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A note on the effects of diversification[1]

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THE DETERMINANTS OF BANK MARGINS REVISITED: A NOTE ON THE EFFECTS OF DIVERSIFICATION

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Abstract: Most of the theoretical and empirical literature on bank margins has dealt solely with interest margins. Applying the seminal Ho-Saunders model (JFQA, 1981) to a multi-output framework, we show that the relationship between bank margins and market power (controlling for risk) varies significantly across bank specializations. Using a set of both accounting margins and New Empirical Industrial Organization (NEIO) margins, we find that market power rises significantly with output diversification towards non-traditional activities. These results contribute to explain the paradoxical coexistence of decreasing interest margins and higher market power found in previous studies (93 words).

JEL CLASSIFICATION: G21, D40

KEY WORDS: bank margins, specialization, market structure.

1. Introduction

Most of the theoretical and empirical models of bank margins behavior have focused only on interest margins. Nevertheless, due to the increasing importance of non-traditional activities in bank revenues, it seems to be necessary to extend the framework of the analysis by incorporating broader definitions of bank margins. The seminal model of Ho and Saunders (1981) has been the reference framework for most empirical analyses on the determinants of bank (interest) margins. Lerner (1981) discussed the Ho-Saunders model and already suggested that the insights that arise from recognising that a (multi-output) production function exists would require a more comprehensive analysis of bank margins. Several contributions of the so-called "New Empirical Industrial Organization" (NEIO) also indicate that there are potential estimation biases associated with the use of accounting margins and, in particular, when using firm-level data and multi-output production technologies (Schmalensee, 1989, p.961; Bresnahan, 1989, p.1013). In this context, Shaffer (2004) shows that price to marginal costs margins should be employed in order to test bank conduct directly and to compare these with the outcomes obtained using accounting margins. Recent contributions have also shown that there is a coexistence of decreasing interest margins and higher market power in several European financial systems (Maudos and Fernández de Guevara, 2004). Specialization/diversification patterns may explain, at least partially, these paradoxical trends.

This article analyses the relationship between bank margins –using both accounting and NEIO margins- and output diversification in European banking during 1994-2001. The study is divided in four sections following this introduction. The theoretical setting and the background of previous studies are shown in Section 2. Section 3 describes the methodology and data of an empirical analysis on a sample of seven European countries: Germany, Spain, France, Netherlands, Italy, United Kingdom and Sweden. Section 4 offers the main results of the empirical exercise. The article ends with a brief summary of the main conclusions in Section 5.

2. Bank margins and specialization

2.1. Theoretical setting

The seminal Ho-Saunders model relies solely on pure intermediation activities (deposits-taking and lending). In order to show the impact of diversification towards non-traditional activities a multi-product framework is employed. In the Ho-Saunders model, the spread is the difference between lending and deposits rates ($r_L - r_D$) that equals the provision of immediacy of liquidity services (a+b). Our model is adopted from Allen (1988), who applied her analysis to two types of loans. We modify the Allen model to assume that bank portfolio is composed of loans (L) and non traditional assets (N) –such as earning assets different from loans and other fee income activities- along with deposits (D). In our multi-product framework, banks have two alternatives: (i) they may set prices on loans relative to deposits so that immediacy fees are b_L and a, respectively; (ii) they may also set prices on non-traditional activities relative to deposits rates so that non-traditional and immediacy fees are, respectively, b_N and a. Therefore, the interest margin will equal $a+b_L$ and the gross margin will be $a+b_L+b_N$ [3]. Using Taylor expansion series to obtain the expected bank utility wealth ($U(w)$) as in the Ho-Saunders model, the first order conditions yield the intermediation margin:

$$a + b_L = \frac{\alpha}{\beta} + \frac{1}{2} R\sigma_I^2 Q + \frac{1}{4\beta}\left[2b_N \left(\frac{\delta_N}{\delta_L} + 1 \right) - R\sigma_I^2 Q \right] \qquad [1]$$

Since our model includes fee-income activities, It is also possible to compute the gross margin as:

$$a + b_L + b_N = \frac{3\alpha}{2\beta} + \frac{3}{4} R\sigma_I^2 Q + \frac{1}{4\beta}\left[2(b_L + b_N) \left(\frac{\delta_N}{\delta_L} + 1 \right) - 2R\sigma_I^2 Q \right] \qquad [2]$$

