1990	1998	Trend ³	Liberal. ³
<i>Germany</i> ¹								
Banks	46.7	45.7	52.4	52.4	44.5	36.2	0.04	–3.50***
Insurance companies	15.0	13.3	14.8	16.6	20.2	22.2	0.07	3.03
Bonds	1.0	3.4	8.5	12.7	13.8	13.4	2.09*	–1.83*
Investment fund certificates	...	...	...	...	4.2	10.0	5.79	6.44
Shares	26.5	24.3	11.3	4.8	5.5	8.7	–0.99**	1.58***
Other claims	12.8	18.7	20.5	21.0	16.1	12.8	–0.09	–3.26
Memorandum item								
<i>United States</i> ²								
Banks	16.9	17.6	20.9	22.1	19.4	11.1	–0.10	–1.91
Insurance companies	7.5	6.3	5.1	3.3	2.6	2.3	–0.39*	–0.25
Bonds	10.7	8.7	6.5	5.1	9.0	5.6	–0.05	0.45
Investment funds	3.8	8.2	16.9	20.4	32.4	44.6	1.14*	–2.13
Shares	57.5	55.5	47.4	46.3	33.7	34.0	–0.33**	–0.35
Other claims	3.7	3.6	3.2	2.7	2.9	2.3	–0.30**	1.66
Memorandum item								

End of period. — 1) Germany: Data until 1990 for West Germany only; investment fund certificates, which include money market, securities and open real estate funds, are displayed separately from 1990 onwards, for the previous period, their respective shares were included in shares and bonds; other claims include money market papers, claims on building and loan associations. — 2) United States: investment funds include money market and mutual fund shares, pension fund reserves, and investments in bank personal trusts; other claims include i.a. mortgages and security credits. — 3) The following equation was estimated to derive the trend: $\log(x) = a_1 + a_2 \log(x_{-1}) + a_3 trend + a_4 lib + e$, where x is the share of a given financial asset in total assets, and lib is a dummy variable capturing deregulation. The usual tests have been applied and are available from the authors upon request. ***(**,*) = significant at the 1 (5,10) percent level. Newey-West heteroskedasticity and autocorrelation consistent standard errors and covariances.

Source: Deutsche Bundesbank (1998, 1999), Federal Reserve (1999), own calculations

A number of noteworthy differences emerge when comparing these results with the distribution of financial assets of households in the US (Table 2). First, financial assets held with banks have never played an equally important role and have even declined substantially in importance to about 11 percent in 1998.

Second, the two most important instruments for households are share holdings, the importance of which has declined from nearly 60 percent in 1950 to 34 percent in 1998, and investment funds, which have grown more than tenfold over the past five decades. This shift is due to the larger risk diversification opportunities offered to households from investment funds. Direct share and investment fund holdings amount to almost 80 percent of total household financial assets.

The results of the regression analysis in Table 2 indicate that, for Germany, a significant time trend can be observed only for bonds (increase) and shares (decrease).¹¹ Bank deposits, in contrast, have not significantly changed in importance over time. For the US, a significant decline in the importance of insurance companies, shares and other claims and a significant increase in investment fund holdings can be observed over time. Similar to Germany, there is no significant time trend for bank deposits. As regards the impact of deregulation, the liberalization of financial markets in Germany has triggered a strong decline in bank deposit and also in bond holdings of households. At the same time, deregulation has fostered share holdings.

3.2 Financing Sources of Firms

A number of previous studies have been concerned with a cross-country comparison of financial structures. Mayer (1988) argues that bank-based systems provide larger external financing, compared to market-based systems (see also Hoshi et al. 1990a, 1990b, 1991). This would be consistent with the evidence of Rajan and Zingales (1995) that German firms have a higher leverage than US companies. Corbett and Jenkinson (1996), however, provide evidence on a predominant use of retained earnings to finance investment while differences between bank- and market-based financial systems seem less pronounced than the conventional wisdom suggests.¹²

In what follows, we provide evidence on the changes in financial structure of German and US companies, based on stock data on the gross sources of finance of firms for the years 1950 through 1998 (Table 3). German companies have predominantly relied on bank financing which accounted for 45-55 percent of

¹¹ The explanatory power of these regressions has been good, with an adjusted R^2 between 0.75 and 0.98 for all regressions.

¹² This analysis has been based on flow data on the sources of funds.

total sources over the past five decades. This confirms the important role of banks in Germany for corporate finance. While corporate bond issuance has been almost non-existent, equity has accounted for more than a third of financial sources in the 1960s, with a consecutive decline, which came to a halt in 1980. Over the past two decades, the share of equity has doubled.

Table 3 — Liabilities and Shares of German and US Companies in Percent of Total Financial Liabilities 1950–98

	1950	1960	1970	1980	1990	1998	Trend	Liberal.
<i>Germany</i> ¹								
Bonds	2.1	2.8	2.6	1.5	1.7	1.3	–0.52	2.97
Shares	27.8	37.2	20.0	13.3	16.4	26.1	–0.69**	13.40***
Bank loans	45.8	40.4	51.3	54.9	54.5	52.6	0.28***	–3.21***
Building and loan association loans	0.9	1.8	4.2	6.1	3.6	2.8	–0.15	–3.55
Insurance enterprises loans	2.4	3.3	4.7	5.0	4.6	3.4	–0.16	–0.24
Other liabilities	22.6	15.1	17.6	19.4	19.2	13.9	0.00	–3.29
<u>Memorandum item</u>								
Financial liabilities in percent of GDP	...	110.6	116.5	127.0	151.4	213.2	...	...
<i>United States</i> ²								
Bonds	14.7	12.9	13.9	13.0	16.1	11.4	–0.25*	4.54**
Shares	50.6	61.4	56.9	40.4	38.5	61.0	–0.65**	15.60***
Bank loans	7.2	6.3	8.3	6.8	7.1	4.1	–0.43**	5.52**
Building and loan association loans	6.3	4.8	5.2	3.9	3.3	1.8	–0.39**	0.71
Other liabilities	21.3	14.5	15.8	35.8	34.9	21.7	0.39*	–3.55**
<u>Memorandum item</u>								
Financial liabilities and shares in percent of GDP	...	112.9	120.9	121.3	133.9	223.2	...	...
End of period — 1) Germany: Other liabilities include money market papers and miscellaneous liabilities. — 2) United States: Other liabilities include other loans and advances, trade payables, taxes payable, and miscellaneous liabilities. — For technical details see Table 5.								

