The Anatomy of Bank Diversification

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Abstract

We use panel data from nine countries over the period 1996 to 2003 to test how revenue diversification in conjunction with increasing bank size affects bank value. Using a comprehensive framework for bank performance measurement, we find robust evidence against a conglomerate discount, unlike studies concerned with industrial firms. Rather, revenue diversification increases bank profitability and is associated with higher market valuation. This performance effect does not depend on whether diversification was achieved through organic growth or through M&A activity. We further demonstrate that previous results in the literature on the impact of diversification on bank value presumably differ due to the way diversification is measured, and the negligence of an indirect positive value effect via bank profitability.

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1. Introduction

While many non-financial firms around the world have been striving for corporate business focus over the last two decades, financial services firms and especially banks have instead increased business diversification. This paper analyzes empirically whether or not the trend towards diversification in global banking has been in the interests of bank shareholders and it aims to shed light on the channels through which diversification might affect value creation in banking.

Our study documents that average diversification levels of the world's largest banks were almost one third higher in 2003 than they had been in 1996. Commercial banks typically increased diversification by moving into fee-based businesses. Banks with already strong fee-based revenues expanded into trading activities. Yet other banks diversified revenues by underwriting insurance contracts.

The disparate diversification trends between non-financial firms and banks raises the question of whether banking institutions are prone to make the same mistakes that many non-financial firms made during the conglomeration wave of the sixties and nineties of the last century. Alternatively, the banking business is possibly truly special in the sense that a broadening of business scope creates value for bank shareholders.

Such value creation could come from two broad sources. One is bank-specific economies of scope. Unlike most firms from other industries, banks often entertain long-term contractual relationships with their customers. Over time banks can gather extensive customer information and reuse that information not only in the business area where the information was originally gathered but also in other non-related business areas. Moreover, banks that operate with high operational leverage (i.e., a high ratio of fixed costs to variable costs) might find that diversification into related businesses awards them with a cost advantage over specialized competitors. For example, selling life insurance through the existing retail bank branch network might result in cost economies of scope. If such economies of scope truly exist in banking, diversification will tend to have positive effects on aggregate welfare and financial system stability.

The second reason why business diversification might be in the interest of bank shareholders has to do with the current state of the financial services industry. Mainly due to technological progress and deregulation, the financial services industry has been undergoing dramatic change over the last two decades. Boot (2003) argues that banks have extended their business scope mainly as a strategic response to this business uncertainty. Banks have been investing into diverse business areas

early on to acquire the skills needed to make efficient production decisions and to reap profits when a particular business area eventually turns out to flourish. Given the real option character of skill building investments, wealth implications for shareholders of diversifying financial institutions are a function of the degree of strategic uncertainty, the effectiveness of early skill building or skill reusing, and ultimately the ability of an institution to create shareholder value from the opportunities at hand. This foot-in-the-door strategy cannot turn out to be successful for all the banks that have embarked on it. Rather one would expect that some institutions will indeed develop into broad powerhouses while others will have to absorb the losses from a failed market entry. If the observed trend towards more diversification was largely driven by such a foot-in-the-door strategy, aggregate effects on welfare and stability are ambiguous at best and bank shareholders as well as regulators should watch diversification trends very carefully.

This paper attempts to provide a fresh view on the direct and indirect effects of revenue diversification on equity market value by disentangling the aggregate diversification effect typically measured by other studies. To this end we measure the effects of diversification on financial indicators from three tiers of a comprehensive framework for bank valuation. We also account for potential interactions between diversification, growth and vertical integration by explicitly controlling for simultaneous changes along these two other dimensions of banking firm boundaries.

Contrary to related studies, our sample covers large banks from nine developed countries with well functioning financial systems. This allows studying banks that face hardly any restrictions regarding diversification levels. We thus complement other studies, that either consider only U.S. banks (which may be special due to the Glass/Steagall-Act, that was effective over most of the available history of firm-level data in the U.S.) or that cover banks from developed countries together with banks from developing countries which are very heterogeneous with regard to regulation, public ownership and influence, or market structure.

Our econometric framework allows discriminating between diversification effects from operational economies of scope and from a foot-in-the-door-strategy strategy.

Finally, we conduct several robustness tests of our results, considering economic significance, sample splits, and three different exercises to control for potential endogeneity between bank value and diversification.

Our main finding is that revenue diversification enhances contemporaneous bank profitability via higher margins from non-interest businesses and lower cost income ratios. Higher contemporaneous bank profitability translates into higher market valuations, implying that diversification has an

indirect positive impact on bank value and giving rise to a conglomerate premium in banking. This result is in line with the economies of scope explanation for diversification. Once we control for the indirect effect of via profitability we find no direct effect of diversification on market valuations. We therefore largely rule out the foot-in-the-door-strategy being the primary reason for bank diversification.

The paper unfolds as follows. The next section provides a quick review of the relevant empirical literature, in particular delineating how our analysis differentiates from and complements a recent study by Laeven/Levine (2007). Section 3 presents the multi-tier framework for measuring diversification effects. Our data are presented in section 4. In section 5 we present and discuss our empirical results. Section 6 provides extensive robustness tests regarding measurement issues, endogeneity, and selectivity. Section 7 concludes.

2. Literature Review

There is a large body of literature on the costs and benefits of diversification. Among the identified benefits are economies of scope (e.g., Chandler 1977; Teece 1982), an improved resource allocation through internal capital markets (e.g., Williamson 1975; Stein 1997), a potentially lower tax burden due to higher financial leverage (e.g., Lewellen 1971) and the ability to use firm-specific resources to extend a competitive advantage from one market to another (e.g., Wernerfelt & Montgomery 1988 and Bodnar *et al.* 1997). These benefits have to be traded off against the costs associated with diversification. Cost may stem from agency problems afflicting diversifying investments (e.g., Jensen 1986; Meyer *et al.* 1992), inefficient internal resource allocation due to a malfunctioning of internal capital markets (e.g., Lamont 1997; Scharfstein 1998; Rajan *et al.* 2000), informational asymmetries between head office and divisional managers (e.g., Harris *et al.* 1992), and increased incentives for rent-seeking behaviour by managers (e.g., Scharfenstein & Stein 2000).

There is abundant empirical evidence for US industrial firms that the cost of diversification outweighs its benefits from a shareholder's perspective. The by now classic studies by Lang & Stulz 1994 and Berger & Ofek 1995 report that diversified US firms trade at an 8% and 13% to 15% equity discount, respectively, as compared to their specialized peers. However, more recent work has cast some doubt on the general existence of a diversification discount. It has been argued that measurement problems (e.g., Whited 2001), data problems (e.g., Harris 1998; Villalonga 2004), selection biases in terms of firms, observation period or country (Graham *et al.* 2002; Lins & Ser-

vaes 1999) and failure to account for the endogeneity of the diversification decision (Campa & Kedia 2002) have driven the results of earlier studies. While the academic debate has not reached a final consensus, a common broad picture emerges according to which value generating diversification is rather the exception than the rule in most industries.

The empirical literature on the merits of bank diversification has largely focused on the question of whether the repeal of the Glass-Steagall Act allowed US commercial banks to reduce business risk by diversifying into non-traditional financial services. The potential to reduce earnings volatility was found for combinations of earnings streams from banking and insurance activities (Boyd *et al.* 1993; Laderman 1999; Lown *et al.* 2000) but was hardly found at all for the combination of earnings streams from interest-based banking activities and fee-based securities activities (Allen & Jagtiani 2000; Estrella 2001).

Stiroh & Rumble 2003 measure the effect of diversification on the risk-adjusted profitability of US financial holding companies for the period 1997–2002. They find that revenue diversification towards fee income reduced risk-adjusted returns because over their observation period, fee-based activities were more volatile but not necessarily more profitable than traditional interest earning activities. The lack of evidence for positive diversification effects on profitability is echoed by event studies on diversifying bank mergers (e.g., DeLong 2001) and by the abundant empirical literature that applies frontier efficiency analysis to examine the productive efficiency of banks. In their extensive survey article Berger & Humphrey 1997 report that there is a lack of strong evidence in favour of or against the joint provision of different financial services.

Laeven & Levine 2007 apply a modification of the Lang & Stulz 1994 ‘chop shop’ method to measure diversification effects on bank market valuation. They compare the market-to-book ratio of a diversified financial institution with that of a corresponding portfolio of selected banks specializing in either interest-based or fee-based business. They assume a linear relationship between diversification and market value and find that diversification reduces market-to-book ratios by up to ten percentage points.

Our approach differs from Laeven/Levine 2007 along four important dimensions. Firstly we utilize several alternative measures for bank diversification. One of these measures is arguably more granular than the type used in Laeven/Levin 2007. This allows us to investigate the robustness of results with regards to measurement of diversification.