[3] As in the Ho-Saunders model, all product transaction sizes are equal to the same transaction size, Q, for all customers and the fees (a, b_L , and b_N) are assumed to remain fixed over time. The deposit supply, the loan demand and the non-traditional business demand are assumed to be linear functions. The key element that determines risk in traditional activities is the stochastic arrival of a loan relative to deposits demand. In the multi-output perspective, non-traditional activities are presented as an alternative to loans so that risk (and market power) may be compensated or exacerbated. This should be an empirical hypothesis itself.

where $R \equiv -U''/U'$ is a measure of absolute risk aversion. $\frac{\alpha}{\beta}$ is the ratio of the intercept (α) and the slope (β) of the symmetric deposit, loan and non-traditional output arrival functions of the bank. As this ratio increases, banks may enjoy higher monopoly power. If $2b_N\left[(\delta_N/\delta_L)+1\right]-R\sigma_I^2Q<0$ in [2], the introduction of non-traditional activities reduces interest margins. Non-traditional activities alter market power by changing both α and β. Similarly, the difference between intermediation and gross margins will also depend on changes in the absolute risk aversion coefficient (*R*) and on the cross-elasticities of demand across bank products (δ_N and δ_L).

2.1. Empirical applications: review and reassessment

Two main approaches have been followed in the analysis of bank (interest) margins: the (static) micro-model of the banking firm (Zarruck, 1989; Wong, 1997) and the (dynamic) intermediation/dealership approach (Ho and Saunders, 1981). Both models follow an Industrial Organization (IO) perspective and analyse the effects of risk and market structure on interest margins. These models are empirically implemented by including variables that proxy competitive conditions and risk. Several studies have also included different sources of (interest, liquidity and credit) risk, as well as the influence of factors such as solvency regulations or operating efficiency (Angbazo, 1997; Saunders and Schumacher; 2000; Maudos and Fernandez de Guevara, 2004). The reduced-form empirical equation that explains interest margins (*INTMG*) in these models can be described as:

$$INTMG_{it} = f(S_{it}(.), X_{it}, \varepsilon_{it}) \qquad [3]$$

where $S_{it}(.)$ is a vector of the determinants of the pure spread (market power and risk variables), $X_{it}(.)$ is a vector of other bank-specific variables (efficiency, solvency) and ε_{it} is the error term.

As opposed to equation [3], in the empirical analysis of the determinants of bank margins within a multi-output (broad banking) environment, the issue of specialization/diversification plays an important role. Changes in bank production technologies

may affect both the pure spread (market structure and risk) parameters as well as other variables that proxy the competitive behaviour of banks (such as efficiency). Therefore, we extend the reduced-form empirical equation shown in [3] to incorporate the effects of specialization/diversification options beyond lending and deposit-taking:

$$MG_{it} = f(S_{it}(.), X_{it}, SD_{it}, OC_{it}, \varepsilon_{it}) \quad [4]$$

MG_{it} is a bank margin definition in a broad sense (not only interest margins but also direct margins such as the Lerner index); $S_{it}(.)$ is a vector of the determinants of the pure spread (market power and risk variables); $X_{it}(.)$ is a vector of other bank-specific variables (efficiency, solvency); SD_{it}, is a vector of bank output specialization/diversification strategies showing the structure of bank's assets portfolio; OC_{it}, is a vector of other control variables such as changes in economic activity or in regulation; and ε_{it} is the error term. Other bank-specific factors (X_{it}), such as efficiency and solvency, can also affect banks' income structure significantly. However, the relationship between operating efficiency and margins remains unclear. On one hand, specialization may imply higher operating efficiency (driven by a reduction in transaction costs). This may result in lower margins if banks reduce prices along with costs (Rogers and Sinkey, 1999; Siems and Clark, 1997). On the other hand, as noted by Maudos and Fernandez de Guevara (2004) for the European banking system, specialized banks exhibit higher unit costs on average so that margins and efficiency may be lower with specialization. Regulatory pressures on capital have been found to represent a premium on bank prices and to widen margins (Angbazo, 1997; Wong, 1997; Saunders and Schumacher, 2000).

The innovative vector in the equation of bank margins is SD_{it}, which states for output technology specialization/diversification variables. As shown above, we expect a close relationship between business and income diversification levels.

Finally, the vector OC_{it} refers to other control variables such as economic conditions or regulation. Changes in business cycle and different degrees of liberalization may result in significant differences on bank margins across countries and regions (Jayaratne and Strahan,1997; Carbo *et al.*, 2003).