Source: Deutsche Bundesbank (1998, 1999), Federal Reserve (1999), own calculations

Comparing these results with the US reveals large differences in financial structures. Equity is by far the most important source of funding, although there have been quite remarkable swings over time, which are mainly mirrored in swings in other liabilities. Corporate bond issues also account for a far larger share in total liabilities as compared to Germany. These differences are also

reflected in a much lower share of bank credits as a source of financing for US companies (less than 10 percent). Inter alia, the absence of universal banking and the much lower degree of relationship banking may have contributed to the faster development of capital markets in the US which provide attractive alternatives to borrowing from banks.

The regression estimates reported in Table 3 provide a number of noteworthy results. First, the trend and the liberalization dummy have opposite signs for Germany and for the US respectively, except for loans from building and loan associations and insurance enterprises in Germany. Second, there are a number of differences between Germany and the US. While for bank loans, a significantly positive time trend can be observed for Germany, coupled with a significant decrease arising from deregulation in the 1980s and 1990s, the opposite holds for the US. Finally, Table 3 also reveals that the trend and liberalization dummy are better able to explain the developments in the US than in Germany.

In summary, the disintermediation process has proceeded much further in the US as compared to Germany. For Germany, looking at time trends alone does not reveal a significant trend towards (bank) disintermediation. Instead, demand for bank loans even seems to have increased. Deregulation of markets, in turn, has promoted disintermediation both with regard to the supply and the demand for banking services. Still, banks have remained the largest collector and provider of funds. These findings contrast with theoretical arguments which claim that increased competition need not harm banks that engage in relationship lending and that universal banking in particular constrains the contestability of markets. Additionally, the convergence of financial structures seems to be hampered by institutional path dependence. This is evidenced by the fact that, possibly due to the prohibition of universal banking, disintermediation has proceeded more rapidly in the United States.

4 Activities of Foreign Banks

The previous section has provided evidence on overall disintermediation trends in Germany and the US without taking into account the special role of foreign financial institutions. In this section, we provide evidence on the impact of foreign competition on individual market segments such as the retail and the wholesale

market for banking services, and we analyze the determinants of corporate lending by domestic and foreign banks.

4.1 Market Shares of Foreign Banks

The German banking system is notorious for its low degree of market penetration by foreign financial institutions (Table 4). With regard to the balance sheet total, foreign banks' market share has hovered around 4 percent since the mid-1980s. Although there has been a statistically significant increase in foreign banks' market share when comparing the 1990s to the 1980s, the magnitude of this shift has been modest. Foreign banks have been even less successful in attracting business with non-banks, as evidenced by market shares of about 2 and 3 percent in the deposit and lending business, respectively.

Table 4 — Market Shares of Foreign Banks in Germany and in the US (Period Averages in Percent) 1980–99

	1980–89	1990–99	Probability of equal means between the sub-periods ^a
<i>Germany</i>			
Total assets	4.34	4.33	0.79
Deposits	1.49	2.23	0.00***
Loans	2.26	2.69	0.00***
<i>United States</i>			
Total assets	7.63	12.11	0.00***
Deposits	3.26	6.61	0.00***
Loans	12.06	24.11	0.00***

a) Based on a *t*-test. — *** = significant at the 1-percent level.

Source: Deutsche Bundesbank and Federal Reserve (Data retrieved via Datastream), own calculations

Developments in Germany are in contrast to those in other developed market economies, notably the US (Table 4). Here, market shares of foreign commercial banks have been on a rise at least until 1997, and the expansion of foreign commercial banks has been particularly pronounced in the loan market. By the late 1990s, foreign banks' share in the market segment of commercial and industrial loans reached 20-25 percent of the total, thus largely exceeding their market share in terms of the balance sheet total (about 10 percent). As in Germany, foreign banks have had a below-average share in the deposit market, possibly because of their lack of access to a sufficiently large branch network.

The disappointing performance of foreign banks in Germany with regard to retail banking activities is also in contrast to their dominant presence in the wholesale market. Foreign banks have occupied substantial market shares in the off-balance sheet business, in investment banking as well as in mergers and acquisitions (M&As), at least during the past decade (Landeszentralbank in Hessen 1990, 1995). Foreign banks accounted for almost 17 percent of the turnover on the Frankfurt Stock Exchange and for 42 percent on the German Futures and Options Exchange in 1998 (Association of Foreign Banks in Germany 1998). Foreign banks are also very active in the underwriting business, where they held a market share among the 20 leading financial institutions in the D-mark primary market of 42 percent in 1996. Even more striking are the figures for M&A transactions, where foreign banks achieved a market share of 77 percent in 1996.

In order to obtain first evidence on the links between the activities of domestic and foreign banks, simple correlation coefficients have been calculated (Table 5). We use logs of changes in loans of different banking groups and split the sample into two sub-periods (before and after 1992). For Germany, changes in the loans of foreign and savings banks have been significantly correlated, although this link was significant only in the second period under consideration. There is, in contrast, no link between changes in loans of foreign and large bank.¹³ In the US, loans of domestic and foreign banks have been much more highly correlated throughout. To a certain degree, this may be due to the fact that foreign banks have increased their market shares in the US market through the acquisition of incumbent banking institutions, thus overtaking the existing (retail) customer base. In Germany, in contrast, cross-border acquisitions have been rare, and market entry of foreign financial institutions has occurred mainly in the wholesale market.