Secondly, we include additional explanatory variables into our regressions that help to avoid potential omitted variables biases. Most importantly we include contemporaneous bank profitability

as a regressor when estimating diversification effects on market values. This allows us to discriminate between indirect, operational diversification effects from economies of scope and direct effects from a foot-in-the-door strategy. In addition, we control for mergers and acquisitions activity and for differences in the vertical integration of our sample banks.

Thirdly we adopt a comprehensive framework of regression models (see next section) that permits us to investigate along which channels diversification affects bank profitability and bank valuation.

Finally, we use a more homogenous sample of exchange-listed banks from well-developed countries rather than a sample that also comprises banks from developing countries.

Similarly to Laeven/Levine (2007), however, we spend considerable effort on examining robustness to measurement issues and potential endogeneity problems of the econometric specification.

3. Methodology

To investigate diversification effects on both a bank's market valuation and its financial performance one needs a consistent bank valuation framework that ties market values to observable financial indicators. This section presents the simple framework that underlies our empirical analysis.

The fundamental value (FV) of a bank's equity equals the present value (PV) of future cash flows to shareholders (CF). Under clean surplus accounting the present value of cash flows is equal to the book value of invested shareholders' capital (IC) plus the present value of future economic value creation, as measured by residual income (RI). The present value of future residual incomes is equivalent to the net present value of all current and future projects of a given bank.

$$FV_t = \sum_{T=t+1}^{\infty} PV(CF_T) = IC_t + \sum_{T=t+1}^{\infty} PV(RI_T) \qquad (1)$$

Residual income in period t is defined as excess net operating profits after tax (NOPAT) over a capital charge for the capital invested by shareholders. The capital charge equals invested capital (IC) times cost of equity (CoE).

$$RI_T = NOPAT_T - (IC_T * CoE_T) \qquad (2)$$

The right-hand side of equation (2) can also be expressed as the spread between the return and the cost of equity where NOPAT/IC corresponds to the after tax return on equity (ROE)

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$$RI_T = IC_T \cdot (\frac{NOPAT_T}{IC_T} - CoE_T) \quad (3)$$

Inserting (3) into (1) yields:

$$FV_t = IC_t + \sum_{T=t+1}^{\infty} PV(IC_T \cdot (\frac{NOPAT_T}{IC_T} - CoE_T)) \quad (4)$$

,

The fundamental value of a bank's equity can therefore be expressed as a function of today's nominal value of invested capital, the expected growth path of invested capital and the expected development of spread. Given that investors use information on past growth spread to forecast future performance, fundamental values will be a function of a vector of past growth and spread and a vector of parameters that investors believe to be indicative of the future development of economic value creation.

$$FV_t = f(IC_t, IC_{t-1}, ..., Spread_t, Spread_{t-1}, ..., X_t) \quad (5)$$

If we assume that market value is a (stochastic) function of fundamental value and if we further assume that book value (BV) is a good proxy for invested capital, we can express the ratio of market value to book value (MTB) as a function of the arguments of f (.) and substitute IC with BV.

$$MTB_t = \frac{MV_t}{BV_t} = \frac{g(FV_t, \varepsilon)}{BV_t} = h(BV_t, BV_{t-1}, ..., Spread_t, Spread_{t-1}, ..., X_t) \quad (6)$$

Equation (6) implies that there are two channels through which diversification can affect the relative market value of banks. Firstly, diversification could affect current spreads due to economies (or diseconomies) of scope. Secondly, diversification could affect the expected future development of bank growth and spreads. Such effects can be positive if diversification is expected to provide the foot-into-the-door to exploit upcoming business opportunities or they can be negative if diversification is expected to increase business complexity and bureaucracy. In both cases the vector X should contain a measure for diversification. The existence of multiple, possibly countervailing effects might give rise to a non-linear relationship between diversification and MTB and possibly to an optimal degree of diversification. Our estimation model for market-to-book (MTB) in equation (7) below therefore also contains a quadratic term for diversification (DIV).

$$MTB_{i,t} = a + b \cdot \log(BV)_{i,t} + c \cdot BVgrowth_{i,t} + d \cdot SPREAD_{i,t} + x_1 \cdot DIV_{i,t} + x_2 \cdot DIV_{i,t}^{\ 2} + \varphi' \cdot X_{i,t} + \varepsilon_{i,t} \quad (7)$$

X contains further possible determinants of future performance, such as the degree of vertical integration.

Note that coefficients x_1 and x_2 measure the effect of current diversification on investor expectations regarding future growth and spread. If they are found to be statistically insignificant, this casts doubt on the foot-in-the-door channel of diversification. Insignificant coefficients on diversification in our MTB-model, however, do not rule out the economies-of-scope channel of diversification because such diversification effects will be captured by the variables spread and growth.

In order to investigate the economies-of-scope channel we estimate diversification effects on the components of spread.. Equation (8) decomposes spread into the corporate tax rate (T), the cost of equity and most importantly into four components of pre-tax operating ROE,:

$$SPREAD_t = \underbrace{\frac{A_t}{BV_t} \cdot \left(\frac{TNOR_t}{A_t} - \frac{TOE_t}{A_t} - \frac{LLP_t}{A_t}\right)}_{\text{Pretax Operating Income}} \cdot (1-T) - CoE_t \quad , \quad (8)$$

where A denotes total assets, TNOR denotes total net operating revenues, TOE denotes total operating expenses, LLP denotes loan loss provisions, and T is the corporate tax rate.

The ratio of total net operating revenues over assets can be further decomposed into four asset margins: net interest revenues over assets, net fee revenues over assets, net trading revenues over assets and net other operating revenues over assets. Figure 2 provides a graphical representation of equation (8) and a numerical example for Deutsche Bank AG in 2003.

In the majority of the empirical analysis, our regressions focus on the market-to-book ratio or the spread as the dependent variable, to test for the direct and indirect (i.e. via the spread) impact of diversification on bank value. To trace the performance impact of diversification through the operational channel, we will also report regressions, that have either leverage (assets over book equity), one of the four asset margins, expenses over assets, loan loss provisions over assets, or costs of equity as the dependent variable.

The general structure of these regressions is shown in equation (9), where Y denotes any of the aforementioned dependent variables:

$$Y_{i,t} = a + z_1 \cdot DIV_{i,t} + z_2 \cdot DIV_{i,t}^{\ 2} + \varphi' \cdot X_{i,t} + \varepsilon_{i,t}, \qquad (9)$$

where X denotes a matrix of control variables for vertical integration, growth, size, systematic risk, business focus (non-interest revenues over interest revenues) and possibly interaction terms. We take the panel nature of our data into account by using fixed-effects regressions, and control for any time variation or macro-factors by including a set of year dummy variables.

The coefficients z_1 and z_2 of equation (9) will indicate whether there exists a relationship between diversification and the individual components of the spread. Comparisons across spread component models will allow us to scrutinize how exactly diversification affects performance. An aggregation of diversification effects across spread-component models according to equation (8) will allow us to check for consistency of our estimates. The aggregate effects should be broadly in line with the total effects from regressing SPREAD directly on diversification.

4. Data

We obtain financial accounting data from the Bankscope database. The database covers 2,072 banks and bank holding companies from the USA, Canada, Australia, UK, Germany, France, Spain, Italy, and Switzerland. Bankscope covers virtually all existing large banks but coverage for small banks has been quite heterogeneous across countries and over time. In order to mitigate the selection bias from that heterogeneous coverage, we required that the total assets of sample banks exceeded 1bn USD in at least one of the nine years of our observation period. The remaining 1,378 banks from Bankscope were matched with DataStream to obtain banks with available share price information. The final sample contains 380 listed banks with a total of 1,917 bank years for the years 1996 to 2003. The number of sample banks was not stable over the years due to mergers and acquisitions. 65% of the sample banks are from the US, 3% are from Canada, 29% are from Europe and 3% from Australia. As discussed in detail as a robustness test in Section 6.3, the large sample concentration on banks from the U.S. does not affect our results qualitatively.

The CAPM beta of the banks was estimated based on matched DataStream price series. M&A growth numbers were calculated based on matched M&A transaction data from Thomson Financial's SDC database (see section 4.2 for more details).

4.1. Definition of Diversification

Unlike other studies on non-financial industries we cannot measure bank diversification based on SIC codes and segmental accounting data. SIC-code classification for banks is not granular enough and is not consistent across countries. Moreover, segmental reporting is not consistent across banks and across time.

Instead, we use an adjusted Herfindahl-Hirshman index to measure revenue diversification. Various authors have applied a closely related approach (see, e.g., Comment & Jarrell 1995; Desai & Jain 1999; Acharya *et al.* 2002; Stiroh & Rumble 2003; Stiroh 2004). We report extensive robustness tests for this choice of the diversification measure in Section 5, however.