3. Empirical methodology and data

An empirical analysis is undertaken for a representative sample of banks from seven European countries –Germany, Spain, France, Netherlands, Italy, United Kingdom and Sweden- during 1994-2001. The aim is to estimate the determinants of bank margins employing a traditional measure of interest margins (the loan to deposits rate spread), a wider accounting margin (gross income) and a broader measure of bank margins following the NEIO perspective (the Lerner index).

Our theoretical model follows a dynamic approach where banks need to match the random deposit supply function and the random demand of lending and non-traditional activities across periods. The maximization of bank wealth considers both initial and end-of-period information. Therefore, endogeneity may affect bank margins significantly. The empirical implementation of the reduced-form equation in [4] results in:

$$MG_{\text{it}} = MG_{\text{it-1}} + S_{it}(.) + X_{it}, + SD_{it} + OC_{it} + \mu_i + \varepsilon_{it} \qquad [5]$$

where MG_{it} states, alternatively, for the loan to deposit rate spread (*SPREAD*) –as a pure intermediation margin-, the gross income (*GROSS*)-which incorporates non-interest income and non-interest expense to intermediation margins- and the Lerner index (*LERNER*) –as a broader banking margin and a measure of market power. Endogeneity is considered since margins in period *t-1* ($MG_{\text{it-1}}$) are expected to affect margins in period *t*. The vectors of the determinants of the pure spread $S_{it}(.)$; other bank-specific factors (X_{it}); output technology specialization/diversification variables (SD_{it},); and other macroeconomic environment control variables (OC_{it}) are also included, while μ_i is the individual unobservable effect. The definition of the variables and data sources are shown in Table 1. Endogeneity requires a simultaneous equations estimation framework. In order to avoid estimation bias with panel data and dynamic variables, we follow the Arellano and Bond (1991) GMM procedure. Two simultaneous equations are estimated, one with first-differenced variables and another one in levels:

$$\begin{aligned} &Bank\ m\arg in_{i,t} - Bank\ m\arg in_{i,t-1} = \alpha(Bank\ m\arg in_{i,t-1} - Bank\ m\arg in_{i,t-2}) + \\ &\beta'(S_{i,t} - S_{i,t-1}) + \chi'(X_{i,t} - X_{i,t-1}) + \delta'(SD_{i,t} - SD_{i,t-1}) + \lambda'(OC_{i,t} - OC_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \end{aligned} \qquad [6]$$

The Arellano and Bond (1991) GMM procedure requires the use of appropriate

instruments. The instruments for the equations in differences are the one-lagged explanatory (including the lagged dependent) variables. The lagged first-differenced explanatory variables are the appropriate instruments for the equations in levels. Country-specific dummies were also included to account for unobservable effects across countries. Although there might be correlation between the explanatory variables in levels and the individual effects, these effects are not necessarily correlated with the first-differenced variables, A Sargan test for restrictions overidentifcation is employed. The null hypothesis in this test is that the instrumental variables and the residuals are not correlated.

The sample consists of 19.322 European banks (annual observations) from Germany, Spain, France, Netherlands, Italy, United Kingdom and Sweden using Bureau Van Dijk-Bankscope database information between 1994 and 2001. These countries are selected in order to analyze bank margins in market-based and bank-based financial systems. In our sample, Germany, Spain, France and Italy are considered as bank-based systems while Netherlands, United Kingdom and Sweden are catalogued as market-based systems. The classification is consistent with recent surveys on comparative financial systems such as Barth et al. (2000). Sample composition is shown in Table 2. The panel is unbalanced due to mergers and acquisitions during the period. The summary statistics –mean and standard deviation by country- of the posited variables are presented in Table 3.

4. Main results: determinants of accounting margins and NEIO margins

The results of the estimations where the loan to deposits rate spread (*SPREAD*) is the dependent variable are shown in the first column of Table 4. The lagged *SPREAD* variable in the right-hand-side is positive and significant, showing the relevance of accounting for endogenity in these equations. As for the determinants of pure spreads, the HHI does not seem to be significantly related to *SPREAD*. This is in line with recent evidence that has found that margins and concentration are not necessarily positively related and that interest margins may be even lower in more concentrated markets (Cetorelli and Gambera, 2002). However, both liquidity and interest rate risk measures are found to augment loan to deposits rate spreads

significantly. Operating inefficiency is also positively and significantly related to the loan to deposits rate spreads since banks with higher costs apparently tend to operate with higher margins. As predicted, the capital to assets ratio –which is also positively and significantly related to interest margins- represents a premium on bank margins due to pressures of solvency regulations on bank lending activities.