¹³ The large banks comprise Deutsche Bank AG, Dresdner Bank AG, and Commerzbank AG.

Table 5 — Correlations Between Changes in Loans of Domestic and Foreign Banks, 1986–99

	1986–1992	1993–1999	1986–1999
<i>Germany</i>			
Foreign and large banks	–0.09	0.07	–0.01
Foreign and savings banks	0.16	0.22*	0.16*
<i>United States</i>			
Foreign and domestic banks	0.56*	0.32*	0.28*
* = significant at the 5-percent level. Critical values calculated from $2/\sqrt{n}$, where n = number of observations.			

Source: own calculations.

In summary, as concerns retail banking activities of foreign banks in Germany, there has been an upward shift in the past decades although the magnitude of this shift has been much less pronounced than for the US. At the same time, the market shares of foreign commercial banks are underestimated if one looks at on-balance sheet activities alone:¹⁴ foreign banks hold substantial market shares in investment banking and other wholesale banking activities. These stylized facts contradict the earlier evidence reported in Rajan (1998) that foreign banks in Germany have low market shares in the wholesale market as well as the hypothesis that universal banking generally impedes the contestability of markets.

4.2 Balance Sheet Adjustments of Commercial Banks

One distinguishing feature of universal banks is their equity holdings in non-financial firms. Hence, the impact of increased competition on the balance sheet adjustments of German banks can be expected to differ among banks depending on their equity holdings. If relationship lending is linked closely to the fact that banks hold shares in firms, contestability of markets would be the lower the higher the share holdings are.

Although the German banking system is typically taken as the prototype of a universal banking system, important segments of the banking sector are not free to choose their activities. Although the savings banks (Sparkassen), which account for about 20 percent of the banking system’s assets, have universal

¹⁴ For a similar conclusion for the US see Molyneux et al. (1998) or Boyd and Gertler (1995).

banking licenses, they do not hold equity in non-financial firms and are restricted in their regional expansion. Perhaps contrary to the conventional wisdom, equity holdings of German banks in non-financial firms are thus not a large asset item for the banks. In mid-1999, the share of all participations of banks in other firms (including financial firms) was below 2 percent of total assets of the banks (Table 6), having continuously increased from about 0.5 percent at the beginning of the 1950s. Equity holdings are substantially higher for large commercial banks (5 percent of assets) than for other banks.

Table 6 — Shares and Participations of German Banks in Percent of Total Assets 1965–99

	1965	1970	1980	1990	1998
All banks	0.44	0.61	0.81	1.15	1.67
Large banks	0.94	1.44	2.71	5.40	5.13
Savings banks	0.28	0.37	0.35	0.35	1.06
Foreign banks	...	...	...	0.29	1.16
End of period.					

Source: Deutsche Bundesbank (1998), own calculations

Of course, share holdings are only one channel for the influence of commercial banks on the corporate governance of firms. At the same time, little evidence on the effects of increased competition on the German system of corporate governance as such is available. Results of Gorton and Schmid (1996) at first sight seem to support the view that a potentially positive impact of bank ownership on corporate governance was merely achieved in protected financial markets and could not be sustained through periods of increased (external) competition. The authors study the effects of bank equity ownership, proxy votes, and block holdings of banks on the profitability of firms. Two cross-sections of large German firms for the years 1974 and 1985 are studied. The results for the 1974-sample indicate no conflicts of interest. The performance of firms increases as a function of how much equity banks own while it is not related to proxy voting or to blockholdings of shares. Hence, banks seem to play a positive role and to be better able than other blockholders to improve performance. The results change for the 1985-sample, as performance is unrelated to equity holdings and to proxy voting of banks but is related to blockholdings. Another analysis of Schmid (1996) for the year 1990, however, indicates that the conclusion that competition has negatively affected the corporate control function of German banks may be

premature, as he still finds evidence for a non-negative impact of banks on the performance of firms.

Table 7 — Claims of German Banks in Percent of Total Assets 1950–97

	1950	1960	1970	1980	1990	1997
<i>All banks</i>						
Claims on banks	17.5	21.8	26.2	28.0	35.1	33.9
Claims on non-banks	72.2	67.5	66.5	65.6	58.0	60.7
Credits	39.9	48.5	52.7	58.1	51.0	51.2
Securities	0.9	2.9	3.0	2.4	3.7	6.7
<i>Large banks</i>						
Claims on banks	9.9	12.6	18.9	22.0	23.8	27.8
Claims on non-banks	78.8	68.6	66.4	64.7	64.9	62.3
Credits	40.2	35.8	45.6	53.5	53.9	52.1
Securities	0.4	7.9	6.6	5.1	5.9	7.8
End of period.						

Source: Deutsche Bundesbank, own calculations

Facing increased competition by non-bank financial institutions, universal banks can be expected to focus their activities on relationship lending (Aoki and Dinç 1997, Boot and Thakor 1997). Unfortunately, evidence on the amount of transactions versus relationship loans is not available as the distinction between these two types of activities is of a qualitative nature. Hence, we use credits to non-banks (Buchkredite) as a proxy for relationship loans and securities of non-banks as well as claims on banks (interbank lending) as proxies for transaction loans (Table 7). For the German banking system as a whole, the share of credits to non-banks has increased continuously from 40 percent of the balance sheet total in 1950 to a little less than 60 percent in 1980. Since then, this share has been on a decline. Interestingly, developments for the large banks parallel these general trends up until 1980 after which the share of credits to non-banks has stabilized for this sub-group. Throughout, holdings of securities of non-banks have been more important for the large banks. This could be taken as weak evidence for a declining share of relationship loans for the banking system as a whole but not for the large banks. This would be in line with the theoretical predictions.