Equation (10) shows the construction of our diversification index.

$$DIV = 1 - \left(\left(\frac{INT}{TOR} \right)^2 + \left(\frac{COM}{TOR} \right)^2 + \left(\frac{TRAD}{TOR} \right)^2 + \left(\frac{OTH}{TOR} \right)^2 \right) \quad (10)$$

INT denotes gross interest revenue, COM denotes net commission revenue, TRAD denotes net trading revenue and OTH denotes all other net revenue. TOR denotes total operating revenue and is equal to the sum of the absolute values of INT, COM, TRAD and OTH.[4]

We use gross interest revenue so that our diversification measure is not unduly distorted by the profitability of the bank's interest business. Unfortunately, Bankscope does not consistently report gross numbers for the other revenue categories. For those banks, for which non-interest gross revenues are reported we find that direct (and presumably mostly external) expenses for trading and fee-based activities are in the range of 5% to 15% of respective gross revenues. We conclude that the distortion from using non-interest net figures is not material.

Note that, because we are using gross interest revenue and the absolute values for the other three revenue streams, total operating revenue (TOR) in equation (10) is different from total net operating revenue (TNOR) in equation (8). In equation (8) we are interested in the profitability of the four business areas and not, as is the case in equation (10), in the relative significance of the revenues streams.

[4] Negative net revenue values would lead to negative shares for some revenue streams and shares greater than one for other revenue streams. As a consequence, DIV would be strongly affected by business unit performance and could take on values far greater than 0.75.

We subtract the sum of squared revenue shares from unity so that DIV increases in the degree of revenue diversification. By definition DIV can take on values between zero (the bank is fully specialized in one business area) and 0.75 (the bank generates a fully balanced revenue mix from all four business areas).

Figure 1 depicts average revenue shares and average diversification levels across all sample banks. Diversification increased from below 30% in 1996 to over 38% in 2003. Average diversification levels of US banks increased from 29.8% to 38.3% with the highest increase in the years after the abolishment of the Glass-Steagall Act in 1999 (see Table 3). Figure 1 also indicates that the overall increase in diversification is not merely caused by a general decline in the revenue share of gross interest income. Rather, average revenues shares have remained fairly constant since 1998. Therefore some banks must have diversified from interest-related businesses into e.g. fee-based business while others must have taken the opposite route.

4.2. Definition of Other Variables

The level of revenue diversification refers to the horizontal boundaries of a banking firm. Management decisions to alter horizontal boundaries are often intertwined with decisions regarding the level of vertical integration and the overall size and growth of the institution. For example, if business complexity is a positive function of both the level of horizontal diversification and the level of vertical integration and if business complexity bears negatively on performance, then bank management has to trade off horizontal diversification against vertical integration and possibly also against size.

To account for possible interaction effects between the three dimensions of the boundaries of banking firms we need to introduce control variables for size, growth, and vertical integration into our regression analysis.

Following standard definitions, we measure size by the natural logarithm of year-end total assets. Growth is defined based on the annual percentage change in equity book values. We matched Bankscope data with M&A transaction data from Thomson Financial's M&A database SDC to break down total book equity growth into an M&A growth component and a residual organic growth component. Because Thomson Financial only reports transactions at market prices we first had to estimate book values for the acquired equity stakes. For that purpose we divided equity market values by the average market-to-book ratio of all banks from the same country as the target in the year of the transaction. We then added book values of all acquisitions and divestitures undertaken by the same bank in a given year and divided that sum by the start-of-year equity book

value of that bank to arrive at an estimate of its M&A growth in that year. We identified 892 deals that contributed on average 3.8% to a bank's book equity growth per annum. Organic growth is defined as total growth rate minus M&A growth rate and amounts to 14.4% per annum for the average bank in our sample.

The measurement of vertical integration is based on the following idea. We consider a bank as highly vertically integrated if most of its output is generated through the employment of a bank's own resources. A bank is considered to have a low degree of vertical integration if it relies largely on outside resources and services to generate output. Following Tucker & Wilder 1977 we use gross revenues minus pretax profit as a proxy for output volume [5] and the sum of interest expenses, labour expenses, fixed charges and loan loss provisions as a proxy for internal input volume. Vertical integration is defined as input from internal resources over profitability adjusted output. The sample average for vertical integration measured this way declined from 79.4% in 1996 to 73.9% in 2003.

The definitions of the remaining variables are standard and are reported in Table 1. Table 2 shows descriptive statistics for the 380 sample banks. Data series are winsorized at the 0.5% and 99.5% quantiles to mitigate the impact of outlier observations on regression estimates whilst keeping the information that an extreme realisation of the variable has been observed.

5. Results

5.1. Diversification and Value Creation

We start by estimating the direct impact of diversification on market-to-book ratios. Control variables include the level of vertical integration, organic growth and M&A growth, bank size, the ratio of non-interest income over gross interest income and year dummies. The results for a fixed-effects model with bank-individual effects and year dummies (not shown) are presented in Table 4, column 2. This is our baseline model, which we will put to several robustness checks in what follows.

[5] As mentioned above, Bankscope reports gross figures for interest revenues but only net figures for the other revenue types. Therefore we had to approximate gross revenues from fee-based businesses, trading, and other business based on their corresponding net revenue figures.

The coefficients on both the linear and the quadratic term for revenue diversification are statistically insignificant. Revenue diversification does therefore not affect market valuations directly. This casts doubt on the foot-in-the-door explanation for diversification because market participants do not seem to factor in diversification when forecasting future growth and spread.

As expected, contemporaneous spread has a statistically significant and strong positive effect on a bank's relative market valuation. Apparently, investors rely to a considerable extent on current value creation when forecasting future value creation. Organic or M&A growth do not systematically affect bank valuations, while the size control is negative and statistically significant.

The regression estimates in columns 3-5 of Table 4 confirm the results from the baseline model. In column 3, we drop squared explanatory variables. In column 4 we repeat the estimation of the baseline model but change the measure of diversification. The corresponding Herfindahl-index now consists only of two blocks – interest income and non-interest income, thus aggregating fee-based, trading and commission income into one component. In both robustness exercises results remain unchanged, diversification does not affect market valuation, but the spread as a measure for value creation is highly positive and statistically significant.

In column 5 of Table 4, we complement the regression model by controlling for extreme changes in diversification levels. We introduce a dummy variable DIVERSIFY that is equal to one if the change in diversification is in the highest decile for a given year. Similarly, we use another dummy variable SPECIALIZE which is equal to one if the change in diversification is in the lowest decile for a given year. We interact these dummies with our measure of diversification to test whether (at least) major changes in diversification affect market values directly. The coefficients of both interaction terms turn out to be insignificant, casting further doubt on the foot-in-the-door explanation. We provide further robustness tests of this result in Section 6.

The non-existence of a direct diversification effect on bank value does not rule out that diversification affects bank value indirectly through the spread (i.e. current bank profitability). Table 5 shows regression estimates of banks' spread (i.e. the excess of earnings over cost of capital as a proxy for periodic value creation). Here, we also repeat the robustness tests documented in Table 4. Hence, the first column of coefficients shows our baseline model, the second excludes squared terms, the third relies on the Herfindahl-index of diversification based on interest vs. non-interest income, and the fourth repeats the analysis of major changes in banks' degree of diversification.

As can be seen from all specifications in Table 5, there is a strong positive effect of diversification on spread.[6] This finding is consistent with the existence of economies of scope in banking to be exploited through revenue diversification. Given that bank value increases in the contemporaneous spread (see Table 4), the positive diversification effect on spread is also consistent with a positive, yet indirect diversification effect on bank value.

As an aside the spread regressions in Table 5 also indicate that growth through M&A activities reduce spread while organic growth leaves spread unaffected. In addition, reducing vertical integration (e.g. through outsourcing) is generally not associated with an increase in profitability.

5.2. Decomposition of Determinants

In Table 6, we analyse the determinants of the spread-components to achieve a more detailed analysis of how diversification bears on bank profitability, relying on the next layer of the spread decomposition shown in Figure 2.[7] Note that all models control for a general trend towards more non-interest revenue by including the variable non-interest income over interest income. Also in all models we include squared terms of the diversification index based on four income types.The rationale for including squared terms is to allow for non-linearity in diversification effects. As it turns out, non-linearity is only an issue for two spread components, namely net interest margin and cost of equity. The significant coefficients for the linear and the quadratic diversification variables carry the same sign in all other eight models.

All three non-interest income margins appear to be positive and linear functions of diversification, indicating that banks benefit from revenue economies of scope (see models 2–4). Expenses per asset dollar are also increasing in the degree of diversification (see model 5), indicating that banks do not benefit from cost economies of scope. However, this result does not hold anymore if one uses the cost-income ratio to measure cost efficiency. Column 6 of Table 6 shows that more diversified banks incur lower expenses per dollar in total revenues. A possible explanation for the discrepancy in both measures is that leverage declines as a consequence of higher diversification (see column 7). Expenses over assets may thus increase primarily because diversified banks operate with less assets per dollar in equity and also with less assets per dollar in operating expenses.