As for the specialization/diversification variables, the coefficient of the ratio "loans to total assets" is negatively and significantly related to *SPREAD*, suggesting that those banks specialized in lending can offer lower bank margins (higher efficiency). However, deposit-taking specialization seems to augment spreads. This behaviour supports the hypothesis of a loss-leader behavior in traditional intermediation activities with banks assuming higher costs on deposits and compensating it with higher interest margins or larger loan transactions. Regarding non-traditional activities, the relative weight of other earning assets is found to affect *SPREAD* positively which, in turn, indicates that more diversified banks operate with higher interest margins in lending/deposit-taking activities compared to specialized banks. However, innovations related to traditional activities- such as loan commitments- are found to be positively and significantly related to loan to deposits rate spreads, suggesting that lending relationships may permit banks to operate with higher interest margins and compensate this with fees from other activities such as credit cards or lines of credit. The ratio "ATM/branches" is also positively and significantly related to spread showing a positive effect of technical change on bank interest margins. As for the effect of the evolution of *GDP*, banks are found to reduce interest margins during the upturns following the evolution of market interest rates. The empirical evidence also reveals that SPREAD tends to be larger in bank-based systems compared to market-based systems.

The second column in Table 4 employs the loan to interbank market rate spread (*LMSPR*) as a robustness check for the effects of diversification on interest margins. This variable permits to analyze pricing behaviour relative to market rates. The results are clearly in line with those obtained when *SPREAD* was the dependent variable. Moreover, these results support the hypothesis of cross-sectional risk sharing against intertemporal rate smoothing in

European banking since *LMSPR* is found to shrink when GDP increases (Allen and Gale, 1994 and 1996; Berlin and Mester, 1999; Allen and Santomero, 2001). These results remain quite similar when taking the GDP variable in second- or third-differences, which suggests that cross-sectional risk sharing behaviour persists over time[4].

The results where gross income over total assets (*GROSS*) is the dependent variable are shown in the third column of Table 4. The goodness of fit is poorer in these regressions, which, in turn, reflects the information problems related to the use of accounting margins. Put differently, as accounting margins become wider, the identification of the sources of market power and risk –in terms of bank specialization- become more difficult. In any event, it is worth noting that the only variables that are statistically significant and positively related to *GROSS* among the specialization parameters are the ratio of other earning assets to total assets, the fee-based activities indicator and the ATMs/braches ratio. This suggests that specialization towards non-traditional activities tend to increase gross margins. In any event, and due to the problems with accounting measures and the poor economic significant of the equations where *GROSS* is the dependent variable, we employ a relative margin from the NEIO (the Lerner index) to study the effects of non-traditional activities on bank margins.

The forth column in Table 4 shows the results when a direct measure of banks margins -the Lerner index- is the dependent variable. First of all, the concentration variable (HHI) is not found to affect *LERNER* significantly, a result that is in line with Maudos and Fernandez de Guevara (2004). However, liquidity and interest rate risk and the capital to assets ratio are significantly and positively related to *LERNER*. Interestingly the estimated coefficients are found to be lower than in the case of *SPREAD* which, in turn, suggests a reduction of risk effects on margins with diversification.

[4] There are two main macroeconomic hypotheses related to banks' margins that affect aggregate risk in financial markets. The first one is the hypothesis of cross-sectional risk sharing, which states that intermediaries transfer risk from certain agents to others although aggregate risk do not change. The alternative hypothesis is the so-called intertemporal risk smoothing, which states that banks may benefit from long-term relationships when households' portfolios are not so dynamic and most of the financial savings are invested in deposits. Banks may then take advantage of their relatively large liquidity holdings to offer lower rates on loans during downturns and compensate this with higher loan rates –relative to market rates- during upturns.

As opposed to the case of *SPREAD*, a higher ratio of loans to total assets seems to be positively and significantly related to *LERNER*, while market power decreases with a higher level of deposits over total liabilities. This result supports the hypothesis of loss-leader behavior in intermediation activities since the negative effect of deposits specialization on bank margins can potentially be compensated with higher market power in lending activities. Other variables such as the weight of other earning assets (different from loans), the variable that relates the Boyd-Gertler estimator to total assets, the level of loan commitments and the relative substitution of branches for ATMs are also positively and significantly related to *LERNER*. These results are not surprising, since all these variables represent higher income from fees resulting from innovations. Overall, European banks have apparently found new sources of market power in fee-earning activities tend to face the increasing competition in traditional business. Therefore, as shown in equations [1] and [2], diversification towards non-traditional products may rise bank margins by increasing market power. Interestingly, bank-based systems are found to exhibit higher *LERNER* indices compared to market-based countries.