4.3 Lending Behavior of Domestic and Foreign Banks

This section takes a more detailed look at the market for corporate loans in Germany and in the United States. More specifically, we are interested in the determinants of loan supply of domestic versus foreign banks. Using time series data on the loan supply of German (US) and foreign banks for the years 1986–98 and distinguishing domestic and foreign demand determinants, we seek to find evidence for a segmentation of markets.

4.3.1 Previous Empirical Evidence

Previous studies on the determinants of foreign banking activities have primarily focused on the US market. Also, these studies do typically not provide evidence for domestic banks as a benchmark. Hence, they are unable to answer the question whether domestic and foreign banks service different market segments.

One of the first studies by Goldberg and Saunders (1981) uses the share of foreign banks in total commercial banks' assets and loans as a dependent variable. The study finds a significant positive impact of interest rate differentials, of falling price-earnings ratios for US bank stocks, FDI in the US, the depreciation of the dollar, and the expectation of regulatory constraints. Similar results are obtained when the number of foreign banks is used as the dependent variable.

Subsequent studies have largely confirmed these results. Budzeika (1991) analyzes asset and loan demand functions of foreign banks, their subsidiaries and branches by distinguishing domestic (financing of business inventories, financing of capital expenditure, market price of US banks' equity) from foreign demand factors (foreign trade links, flow of funds to the US, exchange rate, interest rate differentials). Using data for the years 1973–89, he finds that activities of foreign bank branches are determined mainly by foreign factors whereas subsidiaries of foreign banks more actively enter the domestic loan market. Goldberg and Grosse (1991) and Goldberg and Grosse (1994) find a positive correlation between FDI in the US and the size of the foreign banking sector and foreign banks' presence in the US. However, since first differences of the data are used, no inference can be drawn as regards long-run relationships.

Using bank-level data for about 120 foreign subsidiaries, Molyneux and Seth (1996) analyze simultaneously the performance and the credit extension of foreign banks for the period 1987–91. Their results suggest that domestic demand factors affect the profitability but not necessarily the lending activities of foreign banks. These results are largely confirmed by Molyneux et al. (1998).

One of the few studies for non-US countries is by Fisher and Molyneux (1996) who analyze the number of foreign banks and number of staff of foreign banks in London in the years 1980–89. They find outward-UK FDI, trade links, the size of the home-country market, and distance to have a positive and country risk to have a negative effect on foreign bank presence.

For Germany, the market for commercial bank loans has been analyzed by Winker (1996), using monthly data for the years 1974–89. Total loan demand is found to be a positive function of the expected level of economic activity and of business cycle effects and a negative function of the interest rates on loans, of the wage share, and of inflation. The target value of banks' lending rates depends positively on the insolvency rate, the costs of deposits, and on the amount of equity of the banks (using the lagged value as an instrument). The simultaneous specification of credit demand and supply gives evidence for credit rationing on the German credit market.¹⁵

4.3.2 Estimation Approach and Results

As aggregate banking statistics do not provide information on the nationality of the recipients of bank loans, we are using total credit supply of domestic and foreign banks as the dependent variable and try to single out the influence of domestic and foreign demand factors. If foreign banks service a market segment different from the one serviced by domestic banks, we would expect loan supply of foreign banks to depend on the foreign but not on the domestic factors, and vice versa. The following reduced-form equations have been estimated

$$(14a) \quad L_i = L_i(X_D, X_F, r_L, r_D)$$

$$(14b) \quad L_j = L_j(X_D, X_F, r_L, r_D)$$

where L_i, L_j = credit supply of domestic (foreign) banks, $X_D(X_F)$ = parameters capturing loan demand of domestic (foreign) firms, and $r_L(r_D)$ = domestic lending (deposit) rates. Credit supply of domestic banks in Germany is proxied by the credit activities of the large universal banks as well as the savings banks.

¹⁵ According to Winker's estimates, excess demand has been in the range of 10 percent in the late 1970s as well as in the period 1983–87.

As a starting point, we have regressed the loan supply of domestic and of foreign banks on a limited number of variables.¹⁶ An index of industrial production has been used to proxy domestic demand factors;¹⁷ the real external value of the domestic currency as well as foreign trade activities and FDI in the domestic economy¹⁸ have been used to proxy foreign demand factors. Additionally, domestic lending and deposit rates should be included to capture the returns and the opportunity costs of granting loans. Because of the high correlation between lending and deposit rates, only the former were used. Likewise, foreign trade variables and the index of industrial production were highly correlated and were thus used in separate specifications of the model.

All variables were seasonally adjusted, using the multiplicative Census X-11 method. With the exception of interest rates, variables were entered in logarithmic form, and the estimated coefficients can thus be interpreted as elasticities. As the variables included in the regression were predominantly found to be non-stationary, i.e. I(1),¹⁹ the equations were estimated in the form of an error-correction model:

$$(15) \quad DL_t = c_t + (a_0 - 1) \left[L_{t-1} - b_i X_{t-1} \right] - \sum_{i=1}^n a_i DL_{t-i} - \sum_{j=0}^m g_j DX_{t-j} + e_t$$

Changes in loan supply L_t thus depend (i) on deviations from long-run-equilibrium, i.e. on the error-correction term in brackets, (ii) on short-run effects resulting from changes in the current and lagged exogenous and endogenous variables, and (iii) on an error term. If the coefficient $(a_0 - 1)$ is significantly less than zero, the Null that the variables are not cointegrated can be rejected, and there would be a stationary long-run relationship.

The equation was first estimated by including two lags of each endogenous and exogenous variable ($n = m = 2$), and insignificant lags were dropped successively. Standard specification tests were performed. To ensure normal distribution of the residuals, dummy variables were included; heteroskedasticity of the residuals was corrected using the method suggest by White (1980).

¹⁶ For a detailed description of the data sources and variables used see Table A1 in the Appendix.

¹⁷ Using a more comprehensive measure such as GDP as a proxy for domestic demand instead would, of course, have been desirable. However, data on GDP have not been available on a monthly basis.