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[6] Note that the regressions do not include a measure for the riskiness of banks since the cost of capital are already subtracted from the dependent variable.

[7] While not shown here we also estimated extended models that feature interaction terms of DIV with the variables for vertical integration and growth. The statistical and economic relevance of diversification effects remained unchanged.

Loan loss provisions are only very weakly affected by diversification. The eighth model in Table 6 predicts that expected loan losses are slightly higher for diversified banks than for focused banks. This result does not change if we use total revenues instead of total assets as the denominator of the dependent variable.

Model 9 shows that diversification is associated with smaller current equity growth. In the last section we reported that there is no systematic relationship between current equity growth and market valuation. We can therefore largely rule out that diversification reduces market valuations through a deterioration of growth rates.

The estimated effects of diversification on net interest margins and on the cost of equity are not monotonous across the support of the diversification variable. They can be best analyzed by means of numerical examples. The same is true for the aggregate effect of diversification on spread-components. The next section presents numerical examples for the median bank in the sample and three specific bank types, also to examine the economic significance of these effects.

5.3. Economic Significance

Columns 2 and 3 of Table 8 report sample median values for the eight spread-components. We define the median bank from our sample as a bank for which spread-components take on the values shown in column 2. Column 4 reports the estimated change for each of the spread-components if the median bank augments diversification by 10 percentage points (roughly two thirds of the sample standard deviation for DIV). Estimated changes in single spread-components are computed based on the corresponding coefficients on DIV and squared DIV in Table 6.[8] Aggregate changes on spread are computed based on estimated individual changes in conjunction with equation (8). To verify results on aggregate spread effects we also computed diversification effects on SPREAD based on the coefficients from the regression shown in column 2 of Table 5.

Our model predicts that if the median bank increased its diversification level from 32% to 42%, its total revenue margin would ceteris paribus increase by 62 basis points. The slight 10 basis point drop in net interest margin would be overcompensated by a combined 72 basis point increase in fee, trading and other income margins.

[8] We used both significant and insignificant coefficients. To check whether the results in Table 6 are driven by this procedure we dropped all insignificant variables from the models in Table 5, re-estimated the reduced models and used only significant coefficients for the numerical examples. Estimated effects on spread remained largely unchanged.

The model also predicts that total operating expenses over assets would have gone up by 22 basis points and that loan loss provisions over assets would have added another 2 basis points to total expenses over assets. Both leverage and cost of equity are estimated to decline slightly as a result of more diversification.

These effects are commensurate with the existence of non-trivial revenue and cost economies of scope in banking. As banks extend their business scope, they might find it easier to (cross-) sell more products to the same customers. In some cases non-interest business can, however, slightly cannibalize a bank's conventional interest-related business, as indicated by the negative diversification effect on the interest margin.

When measured over total revenues, expenses decline in response to diversification (see last row in Table 8). This implies that diversified banks need ceteris paribus fewer inputs to generate the same revenue volume as focused banks. Possible reasons for this result are that revenue diversification permits banks to use some of their resources (e.g., branches, IT systems, brands) more productively.

Table 8 also shows that diversification effects on current spread are quite sizable. Our model for the median bank predicts that individual diversification effects on spread-components add up to a total effect of 4.0%. This estimate is comparable to the 3.2% increase in spread that is implied by the model in column 2 of Table 5. We conclude that diversification has increased value creation in banking over the past years.

If current spread is a positive function of diversification and if market-to-book is a positive function of current spread, then market-to-book should be a positive function of diversification. If spread increased by four percentage points (e.g., induced by diversification), the model in Table 4 predicts that market-to-book grows by 22 basis points. Hypothetically, the median bank could have increased its market-to-book ratio from 1.73 to 1.95 through a 10 percentage point increase in diversification.

To see whether our results also hold for specific bank types other than the median bank, we select retail banks, investment banks and universal banks from our sample (refer to Table 7 for selection criteria), compute the group medians for the variables and then estimate the impact of diversification on spread-components and spread. Table 8 documents that economies of scope seem to exist for all three bank types and that diversification effects are somewhat stronger for universal banks and somewhat weaker for retail banks than for the median bank. Moreover, the results shown in Table 8 suggest that aggregate diversification effects are extremely powerful for investment banks.

6. Further Robustness Tests

6.1. Measuring Diversification and Market Valuation

Our first main empirical result, that diversification has no direct effect on bank value, is not in line with Laeven/Levine 2007 who report a negative (direct) effect. There are four potential reasons for this discrepancy:

a) *Different measures of diversification*: Laeven/Levine 2007 use the right hand side of equation (11) as their measure of revenue diversification, and an equivalent measure with loans and non-loan assets to measure asset diversification.

$$Diversification(LL) = 1 - \left| \frac{\text{net interest income} - \text{other operating income}}{\text{total operating income}} \right| \quad (11)$$

Table 9 shows the correlation coefficient between the Laeven/Levine 2007 measure and our income-based Herfindahl-measure to be only 0.65. Moreover, asset-based diversification measures differ from all income measures substantially, e.g. the correlation with our diversification measure is -0.185.

b) *Different measures of bank value*: Laeven/Levine 2007 use a so-called activity adjusted excess market-to-book ratio as the dependent variable in their main regressions. This ratio is obtained by subtracting a hypothetical market-to-book ratio from the observed market-to-book ratio for a given bank. The hypothetical ratio is a weighted average of contemporaneous market-to–book ratios of two groups of banks that either specialize in interest-generating businesses or that specialize in fee-generating businesses.

c) *Control variables*: we include additional explanatory variables when estimating the direct diversification effect on bank value to avoid omitted variables biases

d) *Sample composition*

In this section we investigate to what extent a) to c) are responsible for the discrepancy in empirical result. Section 6.3 will discuss the likely impact of d). In what follows we repeat our major regressions from Table 4 but use alternative diversification measures (including (11)) and an activity adjusted excess market-to-book ratio. Table 10 shows estimates from fixed-effects regressions designed to compare our estimation results with those by Laeven/Levine 2007.

The second column of Table 10 illustrates that we can replicate the Laeven/Levine 2007 result of a negative diversification effect on bank value for our sample if we use their diversification and

market value measure, and do not use further control variables. The R^2-statistic of this model is much lower than those reported for the other specifications, pointing to a potential misspecification of this reduced model. In fact, if we introduce more controls and in particular spread as explanatory variables, the negative revenue diversification effect almost vanishes, with a p-value of 9.9%. It vanishes completely if we use our Herfindahl diversification measure instead of the simple measure from (11). The fifth column shows the effect from asset diversification on excess value if we control for spread. This effect is ambiguous because the linear and quadratic coefficients are both significant but carry different signs.

These results indicate that the discrepancy between the results in this paper and those in Laeven/Levin (2007) are unlikely to be due to how bank value is measured (reason b), partly due to how diversification is measured (reason a), but largely due to the inclusion of spread as a control variable (reason c).

It is not clear a priori, which diversification measure is better suited. We would argue that measures based on more granular information will also better reflect different bank structures. Given equation (6), it is at least clear, however, that contemporaneous profitability needs be included as a control variable based on theoretical grounds.

6.2. Endogeneity

Our second main result, that diversification improves bank profitability and therefore has an indirect positive effect on bank value, rests on the assumption that diversification affects profitability or value, but not vice versa. Moreover, we implicitly assume that it is not the very same characteristics that determine bank values and diversification levels. If these assumptions do not hold, our estimation results and inferences could be biased by problems of endogeneity or selectivity. To control for these issues, we take three countermeasures.

The first countermeasure follows automatically from the fact that our regression results in Section 4 are all based on panel regressions that include bank and time fixed effects. The fixed effects model does not require independence between the regressors and individual error terms. This controls simultaneously for all unobserved heterogeneity with respect to time-invariant, firm specific characteristics (like the country of the registered seat of the bank, legal form, etc) and firm-invariant characteristics that vary over time (like the interest level, other macro-variables, or international regulations like Basle I).

Second, we use instrumental variable regressions to explicitly control for the endogeneity between bank value (or spread) and diversification. It is of course challenging to identify instrumental vari-

ables that are correlated with one endogenous variable (diversification) but not the other (market value). A common procedure in econometrics is to exploit the panel nature of the data and use lagged variables as instruments. These variables are not fully exogenous but predetermined (because lagged diversification is set before the actual market value is determined), a characteristic that is for example systematically exploited in the GMM-framework, when estimating dynamic panel models (see Arellano/Bond 1991), or the Fama/MacBeth-approach in asset pricing tests.