Since prices and marginal costs may be affected differently by technical change, interest rates, the business cycle and other macroeconomic influences, the numerator of this index, defined as the mark-up between prices and marginal costs (*MRKUP*) was also included as an additional dependent variable in Table 4 [5]. The results are clearly in line with those obtained using *LERNER* as the dependent variable.

According to the previous results, a tentative interpretation is the existence of, at least, two different playing fields in European banks' margin strategies. First of all, although competition has increased in traditional activities –with interest margins falling in recent years- banks apparently can take advantage of deposits to enjoy higher loan interest margins (loss-leader behavior). At a second stage, those banks that diversify their assets portfolio to a larger

[5] The mark-up is built as a fraction of bank total assets in order to obtain a relative margin directly comparable with the rest of dependent variables.

extent may also benefit from the lower level of competition –higher market power- in fee-earning activities[6].

All the equations were also estimated by country. A summary of the results obtained for the specialization/diversification variables -including the signs of the coefficients and their statistical significance- are shown in Table 5. All the results are in line with those obtained for the whole sample although the empirical model seems to perform better for bank-based financial systems.

5. Conclusions

This study analyses the relationship between bank margins and specialization. Using a multi-output model were prices on loans, deposits and other non-traditional activities are set simultaneously, we find that both market power and risk parameters alter bank margins when introducing financial innovations. Empirical tests are implemented for a sample of European 19.322 banks -from Germany, Spain, France, Netherlands, Italy, United Kingdom and Sweden- to analyse the determinants of bank margins during 1994-2001. The loan to deposit rate spread and the loan to interbank market rate spread –as conventional approaches to bank margins-, the gross income –as a wider accounting margin- and the mark-up of price over marginal costs and the Lerner index –as more direct and broader measures of banks margins- are employed as dependent variables. The results suggest that specialization and bank margins are significantly related although these relationships can be only observed when considering a broader definition of bank margins (the Lerner index). Output diversification permits banks to increase their revenues and obtain higher market power. In particular, non-interest (fee) income may "compensate", somehow, lower interest margins that result from stronger competition in traditional markets. These results explain, at least partially, the paradoxical coexistence of decreasing interest margins and higher market power in European banking sectors found in previous studies.

[6] Additionally, due to the fact that German banks account for almost 60% of the number of observations, we also undertook the same empirical analysis removing the German institutions from the sample for robustness purposes (not shown). These results are very similar to those obtained for the entire sample.