¹⁸ For the US, monthly FDI data have not been available.

¹⁹ The results of the ADF-tests are available from the authors upon request.

For *Germany*, a significant cointegration relationship between real credit and the explanatory variables was found only for the large banks but not for foreign or savings banks. For the foreign banks, there was evidence for parameter instability between 1992 and 1994. Similar results were obtained when, instead of loans granted, total assets of banks were used as a dependent variable. For the large banks, the index of industrial production and (cumulative) FDI in Germany were used in separate specifications because of the high correlation between the two. Generally, the strength of the cointegration relationship between real credit and industrial production was greater than for FDI, which points to a dominance of domestic demand factors. However, the explanatory power of all equations was low (\bar{R}^2 below 0.2) if no dummy variables were used. Also, the long-run coefficients on industrial production (+4.2) and on the lending rate (–0.05) were either high or had the wrong sign, thus suggesting a mis-specification of the model. Hence, we refrain from reporting and interpreting these results in the following.

Similar regressions were run for domestic and foreign banks in the *United States* (Table A2). In order to make the data comparable, the same time frame (1986-99) was chosen. The explanatory power of our model was much better for domestic US banks (\bar{R}^2 of about 0.55) than for the large German banks but also in comparison to the foreign banks in the US (\bar{R}^2 of about 0.35).

As regards the credit supply of foreign banks in the US, domestic industrial production was the single most important determinant. The domestic lending rate, the real external value of the US-Dollar, business expectations, the Japanese lending rate (as a proxy of the foreign interest rate), the bond rate, or the nominal external value had no significant influence. The strength of the cointegration relationship increased somewhat when foreign trade turnover was used instead of industrial production as an explanatory variable. Yet, it has not been possible to discriminate clearly between domestic and foreign factors. Results for domestic US banks were similar: either industrial production or foreign trade turnover were significant determinants of credit supply. In addition, the lending rate entered with a significant positive sign, and an increase in the real external value of the US-Dollar increased credit supply. All other variables turned out to be insignificant.

Overall, we have failed to provide convincing evidence on the determinants of credit supply of banks operating in Germany. While the activities of large German banks can to some degree be explained by domestic demand factors, no statistically significant determinants were found for the foreign or for the savings banks. This is in contrast to evidence for the United States where our approach

has worked much better in explaining banks' activities. Potential sources of parameter instability for Germany could be the EU's Single Market Program or the unification process.

For the US, results for domestic and foreign banks are similar in the sense that domestic industrial production and/or foreign trade activities explain credit supply of both types of banks. This may be due to the fact that foreign banks have to a degree expanded their market shares through the acquisition of domestic banks. At the same time, the fact that some variables explain lending of domestic but not of foreign banks suggests that the determinants of the credit supply of the two types of banks differ. Differences to the results of earlier studies on loan supply of foreign banks in the US suggest that structural changes might have occurred.

The fact that we have failed to identify variables that determine credit supply in Germany does not mean necessarily that the activities of domestic and foreign banks are driven by different factors. Following Holmes (1997), we have thus also analyzed whether the loan supply of domestic and foreign banks share common trends, which, in turn, could be taken as evidence that the banks serve similar market segments. The extent to which bank lending of different banking groups is determined by the same factors depends on how the explanatory variables in (14a) and (14b) are related. Assume that the following linear relationship holds between L_i and L_j

$$(16) \quad L_i = d_1 + d_2 L_j .$$

Under the composite null hypothesis of integration of the explanatory variables and market clearing, a positive long run relationship exists between L_i and L_j if $d_2 \geq 0$. We are using the Johansen procedure to test for common trends and bivariate cointegration relationships between lending of domestic and foreign banks. Hence, we refrain from assuming a specific direction of causality between the two but take both variables as endogenous. More technically, there is a vector \mathbf{x}_t of n potentially endogenous variables, where \mathbf{x}_t can be modelled as an unrestricted VAR involving up to k lags of \mathbf{x} :

$$(17) \quad \mathbf{x}_t = \mathbf{A}_1 \mathbf{x}_{t-1} + \mathbf{A}_2 \mathbf{x}_{t-2} + \dots + \mathbf{A}_k \mathbf{x}_{t-k} + \mathbf{u}_t, \text{ where } u_t \sim NI(0, \Sigma).$$

We can reformulate this equation into an error correction model:

$$(18) \quad \Delta \mathbf{x}_t = \Gamma_1 \Delta \mathbf{x}_{t-1} + \dots + \Gamma_1 \Delta \mathbf{x}_{t-k+1} + \Pi \mathbf{x}_{t-k} + u_t,$$

where $\Gamma_i = -(\mathbf{I} - \mathbf{A}_1 - \dots - \mathbf{A}_i)$ and $\Pi = -(\mathbf{I} - \mathbf{A}_1 - \dots - \mathbf{A}_k)$, and with $\Pi = ab'$, where a gives the speed of adjustment to equilibrium, while b gives the matrix of long-run coefficients such that bz_{t-k} provides up to $n-1$ cointegrating relationships in the multivariate model that ensure the convergence of the elements in x_t to their long-run steady state values.