Table 11 shows estimation results when using lagged diversification as the instrumental variable for current diversification. In the first step, we simply base the fixed-effects regression on lagged diversification as regressor, to test whether the implicit timing assumption of our baseline regression in Table 4 affects estimation results. Then, we apply two-stage least squares (2SLS) with the fixed-effects estimator, use lagged diversification as the instrument for current diversification and repeat our central regression with either the market-to-book ratio or the spread as dependent variable.[9]

As can be seen from Table 11 in columns 2 and 4, the coefficient on the lagged diversification variable (and the instrumented counterpart) is statistically not different from zero in both regressions of the market-to-book ratio on diversification and other variables. The estimates shown in column 6 of the table illustrate that this result remains robust, when using the activity-adjusted excess market-to-book ratio suggested by Laeven/Levine 2007 as the dependent variable. Columns 3 and 5 of Table 11 show that diversification affects the banks' spread significantly positive even when controlling for endogeneity. As a consequence, instrumental variable regressions confirm our earlier results.

As a third exercise, we follow Laeven/Levine 2007 and model the impact of diversification on the market-to-book ratio and the determinants of a bank's degree of diversification simultaneously. To this end, we estimate a Heckman (1979) treatment effects model by maximum likelihood, with standard errors corrected for clustering of observations for each bank. This explicitly controls for selectivity, i.e. the potential problem that the same characteristics which affect the decision to diversify affect a bank's market value. The model consists of one equation for the determinants of the market-to-book ratio, where a dummy variable indicates whether a firm is diversified. The

[9] Recall that we do not need to include additional risk measures in the regression model of the spread because spread is defined as ROE minus cost of capital, which is based on the estimate of the bank's systematic risk (beta).

dummy equals one, if the Herfindahl index of diversification (based on interest versus non-interest bank income) exceeds 40%, which resembles the 80% quantile of the empirical distribution.

The model comprises a simultaneous probit estimation, where the dummy for a diversified bank is explained by variables exogenous to the market value. As can be seen from our estimations in Table 4, bank market value does not depend on the growth characteristics. However, it is obvious that M&A growth and organic growth are two important strategic instruments for banks to manage their level of diversification. Accordingly, we can use growth through acquisitions and organic growth as exogenous instruments. We also include the cost-income-ratio as an explanatory variable for the diversification status, because increasing diversification might be driven by a bank's desire to use potential synergies through economies of scale and scope more efficiently. The cost-income ratio is a standard bank-efficiency measure in the literature.

Table 12 shows the results of these selectivity estimations. In column 2, we present estimation results based on the market-to-book ratio as in Table 4, while in column 3 we show estimation results when firm value is measured by the activity-based excess value as suggested by Laeven/Levine 2007, similar to the robustness exercise of Table 10, column 2. The coefficient estimates clearly support our main results – diversification does not affect market values but the spread does. Hence, our results are robust to selectivity as well.

6.3. Subsamples and Extended Sample

So far, our analyses were based on a sample of large, exchange-listed banks from nine countries. More than two thirds of the sample banks are domiciled in the U.S. To examine whether this sample concentration affects our results, we repeat our estimations for the non-U.S. subsample, comprising 133 listed banks.

As can be seen in Table 13, our major empirical findings remain qualitatively unchanged. Column 2 of Table 13 shows estimation results for the non-U.S. sample using our baseline specification. The diversification measures are insignificant, while the spread affects the market-to-book-ration positively. The estimation results shown in column 3 illustrate in turn, that the spread positively depends on diversification even in the non-U.S. subsample. Column 4 of Table 13 shows, further shows, that the insignificance of diversification and the positive impact from the spread prevail, if on uses the activity adjusted excess Q measure.

In the last two columns of Table 13, we report in addition estimates for the baseline model (see Table 4, column 3), where we include an interaction term between diversification and a dummy variable INTERNATIONAL, which takes the value of one if international operations contribute at least 20% to total revenues of banks. This serves as an additional test for rsik heterogeneity in our sample. However, neither is the coefficient on the interaction term significant in the market-to-book regression nor in the spread regression, and all other coefficients remain qualitatively unaffected. Thus, our evidence is robust against this additional test for bank risk as well.

Finally, although not reported in this paper for brevity, further robustness test show that the positive dependence of the return on equity (i.e. the principle spread component) is robust when including non-listed banks in the sample. This adds further 438 non-listed banks with assets greater than 1bn USD from the same nine countries. The extended sample comprises 52% US banks, 2% Canadian banks, 36% European banks (8% from the UK) and 2% Australian banks. Again, the regressions results for ROE-components remain qualitatively the same.[10]

7. Conclusions

This paper is motivated by the observation that over the last decade and all around the world, many banks have diversified while non-financial firms have specialized their operations. We hypothesize that either economies of scope are greater for banks than for non-financial firms, or that the high degree of uncertainty in the banking industry increased the attractiveness of foot-in-the-door diversification strategies.

The paper provides strong evidence that diversification improves bank profitability. This result is shown to be very robust for alternative measures of diversification, for alternative subsamples, and also after controlling for endogeneity and selectivity. Based on this result, we believe that economies of scope (at least among related activities) are indeed pronounced in banking.

The evidence presented in this paper is not consistent with the foot-in-the-door explanation suggested by Boot 2003. When controlling for contemporaneous profitability, bank market value is not directly affected by diversification. Both results contradict the findings by Laeven/Levine 2007, who find a negative direct diversification effect on bank value. We show that the discrep-

[10] Results are available from the authors upon request.

ancy in results is mostly driven by the fact that the authors use different measures for bank value and revenue diversification, and do not use a profitability control in their major regressions.

Given that diversification benefits are tied more to the way financial services are produced and less so to the particular challenges the banking industry has been facing over the last decade, it seems likely that banks will also benefit from diversification in the future. And given the fact that a majority of banks still operate at medium levels of diversification, we assume that the industry wide trend towards revenue diversification will continue over the next years.

Finally, on a methodological note, our paper suggests that simple measures of diversification like non-interest revenue over total revenue might in fact be overly simplistic to capture all diversification effects. The same is probably true for econometric models that focus on the direct diversification effects on market valuations. Our paper shows that diversification effects do not typically materialize through such direct effects but rather through indirect effects on current operating performance and is thereby able to reveal a conglomeration premium in banking.

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Figure 1: Revenue Composition and Diversification by Year

The figure shows the mean proportions of the different revenue streams as a percentage of total gross operating revenues. Operating revenue is the sum of the four revenue streams. In addition the graph presents the annual means of diversification levels for the 380 sample banks.

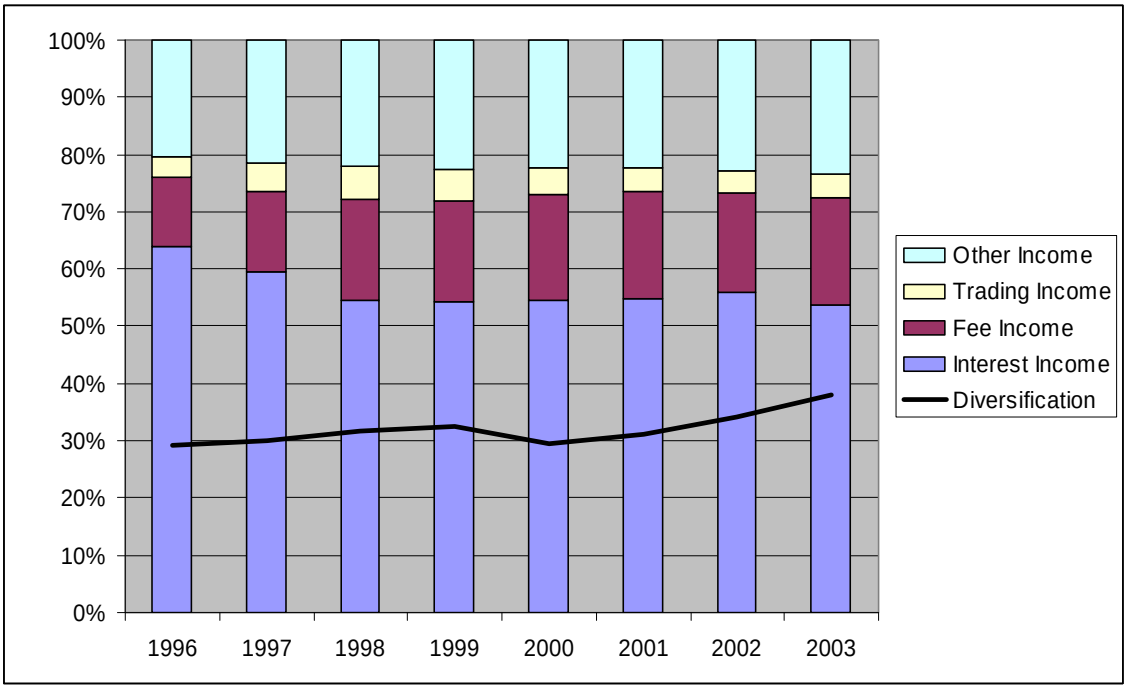
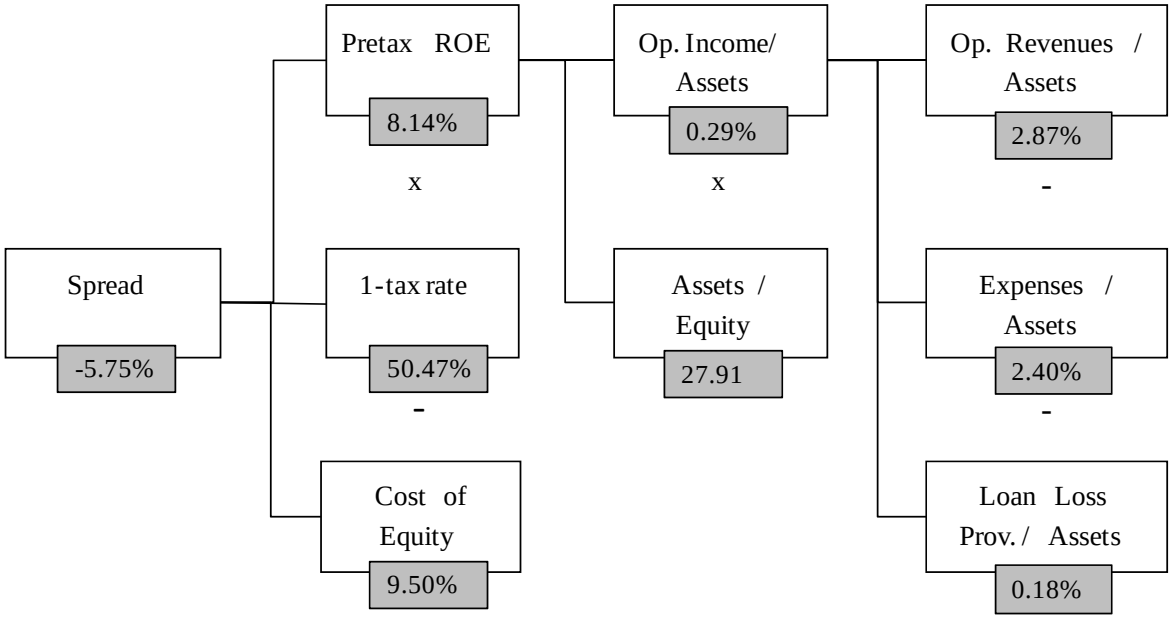