Table 1. Variable definition and data sources

	DEPENDENT VARIABLES
SPREAD	Loan to deposits rate spread. As the difference between the price of loans –computed as the ratio "interest income/loans" and the price of deposits –computed as the ratio "interest expense/deposits".
LMSPR	Is the spread between bank loan rates and the interbank market (three months) rate.
GROSS	Gross income over total assets. This ratio incorporates non-interest income and non-interest expenses to intermediation margins to that non-traditional output is reflected in this accounting margin.
MRKUP	
LERNER	The ratio "(price of total assets-marginal costs)/price of total assets. The price of total assets is computed as the ratio "total (interest and non-interest) revenue/(total assets+off-balance sheet activities ". Marginal costs are estimated using a single output (for the sum of total assets and off balance sheet activities) translog cost function with three inputs (deposits, labor and physical capital).
	DETERMINANTS OF THE PURE SPREAD $(S_{it}(.))$
HHI	A Herfindhal-Hirschman index computed from banks total assets in national markets. According to the traditional SCP hypothesis, concentration and banks margins will be positively related. However, this relationship may be influenced by third variables and margins can be found to be negatively affected by concentration (see, for example, Cetorelli and Gambera, 2002).
Liquidity risk	As a proxy for liquidity risk we employ the ratio "liquid assets/short term funding". Liquidity risk is expected to affect bank margins positively (Angbazo, 1997).
Interest rate risk	Computed as the difference between the interbank market (three months) rate and the interest rate of customer deposits. Interest risk increases bank interest margins (Saunders and Schumacher, 2000).
	OTHER BANK-SPECIFIC FACTORS $(X_{it}(.))$
Inefficiency	Computed as the ratio "operating costs/gross income". Higher operating inefficiency imply higher operating costs. Therefore, we expect that those banks experiencing higher costs will increase prices to a larger extent, so that inefficiency will result in higher margins.
Capital to assets ratio	A proxy of banks' solvency computed as the ratio "capital and reserves/total assets". Capital requirements represent a premium on bank margins (Berger, 1995). Therefore, a positive relationship between this variable and bank margins is expected.
	SPECIALIZATION DIVERSIFICATION VARABALES $(SD_{it}(.))$
Lending/total assets	Customer and interbank loans as a ratio of total assets. As specialization in traditional activities increases, efficiency on these activities may increase and banks might exhibit lower (interest) margins.
Deposits/total liabilities	Total deposits as a ratio of total liabilities. As shown previously, the relationship between deposits-taking specialization and bank margins may be either negative –if deposits are not a loss-leader product- or positive –if deposits are loss-leader products that permit to operate with larger interest margins.
Other earning assets/total assets	Total earning assets different from loans as a ratio of total assets. Contrarily to the loan to assets ratio, a higher value of this ratio will imply a higher diversification towards fee-income and/or market-based activities. Therefore, bank margins should increase as a result of higher income diversification and higher market power.
Loan commitments/total assets	Total loan commitments (credit cards and lines of credit) as a ratio of total assets. Although these activities are considered as non-traditional, they represent an off-balance sheet expansion of lending activities. Therefore, as the level of loan commitments increases, the specialization/efficiency effect on lending activities will be larger and interest margins will be expected to fall.
Fee-based activities (Boyd-Gertler estimator as a ratio of total assets)	The Boyd and Gertler (1994) estimator is a proxy of bank fee-based activities which is directly comparable with balance sheet assets. It is computed as $\left(\left[fee\ income / total\ revenue\text{-}fee\ income\right].\ total\ bank\ assets\right)$. Higher levels of fee-income activities will represent higher income diversification towards non-traditional activities. Higher market power is associated with fee-based activities and, as a result, an increase of bank margins will also be expected.
ATMs/branches	A proxy of technical change in delivery channels. The ratio is computed using national data on banks' ATMs and branches. As this variable grows, banks are expected to reduce their unit operating costs and increase fee-income from the use of these services.
	MACROECONOMIC ENVIRONMENT CONTROL VARIABLES $(OC_{it}(.))$
GDP	GDP, in constant 1995 US dollars. The relationship between bank margins and growth will depend on the correlation between prices, costs and the business cycle. Economic growth is negatively related to bank prices and costs although the extent to which these variables can be affected may be significantly different so that the net effect on margins cannot be clearly determined (Carbo et al., 2003).
BBMB	A dummy indicating if the bank operate in a bank-based or market-based system, This dummy aims to provide a preliminary evidence of potential differences in bank margins according to financial system structure. The dummy take the value 1 if the bank operates in a bank-based system and 0 if the bank operates in a market-based system. Germany, Spain, France and Italy were labelled as bank-based systems while Netherlands, United Kingdom and Sweden were considered as market-based systems .

Note: All the variables were computed using Bureau Van Dijk-Bankscope database information except interbank market rates (International Financial Statistics, International Monetary Fund), ATMs and branches (Blue Book, European Central Bank) and GDP (World Development Indicators, World Bank).

Table 2. Sample composition by country and year

	TOTAL	FRANCE	GERMANY	ITALY	NETHERLANDS	SPAIN	SWEDEN	UK
1994	2098	345	1265	216	36	148	14	74
1995	2284	350	1372	244	47	153	18	100
1996	2434	350	1445	262	51	186	19	121
1997	2512	345	1476	296	49	200	17	129
1998	2549	337	1508	314	46	191	20	133
1999	2579	372	1480	343	48	183	24	129
2000	2541	361	1440	362	42	179	25	132
2001	2325	335	1288	345	33	181	25	118
PERIOD	19322	2795	11274	2382	352	1421	162	936

Table 3. Summary statistics: means of the posited variables by country
(standard deviation in parenthesis)