Table 8 — Tests for Cointegration Between Loan Supply of Domestic and Foreign Banks

	Cointegration Rank		Residuals		Number of lags	Model
	Trace	Critical values	AR(1) (p-values)	AR(4) (p-values)		
<i>Germany</i>						
	Large Banks – Foreign Banks					
$r = 0$	7.27	13.31	0.89	0.15	12	3
$r \leq 1$	0.24	2.71				
	Savings Banks – Foreign Banks					
$r = 0$	16.62	17.79	0.61	0.99	12	2
$r \leq 1$	7.87	7.50				
<i>United States</i>						
	Domestic Banks – Foreign Banks					
$r = 0$	14.14	17.79	0.30	0.15	12	2
$r \leq 1$	5.40	7.50				

Tests for cointegration are Johansen's likelihood ratio test based on the trace of the stochastic matrix (Johansen and Juselius 1990), where r refers to the number of cointegrating vectors. Maximum lag length of the VAR determined by goodness-of-fit measures. Using the Pantula principle, estimates include a constant restricted to the cointegration space (model 2) or an unrestricted constant (model 3). Significance levels have been taken from Hansen and Juselius (1995). Time period: 1986:1 – 1998:12. Due to a structural break resulting from the entrance of Citibank in the German market, the data for foreign banks were corrected back from 1992:12. For all cases, the null hypothesis could not be rejected at the 10 percent level of significance, which indicates that the cointegration rank is zero and thus no cointegration relationship in the system.

Source: own calculations.

The existence of r cointegrating vectors among n variables where $r < n$ implies that there are $n - r$ shared trends. If $n - r = 1$, this is evidence for a single shared trend. If $r = 0$ and the rank of Π thus zero, then there are n stochastic trends but no shared trends. Table 8 reports the tests for cointegrating relationships for Germany and the US, with a distinction between loan supply of large banks and savings banks made for domestic banks in Germany. There is neither a cointegration relationship between the credit supply of large and foreign banks,

nor between savings and foreign banks. Similarly, we find no evidence for a cointegration relationship between credit supply of domestic and foreign banks in the US. These results indicate that domestic and foreign credit supply in Germany and the US do not share a common trend, and thus provide support to our earlier hypothesis that domestic and foreign banks serve different market segments.

5 Concluding Remarks

This paper has analyzed the impact of increased competition and of global trends towards disintermediation of financial services on the German banking system. A brief review of the theoretical literature has shown that market shares of domestic and foreign banks can to a large extent be explained by prior customer contacts as these reduce information costs. This could hold in particular for universal banking which creates close customer relations and thus a certain degree of monopoly power of the incumbent banks. Increased competition may even strengthen these linkages, and traditional financial structures may be preserved.

The insights of these models have been confronted with stylized facts from the German and the US financial system. Substantial discrepancy between Germany and the US can be observed with respect to the process of disintermediation. Overall, disintermediation has proceeded much further in the US. In Germany, disintermediation has been promoted mainly by the deregulation of financial markets. If anything, a loss in importance of banks over time can be observed on the supply side, with households shifting their financial assets from bank deposits to bonds or investment certificates. Companies continue to rely mainly on bank loans, possibly because the increase in competition has not proceeded beyond a point where relationship banking would be threatened significantly. This, in turn, suggests that institutional path dependency has an impact on changes in financial structures.

In Germany, foreign banks' presence in retail markets has been minor. At the same time, they have acquired substantial market shares in the wholesale market, contradicting the notion that universal banking creates implicit entry barriers for this market. These results are in contrast to the US, where foreign banks have been able to attain much higher market shares also in retail banking. Generally, correlations between the activities of foreign and domestic banks in Germany increased after the initiation of the EU's Single Market program. This could be

interpreted as evidence for an increased contestability of the German banking market although links remain much weaker than in the US. In particular for Germany, there has been very little evidence that loan supply of domestic and foreign banks follows a similar and stable pattern. This, in turn, points to the fact that domestic and foreign banks service different market segments. Yet, as we find no cointegration relationship for lending of foreign and domestic banks, both for Germany and the US, these findings cannot be attributed to universal banking.

The results of this paper should be seen as a first approximation to the empirical testing of the impact of competition on the German universal banking system. Most importantly, as the analysis has largely ignored institutional peculiarities of the German banking system, it would be premature to draw far-reaching policy conclusions. The special role of savings banks, in particular, is likely to constitute entry barriers for the retail segment of the market. Further research which takes explicit account of such institutional factors is needed.

References

- Aizenman, J. (1998). Capital Mobility in a Second Best World — Moral Hazard with Costly Financial Intermediation. National Bureau of Economic Research. Working Paper 6703. Cambridge, MA.
- Aoki, M., and S. Dinç (1997). Relational Financing as an Institution and its Viability under Competition. Stanford University. mimeo.
- Allen, F., and D. Gale (1995). A Welfare Comparison of Intermediaries and Financial Markets in Germany and the US. *European Economic Review* 39: 179–209.
- Association of Foreign Banks in Germany (1997). Foreign Banks in Germany 1998. Frankfurt a.M.
- Bakker, A.F.P. (1994). The Liberalization of Capital Movements in Europe. The Monetary Committee and Financial Integration 1958–1994. Amsterdam.
- Baltensperger, E., and H. Milde (1987). *Theorie des Bankverhaltens*. Springer: Berlin.
- Baums, T., and M. Gruson (1993). The German banking system: system of the future? *Institut für Handels- und Wirtschaftsrecht*. Arbeitspapier 4/93. Osnabrück.
- Besanko, D., and A.V. Thakor (1992). Banking Deregulation: Allocational Consequences of Relaxing Entry Barriers. *Journal of Banking and Finance* 16: 909–932.
- Boot, A.W.A., and A.V. Thakor (1997). Can Relationship Banking Survive Competition? *Centre for Economic Policy Research*. CEPR Discussion Paper 1592. London.
- Borio, C.E.V. (1995). The structure of credit to the non-government sector and the transmission mechanism of monetary policy: a cross-country comparison. In: Bank for International Settlements, Monetary and Economic Department (ed.): *Financial Structure and the Monetary Policy Transmission Mechanism*. Basel: 59–105.
- Boyd, J.H., and M. Gertler (1995). Are banks dead? Or are the reports greatly exaggerated? *National Bureau of Economic Research*. NBER Working Paper 5045. Cambridge, MA.