Figure 2: Spread Decomposition

The figure shows a graphical illustration of equation (8) in the text, where the spread (defined as return on equity after tax minus cost of capital of equity) is decomposed in its definitory components. It also depicts information from Deutsche Bank AG annual reports, to provide a numerical example. Assets and equity values are averages of the start- and end-of-year balance sheet numbers for the fiscal year 2003. Cost of Equity are calculated assuming a beta-factor of 0.9, a risk-free rate of 5%, and a market risk premium of 5%.



Deutsche Bank AG	(in thousand $)
Assets (2002/03)	$ 905,071,626.00
Equity (2002/03)	$ 32,433,438.50
Op. Revenues (2003)	$ 25,986,082.00
Expenses (2003)	$ 21,728,532.00
Loan Loss Prov. (2003)	$ 1,616,631.00

Table 1: Definition of Variables

Diversification Measures	
Diversification	Herfindahl-Hirshman index based on types of revenues, see equation (10)
Diversify	Dummy, equal to one if a bank was in the highest decile of yearly changes in diversification.
Specialize	Dummy, equal to one if a bank was in the lowest decile of yearly changes in diversification.
Diversification (Interest)	Diversification measure using interest versus non-interest income (Herfindahl-Hirshman index)
Diversification (LL)	Diversification measure similar to Laeven/Levine 2007, see equation (11).
Diversification (Loans)	Asset-based diversification measure (Herfindahl-Hirshman index) using loans versus other assets.
Return on equity	(Net revenues – operating expenses – loan loss provisions)*effective tax rate / (0.5*beginning-of-period book equity + 0.5*end-of-period book equity)
Spread	Return on equity – cost of equity
Cost of equity	0.05+0.05*Beta
Market-to-book	Market capitalization on Dec 31st/end-of-year book equity
Beta	Calculated based on 250 days of data on return indices for bank and for MSCI World market index (data from DataStream).
Vertical integration	(Staff expenses + interest expenses + loan loss provisions) / (gross operating revenues – pretax operating income)
Equity growth	(end-of-period book equity / beginning-of-period book equity) – 1
M&A growth	(Aggregate deal value from acquisitions and divestitures per bank) / (beginning-of-period book equity) – 1
Organic growth	(1 + equity growth) / (1 + M&A growth) – 1

Table 2: Descriptive Statistics

	Obs	Mean	Std.Dev.	Min	Max
Bank Structure					
Diversification	1917	32.7%	14.1%	0.0%	70.6%
Vertical integration	1917	77.7%	9.4%	36.4%	110.7%
Total Assets (in USDbn)	1917	61.6	145.3	0.1	1264.0
Growth					
Growth due to M&A buys	1917	3.8%	11.9%	0.0%	93.1%
Organic Growth	1917	14.4%	27.4%	-97.1%	263.6%
Shareholder value					
ROE	1917	17.5%	10.0%	-35.8%	56.1%
Spread	1917	3.8%	6.7%	-34.6%	23.0%
Market-to-book	1917	1.995	1.439	0.075	11.351
Revenue composition					
Interest income	1917	62.7%	21.8%	-76.9%	102.8%
Fee income	1917	15.2%	15.5%	-4.0%	91.1%
Trading income	1917	3.9%	9.6%	-15.9%	133.3%
Other operating income	1917	18.2%	19.3%	-3.4%	193.0%
Operations					
Cost/income	1917	62.8%	14.5%	19.6%	153.4%
Expenses/assets	1917	3.3%	2.6%	0.2%	23.4%
Non-interest income/interest income (gross)	1917	65.1%	230.5%	-1.1%	2709.3%
Loan loss provisions/assets	191	0.31%	0.40%	-0.28%	3.14%
Risk					
Assets/equity	1917	13.438	6.176	1.502	62.106
Beta	1917	0.644	0.475	-0.634	1.964

Table 3: Development of Diversification

Summary statistic of the development of the diversification measure in the US compared to Europe from 1996–2003.

	1996	1997	1998	1999	2000	2001	2002	2003
USA	29.8%	30.3%	31.7%	31.3%	27.5%	30.3%	34.3%	38.3%
Europe	28.2%	28.8%	31.9%	34.6%	34.8%	33.3%	33.7%	37.2%
Total sample	29.3%	29.9%	31.8%	32.5%	29.6%	31.2%	34.3%	38.0%

Table 4: Market-to-Book Ratio Regressions

The table reports the results for fixed-effects regressions with the market-to-book ratio of equity (MTB) as dependent variable. DIVERSIFY is a dummy variable, which is equal to one if a bank was in the highest decile of yearly changes in banks' diversification, while SPECIALIZE is a dummy variable that a bank was in the lowest decile. Diversification is measured as one minus a Herfindahl-index, based on interest, fee, commission and trading income. Alternatively, for *Diversification (Interest)* the Herfindahl-index is based on interest vs. non-interest-income only. *,**,*** denote significance at the 10%, 5% and 1%-level, respectively. All models include bank individual effects and year dummies (not shown). p-values in parentheses. The number of observations is 1917, comprising 380 banks over the period 1996-2003.

	MTB / income diversification Baseline specification	MTB / income diversification	MTB / diversification based on interest vs. non-interest income	MTB / major changes in diversification
Diversification	-0.83 (0.311)	-0.09 (0.885)	---	-0.08 (0.897)
Diversification^2	1.01 (0.417)	---	---	---
Diversification (Interest)	---	---	-0.18 (0.921)	---
Diversification^2 (Interest)	---	---	0.74 (0.813)	--
Vertical Integration	-4.55 (0.128)	-0.51 (0.583)	-3.38 (0.500)	-3.41 (0.499)
Vertical Intergration^2	2.551 (0.171)	---	1.94 (0.543)	1.89 (0.555)
Spread	5.81*** (0.000)	5.73*** (0.000)	5.69*** (0.000)	5.70*** (0.000)
M&A growth	-0.22 (0.218)	-0.23 (0.202)	-0.22 (0.214)	-0.22 (0.232)
Organic growth	0.09 (0.277)	0.08 (0.483)	0.08 (0.467)	0.09 (0.422)
Interest / Non-interest Income (gross)	-0.12*** (0.000)	-0.09*** (0.002)	-0.09*** (0.003)	-0.09*** (0.001)
Size (log(assets))	-1.47*** (0.000)	-1.46*** (0.000)	-1.46*** (0.000)	-1.46*** (0.000)
Diversification x DIVERSIFY	---	---	---	-0.09 (0.748)
Diversification x SPECIALIZE	---	---	---	-0.35 (0.142)
R^2	0.318	0.315	0.316	0.317

Table 5: Spread-Regressions

The table reports the results for fixed-effects regressions with SPREAD as dependent variable. DIVERSIFY is a dummy variable, which is equal to one if a bank was in the highest decile of yearly changes in banks' diversification, while SPECIALIZE is a dummy variable that a bank was in the lowest decile. Diversification is measured as one minus a Herfindahl-index, based on interest, fee, commission, and trading income. Alternatively, for *Diversification (Interest)* the Herfindahl-index is based on interest vs. non-interest-income only. *,**,*** denote significance at the 10%, 5% and 1%-level, respectively. All models include bank individual effects and year dummies (not shown). p-values in parentheses. The number of observations is 1917, comprising 380 banks over the period 1996-2003.