Variable	GERMANY	SPAIN	FRANCE	NETHERLANDS	ITALY	UNITED KINGDOM	SWEDEN
Loan to deposit rate spread	0.06	0.10	0.12	0.07	0.09	0.10	0.09
	(0.12)	(0.08)	(0.07)	(0.06)	(0.05)	(0.04)	(0.03)
Gross income to total assets	0.18	0.22	0.22	0.23	0.21	0.22	0.20
	(0.19)	(0.18)	(0.15)	(0.18)	(0.16)	(0.17)	(0.16)
Mark-up of price over marginal cost	0.08	0.13	0.07	0.07	0.14	0.16	0.11
	(0.09)	(0.07)	(0.08)	(0.06)	(0.05)	(0.04)	(0.07)
Lerner	0.35	0.38	0.27	0.26	0.37	0.33	0.29
	(0.12)	(0.05)	(0.04)	(0.08)	(0.06)	(0.12)	(0.06)
Loan to market rate spread	0.06	0.10	0.12	0.06	0.09	0.11	0.06
	(0.03)	(0.05)	(0.08)	(0.07)	(0.08)	(0.06)	(0.04)
HHI	0.12	0.55	0.47	0.16	0.45	0.24	0.20
	(0.02)	(0.05)	(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
Liquidity risk	0.29	0.21	0.15	0.35	0.41	0.34	0.33
	(0.04)	(0.03)	(0.02)	(0.05)	(0.03)	(0.04)	(0.03)
Interest rate risk	0.002	0.003	0.003	0.005	0.002	0.003	0.002
	(0.03)	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.02)
Inefficiency	0.58	0.60	0.62	0.56	0.68	0.59	0.62
	(0.08)	(0.09)	(0.09)	(0.10)	(0.08)	(0.11)	(0.07)
Capital/total assets	0.10	0.11	0.11	0.10	0.09	0.10	0.09
	(0.07)	(0.06)	(0.04)	(0.05)	(0.04)	(0.08)	(0.08)
Lending/total assets	0.73	0.73	0.71	0.68	0.70	0.69	0.70
	(0.07)	(0.08)	(0.09)	(0.08)	(0.06)	(0.08)	(0.06)
Deposits/total liabilities	0.87	0.85	0.72	0.79	0.69	0.73	0.66
	(0.04)	(0.04)	(0.05)	(0.05)	(0.08)	(0.09)	(0.06)
Other earning assets/total assets	0.26	0.27	0.29	0.32	0.31	0.31	0.30
	(0.05)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)
Loan commitments/total assets	0.33	0.30	0.34	0.38	0.30	0.33	0.35
	(0.08)	(0.07)	(0.06)	(0.09)	(0.08)	(0.06)	(0.07)
Fee-based activities (Boyd-Gertler estimator as a ratio of total assets)	0.047	0.047	0.056	0.053	0.040	0.045	0.049
	(0.02)	(0.03)	(0.04)	(0.03)	(0.02)	(0.04)	(0.05)
ATMs/branches	1.06	1.17	1.10	1.01	1.02	1.01	1.12
	(0.08)	(0.09)	(0.08)	(0.07)	(0.07)	(0.09)	(0.09)
GDP (€ billion)	1.92	0.53	1.28	0.35	1.05	1.18	0.21
	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)

Table 4. Determinants of bank margins and specialization: a dynamic panel approach
Total sample (Germany, Spain, France, Netherlands, Italy, United Kingdom and Sweden)
N. observations: 19322
Dynamic Panel Data Analysis (GMM estimator)
standard errors in parenthesis