- Brichs Serra, E., Buch, C.M., and T. Nienaber (1997): The Role of Banks — Evidence from Germany and the US. *Kiel Institute of World Economics*. Kiel Working Paper 802. Kiel
- Budzeika, G. (1991). Determinants of the Growth of Foreign Banking Assets in the United States. *Federal Reserve Bank of New York*. Research Paper 9112. New York.
- Calomiris, C.W. (1995). Universal Banking and the Financing of Industrial Development. *The World Bank Policy Research Department*. Policy Research Working Paper 1533. New York.
- Chen, A.H., and S.C. Mazumdar (1997). A dynamic model of firewalls and non-traditional banking. *Journal of Banking and Finance* 21: 393–416.
- Chiappori, P.-A., Perez-Castrillo, D., and T. Verdier (1995). Spatial Competition in the Banking System: Localization, Cross Subsidies, and the Regulation of Deposit Rates. *European Economic Review* 39: 889–918.
- Chiang, A.C. (1984). *Fundamental Methods of Mathematical Economics*. McGraw-Hill: Auckland
- Clarich, M. (1987). The German Banking System: Legal Foundations and Recent Trends. *European University Institute*. EUI Working Paper 269. San Domenico (FI).
- Corbett, J., and T. Jenkinson (1996). The Financing of Industry, 1970-1989: An International Comparison. *Journal of the Japanese and International Economies* 10: 71–96.
- Danthine, J.-P., G. Giavazzi, X. Vives, and E.-L. von Thadden (1999). *The Future of European Banking*. London: Centre for Economic Policy Research.
- Dell'Ariccia, G. (1998). Asymmetric Information and the Market Structure in the Banking Industry. *International Monetary Fund*. IMF Working Paper 98/92. Washington, DC.
- Deutsche Bundesbank (1998). *Fünfzig Jahre deutsche Mark*. Monetäre Statistiken 1948–1997. Verlag Franz Vahlen: München.
- (1999). Financial Accounts for Germany 1990-1998. Special Statistical Publication 4. Frankfurt a.M.
- Diamond, D. (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies* 51: 393-414.
- Domanski, D. (1997). Disintermediationstendenzen im deutschen Finanzsystem und ihre Auswirkungen auf die Rolle der Kreditinstitute — Eine Bewertung aus geldpolitischer Sicht. In: B. Gahlen et al (Eds.): *Finanzmärkte*.

- Wirtschaftswissenschaftliches Seminar Ottobeuren. No. 26. Mohr Siebeck: Tübingen: 271–290.
- Dziobek, C., and J.R. Garrett (1998). Convergence of Financial Systems and Regulatory Policy Challenges in Europe and the United States. In: S.W. Black and M. Moersch (eds.). *Competition and Convergence in Financial Markets*. Elsevier: Amsterdam: 195–215.
- Economides, N., Hubbard, R.G., and D. Palia (1996). The Political Economy of Branching Restrictions and Deposit Insurance: A Model of Monopolistic Competition Among Small and Large Banks. *Journal of Law and Economics* 39: 667-704.
- Edwards, J., and Fischer, K. (1994). *Banks, Finance, and Investment in Germany*. Cambridge University Press, Cambridge.
- Elsas, R., and J.P. Krahen (1998). Is Relationship Lending Special? Evidence from Credit-File Data in Germany. *Journal of Banking Finance* 22: 1283–1316.
- European Commission (EC) (1997). *Credit Institutions and Banking*. The Single Market Review. Subseries II. Vol. 4. Luxembourg.
- Federal Reserve (1999). *Flow of Funds Accounts of the United States*. Annual Flows and Outstandings. Board of Governors of the Federal Reserve System. Washington D.C.
- Fisher, A., and P. Molyneux (1996). A Note on the Determinants of Foreign Bank Activity in Londong between 1980 and 1989. *Applied Financial Economics* 6: 271-277.
- Gehrig, T. (1998). Screening, cross-border banking and the allocation of credit. *Centre for Economic Policy Research*. CEPR Discussion Paper 1973. London.
- Goldberg, L.G., and A. Saunders (1981). The Determinants of Foreign Banking Activity in the United States. *Journal of Banking and Finance* 5: 17–32.
- Goldberg, L.G., and R. Grosse (1991). Foreign bank activity in the United States: An analysis by country of origin. *Journal of Banking and Finance* 15: 1093–1112.
- , — (1994). Location Choice of Foreign Banks in the United States. *Journal of Economics and Business* 46: 367–379.
- Gorton, G., and F.A. Schmid (1996). Universal Banking and the Performance of German Firms. *National Bureau of Economic Research (NBER)*. Working Paper No. 5453. Cambridge MA.

- Hansen, H., and K. Juselius (1995). *Cats in Rats – Cointegration Analysis of Time Series*. Estima: Evanston.
- Harhoff, D., and T. Körting (1997). Lending Relationships in Germany - Empirical Results from Survey Data. *Journal of Banking and Finance* 22: 1317–1353.
- Helpman, E., and P. Krugman (1985). *Market Structure and Foreign Trade*. MIT Press: Cambridge, MA.
- Holmes, M.J. (1997). Bank Credit in the EU: Long-Run Independence or Integration with Germany?. *Economic Issues* 2: 43–54.
- Hoshi, T., A. Kashyap, and D. Scharfstein (1990a). Bank Monitoring and Investment: Evidence from the Changing Structure of Japanese Corporate Banking Relationship. In: R.G. Hubbard (ed.). *Asymmetric Information, Corporate Finance, and Investment*. University of Chicago Press: 105–126.
- , —, — (1990b). The Role of Banks in Reducing the Costs of Financial Distress in Japan. *Journal of Financial Economics* 27: 67–88.
- , —, — (1991). Corporate Structure, Liquidity, and Investment. *Quarterly Journal of Economics* 106: 33–60.
- Johansen, S., and K. Juselius (1990). Maximum Likelihood Estimation and Inference on Cointegration — with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics* 52: 169–210.
- Kueppers, M. (1999). Curtailing the Black Box: German Banking Groups in the Transmission of Monetary Policy. University of Cologne. mimeo.
- Landeszentralbank in Hessen (1990). Auslandsbanken in Frankfurt. *Frankfurter Finanzmarktbericht* 2: 2–8.
- (1995). Auslandsbanken in Frankfurt — ein fester Faktor des Finanzplatzes. *Frankfurter Finanzmarktbericht* 22: 2–9.
- Mayer, C. (1988). New Issues in Corporate Finance. *European Economic Review* 32: 1167–1188.
- Molyneux, P., and R. Seth (1996). Foreign Banks, Profits and Commercial Credit Extension in the United States. *Federal Reserve Bank of New York*. Research Paper 9628. New York.
- Molyneux, P., E. Remolona, and R. Seth (1998). Modeling Foreign Bank Performance and Lending Behavior. *Financial Markets, Institutions, and Instruments* 7: 26–41.
- Nakamura, L.I. (1993). Loan Screening Within and Outside of Customer Relationships. *Federal Reserve Bank of Philadelphia*. Working Paper 93–15. Pittsburgh.