	SPREAD / income diversification Baseline specification	SPREAD / income diversification	SPREAD / diversification based on interest vs. non-interest income	SPREAD / major changes in diversification
Diversification	0.10** (0.023)	0.27*** (0.000)	---	0.26*** (0.000)
Diversification^2	0.297*** (0.000)	---	---	---
Diversification (Interest)	---	---	0.28*** (0.000)	---
Diversification^2 (Interest)	---	---	-0.00 (0.960)	--
Vertical Integration	1.09*** (0.000)	0.37*** (0.000)	1.02** (0.023)	0.94** (0.015)
Vertical Intergration^2	-0.43*** (0.000)	---	-0.43 (0.145)	-0.38 (0.148)
M&A growth	-0.04*** (0.000)	-0.04*** (0.000)	-0.04*** (0.000)	-0.04*** (0.000)
Organic growth	-0.00 (0.349)	0.00 (0.951)	-0.00 (0.849)	-0.00 (0.736)
Interest / Non-interest Income (gross)	0.06*** (0.000)	0.04* (0.077)	0.05** (0.016)	0.01** (0.011)
Size (log(assets))	-0.01** (0.040)	-0.01* (0.06)	-0.01** (0.049)	-0.02*** (0.002)
Diversification x DIVERSIFY	---	---	---	-0.05*** (0.000)
Diversification x SPECIALIZE	---	---	---	-0.03* (0.050)
R^2	0.245	0.203	0.209	0.219

Table 6: Spread-Components Regressions

The table reports the results from fixed effects regression models. Dependent variables are in column headers. *,**,*** denote significance at the 10%, 5% and 1%-level, respectively. The full models include year dummies (not reported).

	Net interest income / assets (1)		Fee income / assets (2)		Trading income / assets (3)		Other income / assets (4)	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Diversification	-0.056***	0.000	0.015**	0.010	0.006*	0.054	0.029***	0.000
Diversification^2	0.062***	0.000	0.013	0.124	0.022***	0.000	-0.004	0.647
Vertical Integration	0.037***	0.002	-0.028	0.177	0.020*	0.076	-0.139***	0.000
Vertical Intergration^2	-0.029***	0.000	0.011	0.409	-0.008	0.273	0.081***	0.000
M&A growth	-0.002***	0.009	0.000	0.900	0.000	0.998	0.001	0.613
Organic growth	-0.001***	0.000	0.001*	0.097	0.001*	0.064	0.000	0.460
Size (log(assets))	-0.002***	0.000	-0.004***	0.000	-0.001*	0.014	-0.004***	0.000
Interest / Non-interest Income (gross)	-0.001***	0.000	-0.001***	0.000	0.001**	0.000	0.004***	0.000
Beta	0.000	0.133	0.000	0.531	0.000***	0.205	0.000	0.456
Constant	0.055***	0.000	0.056***	0.000	-0.003	0.644	0.099***	0.000
N	1917		1917		1917		1917	
Groups	380		380		380		380	
R^2	0.346		0.131		0.127		0.309	
F-Test	47.34***	0.000	13.47***	0.000	13.03***	0.000	39.91***	0.000

Table 6: Spread-Components Regressions (cont.)

The table reports the results from fixed effects regression models. Dependent variables are in column headers. *, **, *** denote significance at the 10%, 5% and 1%-level, respectively. The full models include year dummies (not shown here).

	Expenses/assets (5)			Cost/income ratio (6)			Assets/equity (7)			Loan loss provisions/assets (8)			Cost of equity (9)			Equity growth (10)		
	coefficient		p-value	coefficient		p-value	coefficient		p-value	coefficient		p-value	coefficient		p-value	coefficient		p-value
Diversification	-0.010		0.137	-0.152	**	0.021	-0.839		0.686	-0.002		0.235	0.022	*	0.090	-2.774	***	0.003
(Diversification)^2	0.044	***	0.000	-0.123		0.219	-5.965	*	0.059	0.006	*	0.075	-0.059	***	0.003	0.212		0.663
Vertical Integration	-0.261	***	0.000	-2.618	***	0.000	-9.598		0.201	-0.005		0.551	-0.015		0.746	-1.723		0.160
(Vertical Integration)^2	0.127	***	0.000	1.237	***	0.000	9.214	*	0.052	0.008	*	0.090	0.012		0.673	0.305		0.649
Spread																		
Growth due to M&A buys	0.004	***	0.005	0.080	***	0.000	-1.833	***	0.000	0.000		0.486	-0.004		0.158			
Organic Growth	0.000		0.496	0.016	**	0.012	-1.574	***	0.000	0.000		0.178	-0.003	**	0.021			
Log(assets)	-0.011	***	0.000	-0.019	**	0.016	1.516	***	0.000	0.000		0.759	0.008	***	0.000	0.327	***	0.000
Non-interest income/interest income (gross)	0.001	***	0.000	-0.010	***	0.000	-0.239	***	0.002	0.000		0.216	0.000		0.763	0.010		0.324
Beta	0.000		0.918	0.006		0.330	0.101		0.623	0.000		0.977				-0.074	***	0.006
Constant	0.259	***	0.000	2.045	***	0.000	3.459		0.349	0.000		0.951	0.016		0.477	-1.056	*	0.097
N	1917			1917			1917			1917			1917			1917		
Groups	380			380			380			380			380			380		
R 2	0.3379			0.2269			0.1337			0.0911			0.1215			0.1268		
F-Test	45.64	***	0.000	26.24	***	0.000	14.67	***	0.000	8.96	***	0.000	13.15	***	0.000	13.80	***	0.000

Table 7: Categorization of Banks

This table reports the criteria for categorizing sample banks into subgroups, used in Table 8.

	Investment bank	Universal bank	Retail bank
Deposits/assets	<40%	>60%	>70%
Loans/assets		>50%	
Gross interest income/assets	<75%	<80%	>80%*

* Additionally: Trading income/operating income <5%

Table 8: Hypothetical Changes in Operating Performance Given an Increase in Diversification

The table reports the estimated change in spread-components, spread and market-to-book ratio if diversification level is increased by 10 percentage points. Changes for spread-components are calculated based on the corresponding coefficients in Table 6 and median values per bank type. The aggregate effect on spread is computed based on estimated changes in the spread-components and based on equation (8). The estimated effect on spread is computed based on the coefficients in column (1) of Table 5. The effect on market-to-book is computed by entering the aggregate effect on spread in the model from Table 4. Bank type definitions are reported in Table 8.

	Median Bank		**Retail Bank**		**Investment Bank**		**Universal Bank**	
	Median value	**Hypothetical change in ppt**	**Median value**	**Hypothetical change in ppt**	**Median value**	**Hypothetical change in ppt**	**Median value**	**Hypothetical change in ppt**
Diversification	32.07%	10.00%	24.29%	10.00%	53.16%	10.00%	39.89%	10.00%
Expenses/assets	2.75%	0.22%	2.58%	0.16%	2.81%	0.41%	3.28%	0.29%
LLP/assets	0.22%	0.02%	0.19%	0.01%	0.04%	0.04%	0.28%	0.03%
Assets/equity	11.97	-0.53	11.53	-0.43	20.47	-0.78	11.43	-0.62
Net interest income/assets	3.00%	-0.10%	3.42%	-0.20%	0.78%	0.16%	3.09%	-0.01%
Fee income/assets	0.45%	0.24%	0.35%	0.22%	0.69%	0.30%	0.59%	0.27%
Trading income/assets	0.04%	0.22%	0.02%	0.19%	0.70%	0.31%	0.06%	0.26%
Other operating income/assets	0.59%	0.26%	0.49%	0.26%	1.68%	0.24%	1.29%	0.25%
Cost of Equity	7.91%	-0.22%	7.15%	-0.13%	12.25%	-0.47%	8.49%	-0.31%
Aggregate Effect on Spread	**5.3%**	**4.0%**	**10.2%**	**3.0%**	**8.2%**	**10.7%**	**8.4%**	**4.2%**
Estimated Effect on Spread	**4.3%**	**3.2%**	**4.8%**	**2.7%**	**2.7%**	**4.4%**	**4.9%**	**3.6%**
Price-to-book-ratio (indirect)	**1.73**	**0.22**	**1.75**	**0.15**	**1.95**	**0.66**	**1.83**	**0.25**
Memo item:								
Cost/income ratio	62.06%	-2.43%	59.55%	-2.24%	72.01%	-2.95%	63.21%	-2.63%

Table 9: Correlation of Alternative Diversification Measures

This table reports correlation coefficients between different measures for the degree of bank diversification. The diversification measure by Laeven/Levine 2007 is calculated as Diversification(LL)= $1-\left|\frac{\text{net interest income}-\text{other operating income}}{\text{total operating income}}\right|$.