Dependent variable	SPREAD	LMSPR	GROSS	LERNER	MRKUP
Constant	-5.0071**	-4.9684**	-0.0437	-4.3611**	-4.3933**
	(0.10)	(0.09)	(0.01)	(0.08)	(0.08)
Dependent variable (t-1)	-0.25835	-0.01235	0.53161**	0.26998**	-1.6943
	(0.55)	(0.61)	(0.09)	(0.10)	(1.86)
HHI	0.807714	0.35780	0.01981	-2.3950	-2.3919
	(1.43)	(1.27)	(0.08)	(1.23)	(1.26)
Liquidity risk	7.1615**	6.7411**	0.02290	4.3690**	4.5754**
	(0.88)	(0.77)	(0.05)	(0.69)	(0.69)
Interest rate risk	2.3171*	0.9632*	0.00816	0.73824*	0.82358*
	(1.00)	(0.64)	(0.021)	(0.65)	(0.66)
Inefficiency	0.00087*	0.00083	-0.00015*	-0.00048	0.00025
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Capital/total assets	16.1828*	15.1553*	-0.0136	4.6929*	3.5937*
	(9.64)	(8.50)	(0.05)	(5.28)	(5.63)
Lending/total assets	-4.1564**	-4.0195**	-0.0169	0.42047*	0.72764*
	(1.73)	(1.53)	(0.02)	(1.14)	(1.16)
Deposits/total liabilities	4.5423*	4.4056**	0.0266	-3.6772**	-3.2716**
	(1.86)	(1.67)	(0.07)	(0.89)	(0.89)
Other earning assets/total assets	-17.2397**	-16.6116**	0.0323**	2.8385*	2.0462*
	(2.56)	(2.30)	(0.01)	(1.51)	(1.51)
Loan commitments/total assets	0.23232**	0.23276**	0.0130	-0.01275	-0.0007
	(0.08)	(0.08)	(0.01)	(0.05)	(0.06)
Fee-based activities (Boyd-Gertler estimator)	0.00014	0.00015	0.00094*	0.00021*	0.00028**
	(0.01)	(0.01)	(0.01)	(2.44)	(0.01)
ATMs/branches	0.27189**	0.26766**	0.00062*	0.11453**	0.10742**
	(0.03)	(0.03)	(0.01)	(0.02)	(0.02)
GDP	-0.46E-05**	-0.44E-05*	0.10E-07	0.87E-06	0.12E-05
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Bank-based/Market-based DUMMY	-5.4863**	-5.0435**	0.0054	2.8300**	2.7631**
	(1.11)	(0.97)	(0.06)	(1.51)	(0.90)
F-test	0.001	0.002	0.018	0.001	0.001
Sargan test	0.010	0.011	0.022	0.010	0.009

* Significantly different from zero at 5 per cent level.
** Significantly different from zero at 1 per cent level.

Table 5. Determinants of bank margins and specialization across countries: summary of results
N. observations: 19322
Dynamic Panel Data Analysis (GMM estimator)

	Lending/total assets	Deposits/total liabilities	Other earning assets/total assets	Loan commitments/total assets	Fee-based activities (Boyd-Gertler estimator)	ATMs/ branches	F-test	Sargan test
Germany								
SPREAD	--	++	--	++	0	++	0.001	0.010
LMSPR	--	+	--	++	0	++	0.002	0.012
GROSS	0	++	++	0	+	0	0.007	0.020
MRKUP	0	-	+	0	++	++	0.001	0.010
LERNER	0	--	+	0	++	++	0.001	0.009
Spain								
SPREAD	--	++	-	++	0	+	0.001	0.011
LMSPR	-	+	-	++	0	+	0.004	0.014
GROSS	0	+	++	0	++	0	0.005	0.018
MRKUP	+	-	+	0	++	+	0.002	0.008
LERNER	0	--	++	0	++	++	0.001	0.010
France								
SPREAD	--	+	--	++	0	++	0.001	0.009
LMSPR	-	++	--	++	0	++	0.003	0.011
GROSS	0	++	++	0	+	0	0.006	0.020
MRKUP	0	-	+	0	++	++	0.003	0.012
LERNER	0	-	+	0	++	+	0.002	0.013
Netherlands								
SPREAD	-	+	--	+	0	+	0.005	0.012
LMSPR	0	+	-	++	0	+	0.006	0.013
GROSS	0	+	++	0	+	0	0.008	0.021
MRKUP	0	-	+	0	++	++	0.002	0.012
LERNER	+	-	+	0	++	+	0.003	0.011
Italy								
SPREAD	--	+	--	++	0	++	0.006	0.011
LMSPR	-	++	--	++	0	++	0.007	0.014
GROSS	0	++	+	0	++	0	0.005	0.016
MRKUP	0	-	+	0	++	+	0.002	0.011
LERNER	0	--	+	0	+	++	0.002	0.010
United Kingdom								
SPREAD	-	+	--	+	0	+	0.006	0.012
LMSPR	0	+	-	++	0	++	0.004	0.020
GROSS	0	++	++	0	+	0	0.007	0.020
MRKUP	+	0	+	0	+	++	0.004	0.016
LERNER	0	-	0	0	++	++	0.003	0.014
Sweden								
SPREAD	0	+	-	++	0	+	0.004	0.011
LMSPR	-	++	--	+	0	+	0.003	0.015
GROSS	0	+	++	0	+	0	0.008	0.020
MRKUP	+	-	+	0	+	++	0.004	0.014
LERNER	0	-	0	0	++	++	0.003	0.012

The following signs indicate that the estimated coefficient was:
+: positive and significant at 5 per cent level
++: positive and significant at 1 per cent level
-: negative and significant at 5 per cent level
--: positive and significant at 1 per cent level
0: not significant

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