- Neven, D., and L.-H. Roeller (1999). An Aggregate Structural Model of Competition in the European Banking Industry. *International Journal of Industrial Organization* 17: 1059–1074.
- Puri, M. (1999). Commercial Banks as Underwriters: Implications for the Going Public Process. *Journal of Financial Economics* 54: 133–163.
- Rajan, R.G. (1998). An Investigation into the Economics of Extending Bank Powers. University of Chicago. Mimeo.
- , and L. Zingales (1995). What Do We Know about Capital Structure? Some Evidence from International Data. *Journal of Finance* 50: 1421–1461.
- Santomero, A., and D.F. Babbel (1997). *Financial Markets, Instruments, and Institutions*. Irwin: Chicago.
- Schmid, Frank A. (1996). Beteiligungen deutscher Geschäftsbanken und Corporate Performance. *Zeitschrift für Wirtschafts- und Sozialwissenschaften* 116: 274–310.
- Schmidt, R., A. Hackethal, and M. Tyrell (1998). Disintermediation and the Role of Banks in Europe: An International Comparison. *Finance and Accounting*. Working Paper 10. University of Frankfurt a.M.
- White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix and a Direct Test for Heteroskedasticity. *Econometrica* 50: 1–26.
- Winker, P. (1996). A Macroeconomic Disequilibrium Model of the German Credit Market. Universität Konstanz. *Sonderforschungsbereich 178 "Internationalisierung der Wirtschaft"*. Diskussionsbeiträge. Serie II – Nr. 302. Konstanz.
- Yanelle, M.-O. (1997). Banking competition and market efficiency. *Review of economic studies* 64 (2): 215–239.

Appendix

Table A1 — Data Definitions and Sources

Variable	Definition and Source
AW_REAL	<u>Germany</u> : Real external value of the D-mark to currencies of 18 industrialized countries, NADJ, seasonally adjusted (Deutsche Bundesbank) <u>United States</u> : Real external value of the US-Dollar, trade weighted, seasonally adjusted, IMF (International Financial Statistics)
CREDIT _i	Domestic loans (Germany: Buchkredite insgesamt), real (= deflated by producer prices) and seasonally adjusted (multiplicative X11-method) $i = d, f$ (Deutsche Bundesbank and Federal Reserve)
IP	Index of industrial production, seasonally adjusted, IMF (International Financial Statistics)
LEND	Lending rate. IMF (IFS)
Trade	Trade turnover (exports + imports)

Table A2 — Estimates of Loan Supply Functions for the United States, 1986–99

Explanatory variables	dependent variable (X)			
	domestic banks (dlog L_i)		foreign banks (dlog L_j)	
constant	–0.29*** (–6.67)	–0.34*** (–6.83)	0.07 (1.01)	–0.05 (–0.67)
log X (–1)	–0.03*** (–4.53)	–0.02** (–3.50)	–0.04 (–3.26)	–0.05* (–3.65)
log IP (–1)	0.05*** (7.35)		0.05** (2.07)	
log Trade (–1)		0.02*** (6.70)		0.03*** (2.63)
log AW_REAL (–1)	0.06*** (6.00)	0.06*** (6.00)	–0.02 (–1.26)	–0.01 (–0.84)
LEND (–1)	0.001*** (3.57)	0.001*** (3.23)	–0.0004 (–0.67)	–0.000 (–0.09)
dlog X (–1)	0.35*** (4.89)	0.37*** (5.16)	0.32** (4.67)	0.31** (4.60)
dlog X (–2)	–0.16** (–2.26)	–0.15** (–2.02)		
dlog IP			–0.42** (–2.25)	
dlog LEND	0.026** (1.99)	0.03*** (2.63)		
dlog AW_REAL (–2)	–0.05** (–1.78)	–0.06** (–1.82)		
\bar{R}^2	0.59	0.57	0.51	0.50
LM1 (prob.)	0.94	0.93	0.29	0.36
LM4 (prob.)	0.68	0.59	0.22	0.36
White-test (prob.)	0.30	0.31	0.17	0.21
Jarque Bera (prob.)	0.60	0.64	0.85	0.88
Number of observations	162	162	162	162
Time period	1986:1–99:6	1986:1–99:6	1986:1–99:6	1986:1–99:6

t-values in brackets, ***(**, *) = significant at the 1 (5, 10) percent level. Dummy variables (not reported) were used to ensure normal distribution of the residuals and to correct for heteroskedasticity. In the case of domestic banks, dummy variables for the following months were used (86:12, 90:10, 91:02); in the case of foreign banks, dummy variables for the following months were used (86:05, 89:01, 89:02, 89:03, 89:07, 89:12, 90:01, 91:09, 99:05). The use of the dummy variables led to an inflation of the adjusted \bar{R}^2 by up to 0.15.

Source: own calculations.