	Income-Div.	Interest-Div.	Diversification (LL)	Asset-Div.
Income-Diversification (Herfindahl-index based on interest, fee, trading, and commission income)	1			
Interest-Diversification (Herfindahl-index based on interest vs. non-interest-income)	0.96	1		
Diversification (LL) (Laeven/Levine 2007-measure)	0.65	0.69	1	
Asset-Diversification (Herfindahl-Index based on loans vs. other assets)	-0.16	-0.08	0.04	1

Table 10: Robustness Regressions: Diversification and Market Value measured according to Laeven/Levine 2007

The table reports the results of fixed-effects regressions for alternative diversification measures. *Diversification* is one minus a Herfindahl-index, based on interest, fee, commission and trading income. *Diversification (LL)* is *the measure for revenue diversification used by Laeven/Levine 2007. Diversification (loans)* is one minus *a* Herfindahlindex based on loan and non-loan shares in total assets. *Excess MTB* is the so called activity adjusted excess market to book ratio from Laeven/Levine 2007. *,**,*** denote significance at the 10%, 5% and 1%-level, respectively. All models include bank individual effects and year dummies (not shown). p-values are in parentheses. The observation period is 1996-2003.

	Excess MTB	Excess MTB	Excess MTB	Excess MTB
Diversification(LL)	-0.98*** (0.000)	-0.92* (0.099)	---	---
Diversification(LL)^2	---	-0.05 (0.927)	---	---
Diversification (loans)	---	---	-10.28** (0.05)	---
Diversification (loans) ^{2}	---	---	11.85* (0.062)	---
Diversification	---	---	---	0.97 (0.427)
Diversification^2	---	---	---	-1.35 (0.434)
Vertical Integration	---	0.57 (0.907)	-0.43 (0.927)	1.26 (0.700)
Vertical Intergration^2	---	-0.19 (0.949)	-0.66 (0.824)	-0.43 (0.841)
Spread	---	5.18*** (0.000)	5.04*** (0.000)	5.09*** (0.000)
M&A growth	---	-0.23 (0.197)	-0.15 (0.432)	-0.22 (0.221)
Organic growth	---	0.02 (0.807)	0.05 (0.639)	0.02 (0.767)
Interest / Non-interest Income (gross)	---	---	---	---
Size (log(assets))	-1.47*** (0.000)	-1.41*** (0.000)	-1.51*** (0.000)	-1.40*** (0.000)
R^2	0.182	0.258	0.273	0.251

Table 11: Endogeneity Tests

The table shows regression results controlling for endogeneity between the degree of diversification and banks' market values as robustness tests of our results in Table 4. For a definition of the variables, see Table 1. *Estimator* denotes the applied estimation technique, where FE is fixed effects and 2SLS is two-stage least squares. The first row denotes the dependent variable, where Activity Adjusted Excess Q is the market value measure suggested by Laeven/Levine (2007). *, **, *** denote significance at the 1%, 5%, and 10%-level, respectively.

	Market-to-Book	Spread	Market-to-Book	Spread	Activity Adjusted Excess Q
Estimator	FE	FE	FE, 2SLS	FE, 2SLS	FE, 2SLS
Diversification (Lag 1 / Instrumented)	0.02 (0.970)	0.19*** (0.000)	0.04 (0.970)	0.37*** (0.000)	0.92 (0.286)
Vertical Integration	-3.81 (0.272)	1.03*** (0.000)	-3.82 (0.270)	0.89*** (0.000)	0.05 (0.989)
Vertical Intergration^2	2.22 (0.317)	-0.45*** (0.000)	2.24 (0.321)	-0.28** (0.02)	0.65 (0.773)
Spread	5.71*** (0.000)	---	5.70*** (0.000)	---	4.83*** (0.000)
M&A growth	-0.24 (0.197)	-0.04*** (0.000)	-0.23 (0.199)	-0.03*** (0.001)	-0.21 (0.236)
Organic growth	0.10 (0.204)	0.00 (0.390)	0.10 (0.206)	0.00 (0.837)	0.04 (0.618)
Interest / Non-interest Income (gross)	-0.09*** (0.001)	0.00 (0.174)	-0.09*** (0.007)	-0.01*** (0.000)	---
Size (log(assets))	-1.46*** (0.000)	-0.01*** (0.008)	-1.46*** (0.000)	-0.02*** (0.004)	-1.51*** (0.000)
R^2	0.321	0.067	0.321	0.216	0.253

Table 12: Selectivity Tests

The table shows regression results for the regression of banks' market values on a set of explanatory variables, including a proxy for the degree of diversification as robustness tests of our results in Table 4. For a definition of the variables, see Table 1. *Estimator* denotes the applied estimation technique, where Treatment indicates the Heckman (1979) treatment effects model, and Cluster indicates that standard errors are corrected for bank-individual clustering. The first row denotes the dependent variable, where the Activity Adjusted Excess Q is the market value measure suggested by Laeven/Levine (2007). *, **, *** denote significance at the 1%, 5%, and 10%-level, respectively.

	Market-to-Book	Activity Adjusted Excess Q
Estimator	Treatment, Clustering	Treatment, Clustering
Diversified (Dummy)	0.20 (0.364)	0.02 (0.938)
Vertical Integration	1.94 (0.724)	5.53 (0.989)
Vertical Intergration^2	-3.25 (0.347)	-5.51 (0.102)
Spread	8.04*** (0.000)	7.54*** (0.000)
Interest / Non-interest Income (gross)	-0.00 (0.0.916)	---
Size (log(assets))	0.05** (0.032)	0.04 (0.136)
Simultaneous Probit Estimation (Diversified as Dependant)		
M&A growth	-0.58* (0.067)	-0.58* (0.065)
Organic growth	0.37*** (0.001)	0.37 (0.001)
Cost-Income-Ratio	1.68*** (0.000)	1.69*** (0.000)
Wald-Test of Independent Equations	(0.109)	(0.069)*

Table 13: Subsample-Regressions

The table shows regression results for the non-U.S. subsample of our data and the baseline model augmented by the interaction of diversification and the dummy variable INTERNATIONAL, which takes the value of 1 if international operations contribute at least 20% to total revenues, and zero else. The model specifications are similar to Table 4, including bank individual fixed effects and year dummies (coefficients not reported). For a definition of the variables, see Table 1. The first row denotes the dependent variable, where Activity Adjusted Excess Q is the market value measure suggested by Laeven/Levine (2007). *, **, *** denote significance at the 1%, 5%, and 10%-level, respectively.

	Market-to-Book	Spread	Activity Adjusted Excess Q	Market-to-Book	Spread
Subsample	Not USA	Not USA	Not USA	Intern.	Intern.
Diversification	0.30 (0.879)	0.28* (0.086)	2.22 (0.232)	-0.49 (0.555)	0.28*** (0.000)
Diversification^2	-0.83 (0.756)	-0.03 (0.897)	-3.07 (0.232)	---	---
Diversification x International	---	---	---	1.91 (0.139)	-0.05 (0.563)
Vertical Integration	-8.99** (0.031)	1.92*** (0.000)	-1.70 (0.659)	-0.60 (0.58)	0.37*** (0.000)
Vertical Intergration^2	5.09** (0.041)	-0.96*** (0.000)	1.23 (0.600)	---	---
Spread	4.38*** (0.000)	---	3.54*** (0.000)	5.76*** (0.000)	---
M&A growth	-0.75** (0.027)	-0.01*** (0.750)	-0.71 (0.03)	-0.22 (0.146)	-0.38*** (0.000)
Organic growth	-0.05 (0.609)	0.02* (0.056)	-0.12 (0.763)	0.07 (0.495)	0.00 (0.937)
Interest / Non-interest Income (gross)	-0.04 (0.211)	0.01*** (0.003)	---	-0.07** (0.025)	0.00 (0.250)
Size (log(assets))	0.03 (0.847)	-0.03** (0.044)	0.04 (0.763)	-1.46*** (0.000)	-0.01 (0.133)
#obs (banks)	668 (127)	668 (127)	668 (127)	1917 (380)	1917 (380)
R^2	0.234	0.275	0.188	0.317	0.204